Lappeenranta University of Technology
School of Business and Management
Degree Program in Business Administration

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INCREASING NETWORK VISIBILITY THROUGH INTEGRATED COMMERCIAL AND OPERATIONAL PLANNING CASE: NEW AIR CARGO TERMINAL

Examiners: Professor Jukka Hallikas
Postdoctoral Researcher Mika Immonen

ABSTRACT

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Increasing network visibility through integrated commercial and operational planning
Case: New air cargo terminal

Master's Thesis
2017
96 pages, 8 figures, 3 appendices

Examiners: Professor Jukka Hallikas
Post-doctoral researcher Mika Immonen

Keywords: Hierarchical planning, sales & operations planning (S&OP), master production schedule (MPS), air cargo, supply chain, service supply chain

This thesis studies the application of hierarchical supply chain and operations planning concepts in the air cargo industry and more specifically within a case organization. The case organization is going through significant operational scale-up in the form of a new air cargo terminal and information system and seeks to analyse what is the best way to integrate its short-term operational planning with higher level commercial planning in the new operational setting.

This thesis is a qualitative study that focuses primarily on definition of concepts, tools and frameworks and applies these to a new business environment on a conceptual level. The result of the thesis is a proposal of an end-to-end planning framework that answers the specific research problem and the formulated research questions. Due to the research methods of the study, the general applicability of the results is limited.

TIIVISTELMÄ

Lappeenrannan teknillinen yliopisto
School of Business and Management
Kauppatieteiden koulutusohjelma

Otto Heiska

Verkostonäkyvyyden lisääminen integroidun kaupallisoperatiivisen suunnittelun avulla
Case: uusi lentorahtiterminaali

Pro gradu -tutkielma
2017
96 sivua, 8 kuvaa, 3 liitettä

Työn tarkastajat: Professori Jukka Hallikas
Tutkijatohtori Mika Immonen

Hakusanat: Hierarkkinen suunnittelu, myynnin ja toiminnan suunnittelu, tuotannonohjaus, lentorahtiala, toimitusketju, palvelutoimitusketju

Tämä pro gradu -työ tutkii toimitusketjuihin ja operatiiviseen toimintaan sovellettavien hierarkkisten suunnittelumallien soveltamista lentorahtialalla ja tietyn case-yrityksen näkökulmasta. Pro gradu -työn tilannut case-yritys vie läpi merkittävää operatiivista toimintaympäristöä muokkaavaa muutosta uuden lentorahtiterminaalin ja tietojärjestelmän muodossa. Yritys pyrkii tämän lopputyön avulla selvittämään, mikä on paras tapa toteuttaa integroitu kaupallisoperatiivinen suunnittelu uudessa toimintaympäristössä.

Lopputyö on laadullinen tutkimus, joka keskittyy määrittelemään konsepteja, työkaluja ja viitekehyksiä, minkä lisäksi se pyrkii soveltamaan niitä uudenlaisessa liiketoimintaympäristössä konseptuaalisella tasolla. Lopputyön tuloksena on konsepti uudenlaisesta kaupallisoperatiivisesta suunnittelumallista. Työn tulosten yleinen sovellettavuus on rajallinen, koska tutkimus on toteutettu pääosin case-yrityksen näkökulmasta.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to all the people that either directly or indirectly participated in any form in this long thesis process. Firstly, I would like to thank the representatives of the case organization for this tremendous opportunity and all the valuable lessons learned during the thesis process. The project taught me many skills that I will surely benefit from later on in my career. Secondly, I would like to sincerely thank my supervisor Jukka Hallikas for all the academic support and guidance that I received during multiple occasions during the process. Finally, I would like to thank my fiancée Charlotta Bonsdorff for all the support, patience and care during this project that from time to time felt like an overwhelming endeavour.

Sincerely,

Otto Heiska
Helsinki 28.7.2017

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ABBREVIATIONS

ACSC – Air Cargo Supply Chain

ASRS - Automated Storage and Retrieval System

AWB – Air Waybill

CC – Control Centre

CSCMP – The Council of Supply Chain Management Professionals

CMS – Cargo Management System

ERP – Enterprise Resource Planning System

ETV – Elevating Transfer Vehicle

FSNC – Full Service Network Carrier

GHA – Ground Handling Agent

GSA – General Sales Agent

IATA – International Air Transport Association

IT – Information Technology

IS – Information Systems

MPS – Master Production Scheduling

MRP – Material Resource Planning

OP&C – Operational & Commercial Planning

PAC – Production Activity Control

RFS – Road Feeder Services

RMP – Revenue Management & Pricing

SKU – Stock Keeping Unit

SLA – Service Level Agreement

S&OP – Sales and Operations Planning

ULD – Unit Load Device

1 INTRODUCTION

This thesis studies the application of hierarchical supply chain and operations planning concepts in the air cargo industry. In more detail, the aim of this study is to suggest how supply chain and operations planning concepts often found in manufacturing environments could be applied to the environment of a hub air cargo terminal and its operational planning. The key aim of the thesis is to study how the operating model of an air cargo terminal's control centre ("CC") and the operations planning managed by the CC can be linked to higher-level planning conducted by an organization within the air cargo industry. Higher-level planning refers to the long-term commercial and operational plans that govern the business operations of the organization and affect the future cargo volumes transported by the air cargo operator through the hub. The operational quality and efficiency of the hub is crucial to the air cargo operator's business as the hub's strategic position in the transportation network has an amplifying effect. Therefore, it is of utmost importance that the hub operations planning is structurally linked to long-term planning. A clear link between the two could potentially by a very useful source of information for the operations planning of a hub and provide the needed visibility into the air cargo end-to-end process.

The focus of the thesis is in the field of service supply chains and hierarchical planning concepts. The air cargo supply chain differs from a traditional supply chain because it is a transport service chain that produces a service and not a physical product. Therefore, the underlying factors are different and need to be defined. The different planning concepts differ significantly when it comes to the methods of application, scope of planning and time horizon. In general, all sorts of business planning concepts within both the manufacturing and supply chain fields can be divided into long-term, mid-term and short-term planning or respectively into strategic, tactical and operational planning concepts. These concepts are not new in the manufacturing environment but using them as the conceptual grounds to support the efficient functioning of a cargo terminal is not as common.

1.1 Objectives and research questions

The objective of this study focuses on the application of planning concepts that are often associated with the manufacturing environment to an air cargo setting. These theories have mainly been developed from an internal planning perspective focusing on manufacturing

plant operations. Only within the last decades these theories have extended to an external setting considering both upstream and downstream functions of the supply chain. This broad range of planning concepts can be grouped under the umbrella term of operations and supply chain planning, which will be examined in detail later.

To be able to apply these concepts to the operating model of the air cargo terminal's CC and its operating processes, Organization A's air cargo supply chain will be modelled as a production process that has inputs, transformation processes and outputs. This will align the cargo terminal's operations to the operations of a factory and help with the theory application. The model of the air cargo supply chain processes will emphasise the structure, time frame and dependencies of the different functions within the said supply chain as well as emphasise the key operating processes. On a high level the model will consist of the following processes: (1) the current planning processes in place at Organization A, with a clear emphasise on the operations planning; (2) the operating model of the new terminal as a factory (production input = import/export cargo, production output = export/import cargo); and (3) the operating model of the CC = control of the key processes within the terminal and the connection to the network.

Once the needed model is constructed and the level of knowledge regarding the current situation is sufficiently gained, the thesis aims to find the right planning concept that can be applied to the case of the air cargo terminal operations and planning horizon. When the applicable planning concept has been identified, the thesis will address the case with the support of the following research question and sub-questions:

(Q1) What is the right level of planning that should be applied to the new cargo terminal's CC operating model and its operating processes to link it with higher-level commercial plans?

(SQ1) What kind of end-to-end planning model should be applied to enable the key information to be communicated from long-term plans to operational short plans?

(SQ2) What is the key data input needed to link higher-level plan to short-term operations planning?

1.2 Limitations

Due to the specific research problem presented by the case organization, a clear need to constrain the research scope with clear limitations exists. The end-result of the thesis is not aiming for general applicability but for a more precise application of tools and frameworks found in a very different setting when compared to the air cargo industry and the case organization.

Thus, the scope of the thesis will focus on the operational processes within the new operational scope of Organization A, which includes the new cargo terminal and the new enterprise resource planning system, hereafter known as ERP-A. The planning hierarchy frameworks, from which the conceptual basis of the thesis draws from, link many different parts of an organization. However, the key focus will be on how the new cargo terminal's operating model and key operating processes of the terminal's CC can be structurally linked to other relevant planning. Therefore, the other levels of planning will be referred to with lesser extent. Other key business processes, such as sales, invoicing and customer service, which are on process specific level, will only be referenced if crucial for the thesis research process.

The industry focus is on the air cargo supply chain environment that exists in the non-integrated air cargo industry. The said concept is explained in more detail in the literature review. The reason behind the limited scope within the air cargo industry itself is the significant difference between the key business processes and the fundamental business models of non-integrated and integrated air cargo supply chains.

1.3 Conceptual framework

The conceptual framework of the thesis is based on the concepts of supply chains and hierarchical planning. Academic literature is the main source for the formation of the conceptual framework. The research framework is visualised in Figure 1. The process through which the conceptual framework is built is constructed by going through the definitions of the needed concepts and by that narrowing down the underlying factors that are relevant for the conceptual framework.

The concept of supply chain is the initial starting point for the conceptual framework. This is then narrowed down to a service supply chain and further to the specific air cargo service supply chain. The levels of the hierarchical planning concepts are defined as strategic, tactical and operational. With each hierarchical level, relevant planning frameworks are presented. Planning in a service supply chain is defined in reference to planning in a supply chain and further in an air cargo service supply chain. Finally, the concept seeks to find a suitable framework that considers the relevant characteristics of the air cargo service supply chain and the most suitable planning framework that can be applied into to an air cargo terminal's operations planning.

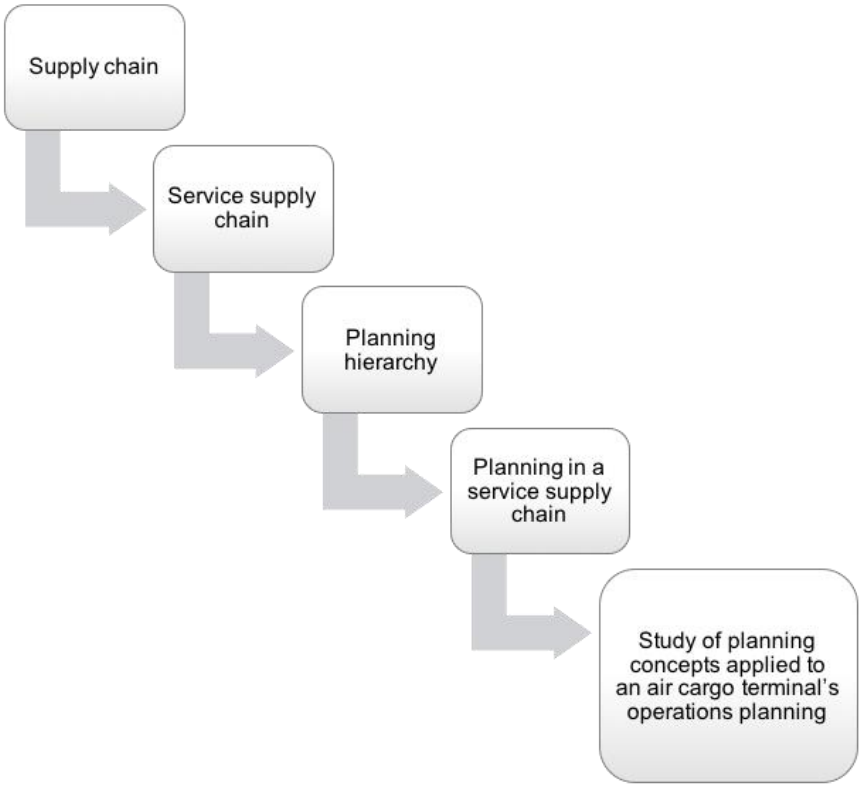

Figure 1. Thesis research framework

2 LITERATURE REVIEW

The following chapter will present relevant literature relating to the operational environment within which the thesis research is conducted. The key concepts of supply chain, service supply chain, different hierarchical levels of planning and planning in a supply chain will be introduced and linked to the air cargo industry. Planning concepts from the manufacturing environment have been extensively researched from the perspective of manufacturing operations and manufacturing company supply chains but not from the viewpoint of a logistics service supply chain in which the air cargo supply chain is categorized in. This viewpoint has not been notably researched by academics and therefore, the formation of the research gap will rely on this new perspective that will in turn support in the formation of the conceptual framework of the thesis.

2.1 Supply chain and supply chain management

A supply chain is a process that is relevant to most businesses globally. It has numerous different definitions emphasising the importance of the flows of materials, information and capital that exist within a supply chain. However, all existing definitions share the same basic concept. (Evangelista, 2015) The fundamental similarity is that a supply chain is a process that transforms either tangible or intangible inputs into some form of goods and services. The concept of a supply chain has been the focus of extensive academic research as well as the focal point for many industry associations.

Harrison & Van Hoek (2008) define supply chain from an abstract point of view as a network of partners that through a collective effort covert a basic commodity into a finished product which is valued by the end-customers, and manage the return of the product through each stage. (Harrison & Van Hoek, 2008, pp. 6-7) The Council of Supply Chain Management Professionals (CSCMP), which is a leading internationally renowned association focusing of supply chains, defined supply chain in a more practically oriented manner. This definition considers supply chain as a process of material and informational interchanges that start with unprocessed raw materials and end with a final customer using the finished product. All vendors, service providers and customers that take part in this chain process stretching from the acquisition of raw materials to the delivery of the finished products to the end users are links in the supply chain. (CSCMP, 2013)

The presented definitions of supply chain highlight the comprehensiveness and importance of having supply chain as the backbone of business from both practical and abstract viewpoints. With these definitions laying the ground, the concept of supply chain management can be defined. Supply chain management is in turn the effective and efficient management practice of integrating key business processes within a supply chain from the initial source of resources all the way to the end user of the product through each value adding link of the supply chain (Lambert et al., 1998). The importance of efficient and effective supply chain management as a contributing factor to cost reduction, increased customer satisfaction, improvements in delivery and service quality has for long been identified and its importance as a management practice has substantially increased during the last decades. (Baltacioglu et al., 2007)

2.1.1 Service supply chain

All the mentioned definitions, even if comprehensive in nature, still represent the strong focus on the manufacturing business environment that is still widely present in the study of supply chains and supply chain management. Supply chains in the service industry have not been studied nearly in the same scale as in the manufacturing environment, despite their equal importance. Baltacioqlu et al. (2007) purpose a definition for a service supply chain as a supply chain that is a network of suppliers, service providers, consumers and other supporting units that perform transactions of resources that are required to produce services, transform these resources into core and supporting services and the deliver these services to end-customers (Baltacioqlu et al., 2007).

This definition of a service supply chain bears much resemblance to the definition of a manufactured product supply chain. However, such definition does not consider some crucial factors that often separate a tangible product from a service. In the production of a service, the service is produced by a company's employee who acts as the key interface towards the customer. In the service process, the customer is often present and can even actively participate in the service delivery process. (Ellram et al., 2004) Another separating key characteristic of a service is the prerequisite of an easy access location where the service is offered. All service systems are dependent on this. (Yücesan, 2016, pp. 135-137)

The difference of products and services is not clear-cut as the production aspect as well as the service aspects to all products must be considered. A car manufacturer produces cars, but, however, the after-sales services of the company are clearly services. Using the same logic, a restaurant offers a service, however, the production process that leads to the serving of the food resemblance a production process. Yücesan (2016) argues that the production aspects can be seen as back-office functions, whereas the service aspects as front office functions. Depending on the relative size of the functions, the product is either more a service or a tangible product. The complexity of the back office and front office functions determine the challenges of the supply chain from the customer's point of view. The back office process complexity can be defined as a non-standardized production processes that have high variety and low volume versus to a highly standardized high volume product. Front-office complexity can the defined as the extent of customized service that requires high level of expertise versus limited standardized service that is close to self-service. (Yücesan, 2016 pp. 137-138)

The interface between the production and service aspects of product is dependent on the coordination of these functions. The design of the supply chain must consider whether the back-office or the front-office of the service product is more complex. A manufactured product supply chain focuses on economies of scale in the back-office without compromising the service that front-office is offering. Service supply chains focus on economies of scope through the effective management of capacity. The two should complement each other in such way that the customer experience remains at the wanted level. (Yücesan, 2016, pp. 137-143) In a service supply chain, the quality of the product can be aligned to the adequacy of the service and the consistency of the produced service at different occasions. In a manufactured product supply chain, the quality is measured by the number of defects in the production process. (Ellram et al., 2004)

The quality of the service in a service supply chain is very much dependent on the customer experience. The customer experience is often effected by three key levers of service performance, which are the average service time, the available capacity of the service provider and the average waiting time. These levers have a significant effect on whether the service supply chain effectively supports the actual service production process. The availability of the capacity to produce the service is the most crucial of these key levers as it

effects directly the two other key levers. If the capacity is lacking, the waiting time to initiate the service production is prolonged as well as the actual service time. Hence, the effective management of the capacity is directly linked to the customer experience. (Sengupta, 2006) The effective capacity management can be achieved with a clear interface between the back-office and the front-office aspects. (Yücesan, 2016, pp. 137-143)

Even though the concept of a supply chain is fundamentally similar in both service business and in manufacturing business, there are key differences that must be highlighted. In a traditional manufacturing business, in which the supply chain is constructed around a tangible product, it is possible to control the production process and the resulting inventories efficiently. (Baltacioqlu et al., 2007). Physical handling of raw materials, semi-finished goods and products often leads to standardization and centralization of procedures and control to improve efficiency and predictability and reduce risk. With a highly-developed quality management system that effectively intercepts non-conforming products and reworks them, a policy of zero defects is possible. In service business, the non-tangible nature makes this much more complicated. (Yücesan, 2016, pp. 135-137)

With high human involvement, the amount of decisions taken locally and the variation and uncertainties in outputs are much higher. The focus of supply chain management in service business is also quite different as metrics such as the management of capacity, flexibility of resources, information flows, service performance and cash flow management are taken into account. However, similarities are found through management, customer relationship management and supplier relationship management, which remain equally important both in service and manufacturing supply chains. (Sengupta, 2006)

2.1.2 Air cargo supply chain

Factors of complexity, market dynamics and relatively high unpredictability label the air cargo industry and differentiate it from a more traditional transport chain. The air cargo supply chain ("ACSC") is most often an international service supply chain that stretches over long geographic distances within a short operational time period. Due to the speed of air transportation, the cargo that is transported by air is mostly of high value, relative low volume and time critical. As a comparison, in 2015 the globally transported air cargo

accounted for 35% of the value of global trade whereas by volume it only accounted for 1% of the global trade. (IATA, 2016)

Due to Organization A's business model in which air cargo service is a business unit of an airline, the integrated ACSC and integrator operators is not considered in this review. The non-integrated ACSC is labelled by complexity, unpredictability due to the relatively high number of parties included in the service chain and other variables. In comparison to the passenger transport, air cargo service supply chain has more sophisticated operating and business processes, a combination of weight and volume, varied priority services, integration and consolidation strategies, and multiple itineraries of a network comparing to the passenger transport (Feng et al. 2015).

The division of labour in the non-integrated air cargo market is rather complex. The physical service supply chain has many participants that contribute to the transportation process from point A to B. (Clausen et al., 2013 pp.63-67) In general, the non-integrated air cargo market of can be roughly divided into three different groups operating in the market and under which any of the market participants can be grouped into. These three groups are asset providers, shippers and intermediaries. Asset providers are the parties that offer airport-to-airport transportation and operate physical assets, namely aircrafts. Among these, are both passenger airlines that offer cargo capacity on the cargo holds of passenger aircraft as well as cargo airliners that operate dedicated all-cargo aircrafts. (Hellermann, 2006 pp.5-7) Considering the complex structure of the ACSC the asset providers have concentrated on their core competencies and leave the other steps of the process to specialised service providers. (Clausen et al., 2013 pp.63-67) Shippers are the party utilizing the air cargo services, which in other words are the senders of the air cargo. Air cargo shippers interact directly relatively rarely with the asset providers and only approximately 5-10% off all air cargo is directly shipped as per contract between initial shippers and asset providers.

Majority of all air cargo is shipped through intermediary parties. These intermediaries act as middle men between the shippers and the asset providers and are in most cases freight forwarding companies that operate road transport services and cover the door-to-airport and airport-to-door sections of the airfreight transport. These freight forwarders have often a broader service offering than just road transportation covering integrated logistics service

that includes e.g. handling, storage, commissioning and organization and management of the whole transportation chain for the initial shipper of the cargo. (Hellermann, 2006 pp.5-7)

In reference to the case study, the key areas of fundamental difference that separate the ACSC from other transport chains are uncertainty of capacity, complexity of planning and relative flexibility. The air cargo capacity is managed by airlines or air cargo carriers and is often reserved between 6-12 months earlier by forwarders based on forecasted capacity needs. However, mainly due to the short transport planning horizon related to the time critical and high value cargo transported by air the reserved capacity rarely matches the actual need of capacity, which in turn creates high capacity fluctuations. (Feng et al. 2015).

Due to these underlying factors, the air cargo capacity market is dominated by long-term and mid-term capacity agreements that exist between the air cargo carriers and intermediaries. Through these contracts of various kind and form, the capacity availability is guaranteed for the intermediaries for certain routes. The contracts are often either reservation agreements or direct purchase agreements that obligate the parties to guarantee the purchase of capacity or the sale of capacity with a certain rate during a certain time-period. The agreements act as incentives for both contractual parties as the intermediaries benefit from secured capacity access if capacity is scarce and locks in the future prices. The air cargo carrier benefits from the capacity agreement as it reduces the capacity utilization risk due to the partial shift of the risk to the contractual partner. Also, for the air cargo carriers, the business relations maintained with the freight forwarders are of utmost importance as the freight forwarders and logistics service providers represent often large aggregated cargo volumes on many routes and maintain direct business relationships to the initial shippers, for whom they often decide, which carrier to use as part of the service offering. (Hellermann, 2006 pp.5-7)

In addition to the abovementioned, the planning complexity in the ACSC is also related to cargo capacity of different aircrafts operating on different routes. Capacity is dependent on several issues such as container types known as unit load devices (“ULD”), which are further specified by several different dimensions and special usage. Different aircraft types utilize different ULD types. Taking all these variables into account makes capacity planning and management complex. Shipment route planning brings in relative flexibility to the ACSC, as the air cargo industry operates mainly on a hub-and-spoke principle. According to the

hub-and-spoke in the aviation industry, all routes are connected to each other through a hub station, which allows a larger variety of possible transport route combinations. (Feng et al. 2015) In an ACSC, the airline or air cargo carrier is needed to declare the origin of the shipment, transit airports and the final-destination to the forwarder that represent the shipper but is otherwise free to make transhipment itinerary planning to optimize the use of available network capacity. (Clausen et al., 2013 pp.63-67)

A standard non-integrated ACSC process starts with the need for air transport defined by the initial shipper, who is always the starting point as can be seen in Figure 2.

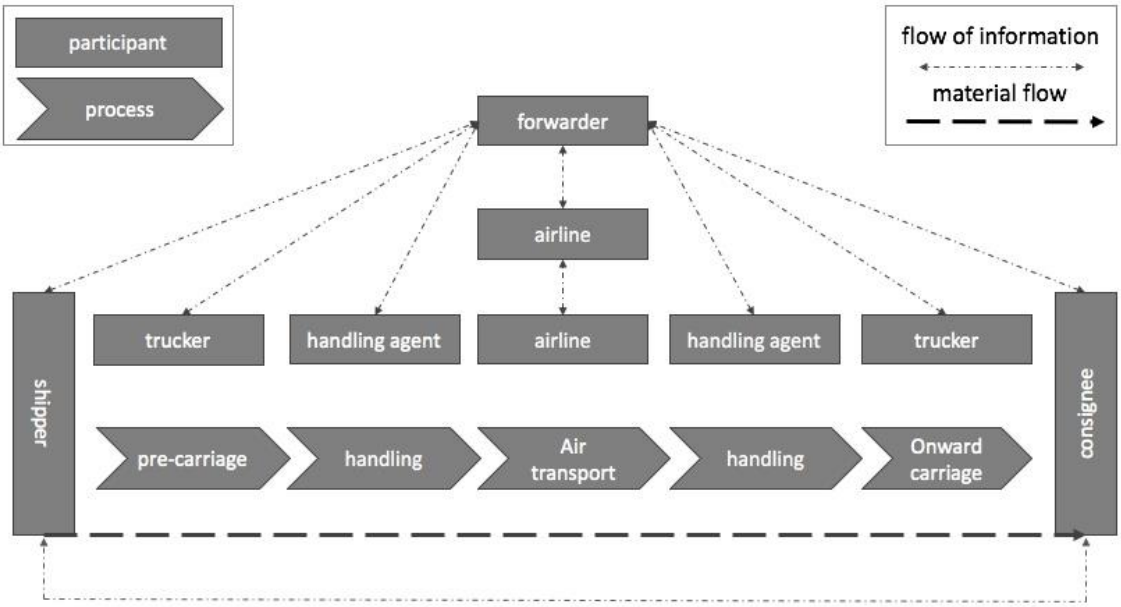

Figure 2. Air cargo supply chain (based on Clausen et al., 2013)

Shippers contact a forwarder acting as an intermediary between the actual provider of the air cargo transport and the initial shipper. Forwarders arrange the needed road transport to and from the airport and manage the transport chain from the perspective of the initial shipper and consignee. In most cases, the service flow of air cargo transport begins when the cargo to be shipped is delivered to the air cargo terminal by the forwarder. The delivery of the air cargo to the terminal triggers the cargo acceptance process by the airline or air cargo carrier. Through the acceptance process all relevant information related to the shipment such as weight, dimensions, number of shipped pieces and type of freight is processed. After the acceptance, the airline or air cargo carrier prepares the cargo for air transport through a build-up process in which the cargo is in accordance with load planning build into a specific ULD

unit. As per the hub-and-spoke principle, international air cargo often flies through hubs, where it is then unloaded from the aircraft, unloaded form the ULDs through the breakdown process, built up into a new ULD and flown on another flight to the final destination. At the final destination, the cargo is then placed into a warehouse from where it is then delivered to the final consignee directly or through road transport. (Feng et al. 2015)

2.2 Planning hierarchy

Planning is the practice of identifying possible future activities and scenarios that have different effects and outcomes and selecting the most suitable in terms of the needed result. Planning is done to support the decision-making process with an analysis of what is the right decision to make considering the present knowledge. Planning can only be done to a certain extent because with the increasing length of the time horizon also the level of planning uncertainty increases. Planning is a highly iterative process, and all plans made should be open for re-evaluation to enable them to reflect the changes in the underlying circumstances. (Stadtler & Kilger, 2008, pp. 82)

Specific plans are often restricted to a predefined planning horizon, which corresponds with a certain time frame. According to the length of the planning horizon, the importance of planning tasks and the reach of the effect that the planned activities have, planning is often categorically divided into three distinct planning levels that that form a hierarchical pyramid of plans. These distinct levels have differing names but most often the long-term planning is known as strategic planning, mid-term planning as tactical planning and short-term planning as operational planning. (Stadtler & Kilger, 2008, pp. 82) The initial idea behind hierarchical planning is to divide planning into more manageable modules that consist of partial plans that all cover a certain part of the whole planning task. Coordination of the hierarchical planning is done through a top-down concept. Plans of one level are coordinated by a more comprehensive plan on the next upper level in the hierarchical structure. The highest strategic planning level covers a high-level enterprise-wide or business unit-wide rough plans. The lower tactical and operational levels are more restricted by the planning horizon but cover more detailed plans. (Stadtler & Kilger, 2008, pp. 83-85)

2.2.1 Supply chain planning

The concepts of operations planning that serve different time horizons have been applied into the manufacturing environment for over 50 years. Modern manufacturing companies have always sought for new ways to improve the efficiency and competitiveness of their operations. An operations planning scope focusing only at the company's internal operations was for a long time a sufficient way to plan and control operations. In the contemporary global world, this is not enough. (Olhager, 2013) The nature of competition has changed in the sense that companies seem to compete against each other not only as sole companies but as parts of efficient supply chains. Companies compete on a supply chain level in areas such as quality, delivery cost efficiency and flexibility. (Christopher, 1998)

With increased competition in many industries, the planning of operations has also been extended to cover much of the whole supply chain in which the company operates. Supply chain planning is a rather broad concept that needs clear definition and limitation to clearly define what is meant with it. Gupta & Maranas (2003) define supply chain planning as the coordination and integration of all the key activities that a company undertakes from the procurement of raw materials to the delivery of the final product to the end customer (Gupta & Maranas, 2003). This is very much like the definition of supply chain management and the link between these two concepts is also pointed out by Boukherroub et al. (2015). He argues that supply chain planning is an important function within supply chain management that relates to the determination of a set of decisions that govern the operation of the supply chain (Boukherroub et al., 2015). Paiva et al. (2014) argues that supply chain planning is concerned with the gathering of information from and relating to other supply chain parties to aid the focal company to plan its future supply chain activities in a way that satisfies demand at minimum cost (Paiva et al., 2014). Jonsson and Holmström (2016) define supply chain planning as an operations planning and control framework or method that has a supply chain scope. Supply chain planning coordinates and synchronizes the supply and demand activities to generate value through intra-organizational collaboration. (Jonsson & Holmström, 2016) On a general level, planning in a supply chain can be defined as the practice of planning future actions that allow the focal company to balance supply and demand within the supply chain by utilizing the information that it has concerning the suppliers, buyers and the market in which it operates in during a certain time-period at minimum cost.

Similarly, as there are different levels in the planning hierarchy, also the supply chain planning has different levels. Planning of supply chain operations on a strategic, tactical and operational levels have all the same goal, although the distinctive difference exists regarding the time horizon and scale of the plans. Short-term supply chain planning is most often based on already known historical demand patterns and the short-term demand forecasts. (Schütz & Tomasgard, 2011) Long-term supply chain planning, on the other hand, focuses on market and supply activities based on the available buyer and supplier information. Therefore, supply chain planning as a practice is very dependent on the available information that flows through the whole supply chain. (Paiva et al., 2014).

2.2.2 Strategic planning

Strategic planning is the highest level of planning in the hierarchy and encompasses plans, which provide guidelines for the long-term future. The plans are in relation to the top-level management decisions that reflect a connection to the overall company policies, corporate financial plans, overall competitiveness and adherence to the key organisational goals. (Gunasekaran et al., 2004) Strategic planning aims to incorporate the future development needs that concern the whole enterprise or a certain significant function of it. These plans are often made for a couple years at a time but can also be mapped out for as long as a decade into the future. (Stadtler & Kilger, 2008, pp. 82) In a manufacturing environment, strategic plans include decisions regarding the future capacity needed for future production, the type of capacity that is needed in the future and whether the capacity is supplied externally or through internal resources (Harrison & Van Hoek, 2008, pp.173).

2.2.3 Tactical planning

Tactical planning determines the outline of the regular operations and is to a great deal linked to the crucially important task of matching supply and demand effectively. Tactical planning often deals with resource allocation in terms of the projected demand and measuring performance against the targets that are set on the higher strategic planning level. The tactical planning horizon typically ranges between 6 to 24 months, which enables the consideration of seasonal developments in supply and demand. (Stadtler & Kilger, 2008, pp. 82) Thus, tactical plans are in many cases subject to more frequent renewal which can sometimes be

done even monthly. Such tactical planning makes use of a concept known as rolling planning horizon, where the planning horizon is split into several time buckets and only the plans of the first bucket are put in place. Re-planning is done after implementation of each time bucket with the use of new and probably more reliable information. (Fleischmann & Meyr, 2005) In a manufacturing environment, tactical planning deals with ensuring that the forecasted demand can be matched with the right material provision and production resources such as manpower and machine hours. (Harrison & Van Hoek, 2008, pp.173)

2.2.3.1 Sales and operations planning

Sales and operations planning (S&OP) is a widely-known planning framework that integrates the planning processes of different functions within a company to a one set of plans. It is a high level tactical framework in which the key aim is to maintain the balance between demand and supply. More specifically, the S&OP process can be defined as the process where sales, marketing, demand and supply planning are constantly revaluated and realigned to synchronize the plans with reference to the higher-level strategic plans. (Scott et al, 2011)

S&OP utilizes a rolling planning horizon that stretches between 12-18 months into the future. (Harrison & Van Hoek, 2008) S&OP makes use of aggregated data regarding sales and production operations, which makes it a planning framework for the long-term. Variables that effect the success of S&OP are demand patterns, product variety and commercial lead times. The main decisions that are made through the S&OP planning framework relate to groupings of product families, choice of planning strategy, and aggregate production volumes. (Olhager & Rudberg, 2002)

S&OP seeks to form a common view on the demand and supply decision, as well as joint accountability over the plans that are made through S&OP. This is a crucial precondition for the efficient implementation and utilization of an S&OP process in any organization. The S&OP plan derives the guidelines for sales, production quantities and inventories, which must act as the basis for the execution of all operations throughout the functions that participate in the S&OP process. (Stadtler et al, 2015)

In reference to the planning hierarchy, S&OP is a framework that bridges the gap between long-term strategic plans to the practical operations of an organization. It is a way to manage medium-term change in a structured manner at least monthly. The S&OP process directs an organization to constantly keep a close eye on the market and enable it to plan ahead in order to position itself better rather than reacting to changing conditions after they have already occurred. Such coordinated planning effort also boost communication between departments and ensures that their individual plans are realistic, coordinated, and support the overall strategic business plans. (Arnold et al, 2008 pp. 26-28)

The comprehensiveness of the S&OP process within an organization is often referred to as the S&OP process maturity. Basic S&OP deals with the synchronization of sales and production operations, however, a more mature S&OP process often integrates financial plans into the process early on. The participation of the finance function sheds light into any possible financial constraints already early into the S&OP process. Highly developed S&OP processes that are also sometimes referred to as integrated business planning also include product development into the planning process to consider product launches or other R&D related factors which might have a significant impact on the demand or production resource utilization. This way the integrated plans produced form an even more comprehensive view into the overall business environment. (Stadtler et al, 2015)

The S&OP process is an iterative process that consists of several steps that are executed in a roughly similar fashion in every iteration. The process consists of a series of planning meetings that focus on the different elements that the S&OP process integrates. The process starts with pre-meetings that focus on collecting data from various sources to formulate an up-to-date picture of the current situation in terms of sales and operations. The first meeting often relates to demand planning, in which sales, marketing and demand planning teams gather the most current statistical forecasts, promotional plans and volume effect forecasts of the effect of marketing campaigns to formulate a plan as realistic as possible over the future sales volumes based on unconstrained demand. The process continues with the passing of the sales plans to the supply and resource planning team that analyses these in the second pre-S&OP meeting. The goal of the analysis is to align the unconstrained demand plans against production plans, currently available inventory and any capacity constraints. (Scott et al, 2011)

With the supply and production plans aligned with the sales plan, the S&OP process moves on to construct several different alternative scenarios that tackle any demand shortfalls and demand constraints. The outcome scenarios also consider the operational and resources environment that might indicate some constraints to the scenarios. After the sales, supply, demand, production, operational and resource plans have been synchronized, the plans will be integrated with the financial plans. The last pre S&OP meeting aims to reconcile the financial business goals with the sales and operations plans. The financial team analyses the feasibility of the plans against the financial plans based on set revenue and profitability targets. The output of the meeting is to build on the constructed alternative scenarios that were produced in the previous meetings to find opportunities for demand-shaping to maximize profit in situations where capacity constraints to the projected customer demand exists. (Scott et al, 2011)

After the pre-meetings, the S&OP process continues with the actual S&OP meeting, which takes place monthly. In the S&OP meeting, all the functions that take part in the pre-meetings are represented and jointly analyse and discuss the plans. As mentioned earlier, the S&OP as a framework deals with aggregated medium to long-term planning that does not focus on specific detailed information but more on the execution of the higher-level plans in practice. This is clearly visible in the S&OP meeting which focuses on the product or product group level. The main aim of the S&OP meeting is to identify opportunities, risks and areas that need most of the executive level's attention according to all the analysis that has been done in the pre-meetings. The output of the meetings is to identify gaps caused by the imbalance of supply and demand and plan actions that can close these gaps and balance the supply and demand on an aggregated level. Once the plans have been agreed upon, all the functions must commit to the plan and enforce in throughout their own actions. The S&OP framework structure is visualized in Figure 3. (Scott et al, 2011)

Figure 3. Sales and Operations Planning (based on Arnold et al, 2008)

After the S&OP plan has been finalized and implemented, it is crucial that the executing and monitoring of the plans is followed through with care. For the various teams that participate in the S&OP process, the post-process actions deal with efficient communications that ensures consensus over the agreed plans among all relevant parties. As the S&OP planning framework utilizes a rolling planning horizon, the agreed plans are the blueprint for the future planning. The executed operations have to been closely monitored against the agreed plans through relevant KPIs such as forecast accuracy, profitability and revenue variances and service levels as the possible deviation from the plan will provide valuable input to the next planning cycle. (Scott et al, 2011)

2.2.3.2 Evaluation of S&OP maturity

S&OP is a complex process to implement into any organizational setting due the cross-functional nature of the S&OP process. Traditionally, the sales and marketing functions and the operational function have been far apart in their own respective silos in the organization

both structurally and in terms of the existing mindset. S&OP seeks to form consensus over both sales and operations plans, which can be a difficult task. To evaluate the state of an organization's S&OP maturity, Grimson & Pyke (2007) have developed a framework that is presented in Appendix 1 in spreadsheet format. The said model seeks to position an organization into one of five stages in the framework. The ranking of the organization starts on stage one equalling to no S&OP process at all and ends at stage five, which indicates that the evaluated organization has a very proactive, well-developed and robust S&OP framework in place. The stages in between are (2) reactive, (3) standard and (4) advanced. (Grimson & Pyke, 2007)

The framework consists of five different categories based on which an organization is evaluated on and all the five categories contribute equally to the stage that is assigned. These are meetings and collaboration, organization, measurements, information technology (IT) and S&OP integration. Meetings and collaboration evaluates the organization's S&OP process based on the effectiveness of the communication and S&OP team collaboration. In stage one, the S&OP has not been implemented, Hence, there are no pre-S&OP meetings, S&OP meetings or any collaboration about S&OP in the organization. The organization category focuses on the organizational dimension of the S&OP process. There is no S&OP functionality existing at all in the organization in stage one. At stage five, S&OP is a formal part of an organization that has executive level presence and sponsorship. (Grimson & Pyke, 2007)

The measurement category assesses the performance and effectiveness of the S&OP process which an organization has in place. At stage one there is no measurements in place as there is no S&OP process. At stage five on the other hand, the S&OP process is measured through multiple measurements such as forecast accuracy, S&OP effectiveness and overall company profitability tied to the S&OP process. IT is the fourth category by which the maturity of the S&OP process is evaluated. This category seeks to address the maturity of the information process behind the S&OP process. In practice, this category is related to the effectiveness of information sharing in relation to S&OP and relevant IS that supports S&OP. Individual managers have their own spreadsheets at stage one which are not shared and no S&OP IS is in place. At stage five, the organization has a very sophisticated S&OP optimization software

in place, which utilizes real-time data that is seamlessly integrated to the ERP system as well as other relevant IS. (Grimson & Pyke, 2007)

The presented framework for evaluating S&OP process maturity is a useful tool for any organization whether there is no S&OP process in place or the goal is to develop the S&OP process further. The integration framework provides valuable insight into what are the key factors that form an effective S&OP process and what are the key factors that affect it. With the help of the tool, the focal organization can evaluate the current state of their S&OP and based on identified findings, target the necessary areas to reach the set goals in terms of S&OP process development. (Grimson & Pyke, 2007)

2.2.3.3 Master production schedule

Master production scheduling ("MPS") is a disaggregated version of S&OP to a certain extent. This means that the high-level groupings such as product families are broken down to a more detailed level in the MPS. In the manufacturing environment, this means that the level of detail used in MPS is often on stock keeping unit ("SKU") level. MPS is the link between detailed production planning and higher-level S&OP. MPS uses the aggregated sales and operations data derived in the S&OP process and decides how the plans will be executed. The link between S&OP and MPS works both ways as the S&OP framework also subsequently references its plan against the capacity plan derived by MPS. Hence, all the different planning frameworks are interdepended of each other. (Harrison& Van Hoek, 2008)

MPS is an extremely vital planning framework that forms the main communications link between manufacturing and sales at this stage. MPS has a more detailed outlook although it is not meant to be rigid. MPS communicates the demand forecast as much as it communicates the supply-sides capacity to fulfil that demand. (Arnold et al, 2008 pp. 49-50) For the most part in manufacturing environment, MPS concentrates on the effective use of the available capacity. The decisions made in the MPS process relate to the end-product as the MPS framework derives the production mix with a given volume and the time frame within which the production operations must be followed through in respect to the delivery lead times and possible capacity constraints. (Olhager & Rudberg, 2002)

MPS acts as a schedule and a way to prioritize the items that will be built and dictates the creation of the Bill of Materials ("BOM"). BOM specifies in detail what components need to be manufactured and what materials or components must be purchased. MPS also prioritizes the manufacturing operations, whereas S&OP concentrates on higher-level product group level planning based on aggregated measures. MPS concentrates on the end-product level within each product group, date and quantity. The MPS is constrained by the S&OP as it plans only within the set limits. Within the set limits, the goal is to balance the demand that is generated by the market with the available supply of materials, labour and equipment at hand. MPS acts as the basis for the capacity and resource allocation and therefore drives the formulation of the material requirements planning ("MRP") that is used to plan the need for the materials and components that have been specified by the MPS. (Arnold et al, 2008 pp. 49-50)

2.2.4 Operational planning

Operational planning is the lowest tier of the planning hierarchy and has the shortest planning horizon. Within the operational planning horizon, the planned activities are related to the detailed instructions on immediate execution and control of the processes that are planned. Operational planning is the planning level where the actual planning tasks are most detailed and degree of planning accuracy is the highest. Therefore, the accuracy of operational planning can often be measured with very detailed metrics. The time span of the operational planning horizon ranges from a few days to up to three months depending on the process and activities that are planned. (Stadtler & Kilger, 2008, pp. 82)

In a manufacturing environment, operational planning is often done in the form of weekly production plans to meet specific demand. Operational planning has the shortest response times as operational changes occur frequently. Changes in areas of customer demand, facility problems and supplier shortages can emerge relatively quickly and hence the plans need to be refreshed daily or weekly. (Harrison & Van Hoek, 2008, pp.173)

2.2.4.1 Materials requirements planning

Materials requirements planning ("MRP") is an operational long-term planning framework that has two main objectives. The first main objective is the acquiring of the components needed to fulfil the plans set by the MPS. The components can be either purchased or manufactured. The second main objective is the capacity in the internal and external supply systems. In manufacturing setting, these translate to the ability to have the correct material availability and the right quantities at the right time frame to meet the demand of the products to be produced. As the MRP works closely with actual production operations, it must encompass the needed flexibility that is posed by the dynamic demand of the market. In manufacturing, the MRP must recognize the need to prioritize and keep the plans as current as possible. This is done by making quick adjustments to the plans by adding, delaying, cancelling and changing orders when needed. Through these actions, the MRP establishes a schedule showing what is required at each level of the production process. Based on the lead times of the whole production process and its sub-processes, also information of when each component or raw material is needed is presented. (Arnold et al, 2008 pp. 77-80)

MRP considers the production mix, production volume and time frame within which the production is to be followed through and develops detailed material requirement plans at SKU level. The detailed plans show the amount of how much the SKUs must be manufactured or assembled during a certain time-period. MRP also concerns with the capacity availability about the set production volumes on the production unit level, whereas the higher-level planning frameworks often are either for product, product-family or category levels. (Harrison & Van Hoek, 2008)

The complexity of the MRP plans is to a high degree determined by the complexity of the manufactured or purchased SKUs and the manufacturing or assembly process. The more complex the process, the more planning points are included in the planning process for an individual SKU. The MRP is the first planning level that deals with process set-up and run times, which makes it a clearly operational planning framework. (Olhager & Rudberg, 2002)

2.2.4.2 Production activity control

Production activity control ("PAC") is the factory shop floor planning framework that lies closest to the actual production process. It links the MPS and the MRP to the execution of the production. PAC deals mainly with the production process' scheduling and control of the execution. However, at the same time it deals with the efficient use of labour and machines that are utilized in the production process, maintains any customer service coordination that is directly related to the information generated by the production process and minimize the work-in-process inventory. (Arnold et al, 2008 pp. 153-154)

The MRP is the main source of information for the PAC and the plan that authorizes the PAC. In a traditional manufacturing setting, the PAC must primarily make sure that all the needed production resources are utilized efficiently, the work-in-progress inventories remain low and production quality remains constant. The PAC is also concerned with the immediate detailed planning of the flow of production orders that are authorized by the MRP within a certain time-period. PAC is the first touch point for any inefficiencies relating to production resources or processes to be considered in the higher-levels of planning. (Olhager & Rudberg, 2002)

2.3 Literature review summary and analysis

The reviewed literature considering supply chains and service supply chains suggests that conceptual similarities exist between the two and that they share a significant number of underlying factors as has been brought forth. However, there are still fundamental differences as the end-product in what could be called as a standard supply chain is a physical product. In the service supply chain it is a service. The literature highlights that in a service supply chain setting the supply chain is organized to produce a service which is of intangible nature and therefore, the production process is fundamentally different. A service cannot be stored as a physical product or produced in advance. The human factor and the rather high possibility of variety in the quality of the end-product are also factors that play a more significant role in the production of a service compared to a tangible product. In the production of a service, the customer can play a significant role especially in the delivery process of the service product. These factors are not solely related to the production of

service and thus, it can be stated that the difference between a product and a service is not always clear as there are production and service aspects to each commercial offering.

The concept of back-office and front-office presented by Yücesan (2016) portrays the back-office functions as the more production or production-like aspects and the front-office functions as the more service or service-like aspects of the product. This is a good representation of the reality. Yücesan's concept argues that the complexity of either of the two determines whether the offering is more a product or a service. The higher the complexity in the back-office function, the more likely it is that the offering is a product, whereas the complexity in the front-office tends to indicate that the offering is closer to a service. The complexity in either of the two does not, however, rule out the possibility of complexity in both aspects but the other tends to dominate.

The coordination between the two aspects is crucial and should be at the core when developing the supply chain. Based on the needs of the product, whether it is more service or production intensive, the other should be optimized to support the more complex aspect. An intangible service is very much tied to the exact time when the service is demanded and customer experience of that service. The quality of the service is largely dependent on the average service times, the utilization rate of the service provider and the average waiting time. These are all levers that the effectiveness of the service supply chain effects to a high degree.

An ACSC is fundamentally a service supply chain, but the nature of the ACSC is quite similar to a production process. An ACSC is initially a transportation process. However, the level of control and regulation due to the nature of air transportation and the relatively high level of processing of the cargo to make it suitable for air transport align it quite well with a production process. The industry factors emphasized in the literature that affect the ACSC are the high level of process complexity, relatively high vulnerability to external factors causing uncertainty and high level of capacity utilization uncertainty. These are all factors that must be carefully considered when determining the service or production intensiveness of an ACSC.

As mentioned, the ACSC offers a relatively simple transportation service. It should be taken into account that the air transportation aspect adds complexity in terms of both back-office production and front-office service aspects. The front-office aspect of an air cargo service is a complex process landscape that requires much special skills. This in turn has enabled the formation of niche markets for specialized services providers such as forwarders, land transportation operators and terminal operators. From the viewpoint of a non-integrated carrier such as Organization A, the front-office can also pose much complexity, but this is highly dependent of product offering of the non-integrated carrier and whether it operates a complex route network and what kind of fleet it operates. The back-office aspect of the air cargo service is also rather complex even though the nature of the service is simple transportation. The back-office functions require a fair amount of speciality skills, but the highly-regulated nature of air cargo transportation allows much of the processes to be standardized on an industry level.

The time-critical, diverse and sensitive nature of goods transported by air complicates the production process, which mainly consists of the preparation for air transportation. This can be quite simple for general cargo such as electronic goods, but the processes are much more complex in case of any cargo declared as special in various degrees. The relative complexity in the production aspect of air cargo service makes an ACSC rather production intensive service.

Considering the underlying factors of the ACSC, the reviewed literature on operations and supply chain planning concepts suggest that the application of these to a service supply chain sharing significant common factors with a standard manufacturing supply chain is generally feasible. However, these should be adjusted to fit the purpose of the service setting to find out what are the most relevant aspects of each of the hierarchical planning concepts. The concept of supply chain planning, which is initially a form of operational planning that is reaching outside the premise of one single organization towards both upstream and downstream of a supply chain, can be linked to the ACSC setting easily.

As highlighted in the literature, a non-integrated ACSC is a complex service supply chain that consists of several specialised service providers that focus on relatively small part of the entire chain. Therefore, it can be argued that in the setting of an ACSC intra-organizational

planning reaching the full range of the ACSC is beneficial to all participating parties. Planning that reaches several tiers of the ACSC is, however, most likely uncommon due to the industry dynamics and the industry-wide structure of the air cargo market. As long as the forwarders are the most significant customer group for the airlines and air cargo operators together with shippers have no significant direct business interaction with the asset providers, it is likely to remain this way.

Strategic, tactical and operational planning levels are likely to be found in any business setting and the air cargo industry is no different. The degree to which these planning levels exist within the Organization A depends highly on the position and the strategic relevance of the air cargo business unit. Non-integrated carriers are often business units or subsidiary companies of larger airline groups, which significantly affects this as the air cargo business units' strategic focus is dependent on the overall strategy of the organization it is part of.

The higher-level tactical planning concept S&OP, which focuses on the balance of supply and demand is almost certainly a relevant framework also in the service business and service supply chain environment. As S&OP deals with product group level aggregated data and the synchronizing of the sales and operations plans, the application to the relative production intensive ACSC can most likely be accomplished after some adjustments are made. The balancing of supply and demand is of crucial importance in any business setting and in the air cargo industry. The fast –phase of air cargo industry setting emphasizes this to an even higher degree. The aggregation of planning, which in the manufacturing environment is done at product levels, could also be done on air cargo product level or alternatively on transportation route level that could be an adequate unit of planning.

The presented S&OP integration framework used to evaluate an organization's S&OP process maturity could prove to be a helpful tool to also assess the current state of long-term planning and the integration of existing planning concept cross different functions in the case of Organization A. The framework incorporates many key aspects that effective planning on a broader scope relies on and for that matter it could serve also as a tool to evaluate the current state of overall planning in Organization A. As S&OP is a framework that relies on collaboration throughout the organization, using the framework to evaluate what of the

possible existing planning integration could be developed further to gain the benefits of S&OP could also prove useful.

MPS is a shorter term tactical planning framework addressing the schedule of the production operations., This translates in the manufacturing environment to an overview of what to produce and when to complete the production operations as efficiently as possible in respect to the delivery lead times and possible capacity constraints. The literature highlights in the case of MPS the importance of commutation between the hierarchical planning levels. MPS is an important platform of commutation that translates the balanced demand and supply plans of S&OP to a more operational scope.

This steering functionality of MPS that passes onwards the higher-level plans can possible be adjusted to fit the needs of service production and a service supply chain around it. As the MPS process relates to the end-product level, it could be modified to serve as a platform to link the air cargo capacity allocation process to the higher-level sales and operational plans. The production of the air cargo service cannot be scheduled as in the manufacturing environment but the capacity allocation management process could perhaps be done in a demand-shaping manner to be able to affect the occurrence of certain higher peaks in capacity usage.

The application of MRP, which is a planning framework more oriented towards a manufacturing process, into the service production planning is dependent on the production intensiveness of the service production process. Air cargo has relative complexity in the production aspects of the service, which indicates that such production could be planned using features of the MRP framework. MRP is concerned with the acquiring of components needed for the production process and the capacity needed to execute the production. As mentioned, in the ACSC setting this includes mainly the preparation process of the air cargo for transport.

The needed components in such process are the transportation materials such as ULDs and other related materials needed to securely build the air cargo into transportation units. The capacity needed for the process is the man power needed to execute the build-up process, which for the most part is a manual process throughout the industry. The control of these

factors, through an adjust MRP like operational planning framework could prove feasible as there is transferability at this planning level between the manufacturing and service industry production processes.

As stated in the case introduction, the logic behind the application of operations planning concept into setting of an air cargo terminal is based on a concept that a modern air cargo terminal bares much resembles to the likes of a modern factory that operates a manufacturing process. PAC is a pure production control framework that focuses on the planning of the actual production operations in a way in which the production resources are utilized efficiently, the WIP inventories stay low and quality remains constant. These criteria are crucial to any well-developed production process. However, within such a highly-regulated industry where the production control is directly connected to flight safety, such level of planning is highly developed. PAC is unlikely to provide any new insight to the overall planning of the ACSC operations in the scope of the to the case study under research.

The above-mentioned concepts provide a broad outlook into supply chain and operations planning concepts with differing scopes and areas of application. The reviewed literature supports the purposed conceptual framework of the thesis. Therefore, it can be assumed that the research gap derived based on the formulated research problem can be addressed with the reviewed frameworks. The degree in which these concepts provide the basis to develop a solid streamlined CC operating model for the cargo terminal, that is linked to the higher-level plans and supported by different levels of operational planning, will be determined through the empirical research. The application of the planning frameworks will most likely not be problematic due to the characteristics of the ACSC. However, finding the suitable planning horizon and granularity of planning process and planning points will most likely be the difficult in the setting of Organization A.

3 CASE STUDY

The following section of the thesis will present the empirical research conducted for the thesis. First, the applied research methodology and the data collection methods used will be presented in brief followed by a presentation of the case study background, the present state and business environment as well as the market position of Organization A. These aspects are crucial in clarifying the current state and future developments of Organization A and the purposefulness of this study in the form it is constructed.

After the presentation of the aforementioned aspects, the operations of the company will the described in terms of the ACSC that is core business model of Organization A. With the current state of the company presented, the empirical section will analyse the planning concepts that are in place in the group that Organization A belongs to and what are the effects and links of these planning concepts to Organization A and its respective planning concepts and processes.

3.1 Research methodology & data collection methods

This thesis focuses primarily on definition of concepts, tools and frameworks that are used in certain organizational functions. This thesis also focuses on applying these to a fundamentally different kind of business environment but into a relatively similar organizational function on a conceptual level. The aim of the research is to produce a concept that would incorporate the most relevant factors of the studied, already existing concepts, tools and frameworks into a new industry setting to leverage the advantages that have been successfully utilized in other industries also in the setting of the focal organization.

The research methods utilized in this thesis are primarily of qualitative nature as the research problems addressed by the thesis are analysed on a conceptual and perceptual level without the aim to produce direct results that would be analysed in a quantitative manner. Qualitative research is a very broad research concept that has a rather broad definition. In general, it can be defined as a research concept that is concerned with the interpreting, understanding and experiencing how the social world is produced and constituted. In practice, qualitative research works with data in the form of text. In qualitative research, the methods used to collect information are interviews and observations through which the researcher or

researchers transform the collected information into text that can be analysed. (Sreejesh et al., 2014, pp.3)

Qualitative research is the widely-used concept in business research, which in turn can be grouped under social studies on an aggregated level. Business research is often defined as a research process aiming to systematically and objectively gather, record and analyse data, which in turn can be used as information to support business decisions. The scope of issues that business research concentrates on is broad, but it often relates to various operational or business planning related issues. (Sreejesh et al., 2014, pp.3) This thesis focuses to business planning related issues and seeks to highlight on a conceptual level what can be achieved with the proper application of supply chain and operations planning concepts in the field in question.

The produced text, which is transformed from the collected information, is the analysed with suitable methods and reflected against theories of the researcher's choice. Through this process, the researcher can seek to explain the complexity, detail and context of the issues at hand. The qualitative research process can be represented as the path from theory to text and from text back to theory. Qualitative research differs from the quantitative research by default as it works on a subjective level considering the different perspectives and the researchers reflection on the subject, which is a natural part of the research. Whereas, quantitative research works with exacts and aims to produce research that can be replicated with no dependency towards the party conducting the research. (Flick, 2009 pp. 14-17)

This thesis will follow a research process where the relevant concepts, business models and industries are first studied, analysed and reflected upon in detail to form an understanding of the factors that affect them and have formulated them to a certain state. Hereafter, the conceptual framework that is produced in this process is reflected towards a contemporary real life setting in the form of the case study presented above. The framework is the then applied to the case study setting to gain empirical insight whether the studied concepts can produce an outcome, which would provide an answer to the outlined research problem and answers to the specified research questions.

The main source of information in the process of forming an understanding of the concepts, business models and industry is gained through the above presented literature review. The literature used consists mostly of academic journals, course books and other publications by key industry associations. The needed qualitative data in the empirical part of the thesis research is primarily gathered through in-depth interviews that will be conducted with representatives of the case company. In addition to the interviews, data is also collected when applicable through participation to the case organization's on-going project and development workshops that take place simultaneously with the thesis process and are highly relevant in reference to the topic of the thesis. Case organization's own material and documents will be used as secondary sources to support the data gathered through the interviews.

3.2 Case study background

The initial idea to combine supply chain and operations planning to the air cargo industry stems from previous experience gained from both the air cargo industry and supply chain planning functions. The air cargo industry is a highly dynamic environment that reacts turbulently into changes in the world economy. Thus, it is an industry where swift changes in the operating environment are not uncommon. With the ever-increasing complexity of global supply chains, the need for effective planning has become a very crucial part of supply chain management.

The case organization that presented the research topic is the cargo business unit of an airline that operates an intercontinental network. The company in question, meaning the cargo business unit of the airline, will hereafter be referred to as Organization A. Organization A will introduce a new air cargo terminal during 2017. The new terminal will substantially increase Organization A's scale of operations and significantly support its group-wide growth strategy. When operational, the new cargo terminal will be the main cargo hub for organization A's whole network. It is therefore crucial that the hub can operate in an efficient and effective manner that supports the high level of service quality that Organization A upholds. (Organization A, 2017a)

The significant increase in the scale of operations requires Organization A to adjust its operational procedures accordingly. The process to do so began already during 2016 when

the company introduced a new enterprise resource planning system, hereafter known as ERP-A. The new ERP-A and the new cargo terminal will complete each other and form a new basis for the planned growth. With the implementation of the new ERP-A system, Organization A encountered distortions between the operating processes of the new ERP versus the operating processes of company. The distortion was primarily triggered due to lack of process discipline and data inconsistency between information systems ("IS") and actual physical cargo movement, which in turn resulted in inconsistency between the planned and actual cargo operations. Such distortions can potentially have a significant negative effect on the service quality that Organization A can offer its customers. (Organization A, 2017a)

Even though the distortions where primarily caused due to the above-mentioned issues, which were swiftly handled, Organization A recognised that the weak link between terminal operations planning and the future cargo volume of the network is a significant short-coming, which should be addressed with a high priority. Due to these distortions Organization A wants to analyse the operating model of the new terminal's CC and its operating processes to find ways how it could be linked to long-term planning in a clear and robust way that would allow effective information sharing and safeguard the integrity of the new scale of operations. (Organization A, 2017a)

The CC is the core control unit that manages the network and terminal operations and is responsible for the efficient and effective running of the hub and overseeing the cargo flow throughout the network. Organization A wants to find ways how to develop existing operating process in a way that the new cargo terminal's CC is structurally interlinked to the higher business and operations plans. The key operational aim of Organization A is to be able to plan the new cargo terminal's terminal operations with sufficient information of the future cargo volumes transported in the network which will be processed through the terminal. (Organization A, 2017a)

3.3 Description of organization A and the focus industry

Organization A, which is the cargo business of an airline (hereinafter "Airline A") is dependent on the group-level strategy that is designed the serve the interest of the whole

airline. Airline A is an airline, which could be characterized in airline industry terms as a full-service network carrier ("FSNC"). This term refers to airlines that offer a significantly wider service offering than low-cost business model that today forms a significant part of the global airline industry. FSNC airlines have often a history of being either fully or partly government owned and operated national airlines, which operate a network that consists of both long-haul and short-haul routes with a fleet that consists of both narrow body and wide body aircraft. Organization A has a long history as one of the main airlines serving its respective geographical market. FSNC carriers operate with a hub-and spoke network model, offer a significant amount of on-board services, which includes different classes of service both on the ground and in the aircraft. (Organization A, 2017b) Throughout the world, the FSNC airlines are former national carriers or still majority owned by the respective states. Most FSNC carriers also operate air cargo services as an additional revenue generating business segment. The level of importance that the cargo business has for the FSNC carrier differs significantly throughout the market. Some FSNC carriers only operate a very small cargo business, whereas other FSNC carriers operate a significantly larger cargo business with designated cargo routes operated with all-cargo aircraft known as freighters. (Dlr.de, 2008)

Organization A is a medium-sized cargo business unit that represents an approximately one sixth of the revenues generated by Airline A. As mentioned, Organization A is dependent on the long-term strategic choice made on group level. This indicates that Organization A is not considered directly with any of the strategic choices made within the airline business such as acquiring new aircraft, what routes to operate and where to place operational hubs. The position of the cargo business unit within the airline group is not, however, strategically irrelevant as the cargo business does contribute significantly on selected routes.

The cargo business angle is always considered when making strategic choices, but it is not considered as the primary issue. In practice, this indicates that the cargo business unit can positively advance opening of new routes, traffic schedule development and even fleet development if the projected contribution of the cargo business is significant. The position of the cargo business unit does have some constraining effects on the cargo businesses development, but it also has some enabling effects. As the cargo business unit does not operate its own fleet of aircraft, it can also operate on routes that are not significantly

profitable as all the routes are evaluated as combinations of both passenger and cargo operations with a focus on the passenger business. On a group level, the cargo business is initially a revenue contributing unit within the airline group. This relationship is visualized in Figure 4. (Organization A, 2017b)

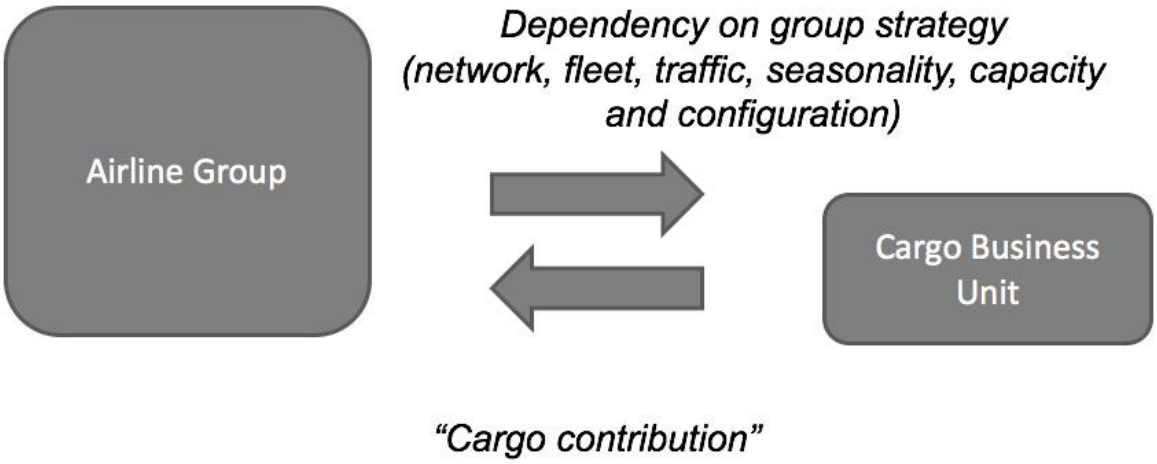

Figure 4. Organization A, 2017, Cargo business unit position

Organization A transports most of its cargo as belly cargo, which means that the cargo is transported in the cargo hold of regular passenger aircraft that fly on regular passenger routes. Organization A does operate some cargo routes, but this capacity is leased and the routes are operated by other carriers. Organization A is the market leader in its respective domestic market and has a very strong presence in the regional market. Airline A operates a significant intercontinental network of which approximately 80% is operated in its strategic long-haul market.

Given the size of Airline A as relatively small FSNC carrier, it operates a relative large long-haul network. This is due to the strong position it has been able to gain in its focal market and is considered as one of the preferred key airlines that operates an effective long-haul network in its respective market towards its strategic long-haul market. The fleet that Airline A operates and Organization A utilizes is relatively new, fuel-efficient, environmentally sound and cost-efficient aircrafts. This is due to a strategic choice made by the airline some years ago to renew the old fleet, acquire new long-range aircraft and concentrate on single aircraft manufacturer's aeroplanes. This has turned out to be a great strategic choice for the

whole airline, which now operates one of the newest fleets in the whole focal market and has very lean technical operations. (Organization A, 2017b)

The business model of Organization A is built around the principal of a non-integrated ACSC. Its primary customer group is forwarding agencies that serve as the middle-men between Organization A and initial shipper or receiver of goods. Organization A does also serve private customer to some extent, however, the revenue that is generated through this is very small part of the total revenue. The product portfolio of Organization A is divided into similar classes as the tickets sold in the passenger services, some offering premium services, while others are aimed at a more standard air cargo transportation needs. Organization A also has different products that are designed to serve customers based on how time critical or special the cargo is. Organization A does only have a few industry specific products aimed at industries such as the pharmaceutical industry and industries producing perishable goods such as different food stuffs. (Organization A, 2017b)

The operations of Organization A have a strong focus on its primary hub that is also the primary hub for Airline A. Organization A operates a secondary cargo hub, which acts as a feeder hub to the primary hub. Organization A also operates a network of road feeder service ("RFS") trucking routes and some leased freighter aircraft capacity that are feeder services to the primary hub and secondary hubs. (Organization A, 2017b)

3.4 Air cargo supply chain of Organization A

The air cargo supply chain that Organization A operates has a setup that is very much like the defined non-integrated air cargo supply chain, which was presented in section 2.1.2. Organization A, just as most of the FSNC carriers that operate an air cargo subsidiary, has focused on its core competence of air cargo transportation. This means that Organization A subcontracts all other needed services from specialised external service providers. From Organization A's point of view, the downstream functions of the air cargo supply chain of consist of various service providers that offer cargo sales and booking services, ground transportation, security checking services and cargo handling and terminal service. The upstream services consist mainly of the same service but just in a revert order. The high-

level model of the air cargo supply chain of Organization A is presented in Figure 5. (Organization A, 2017c)

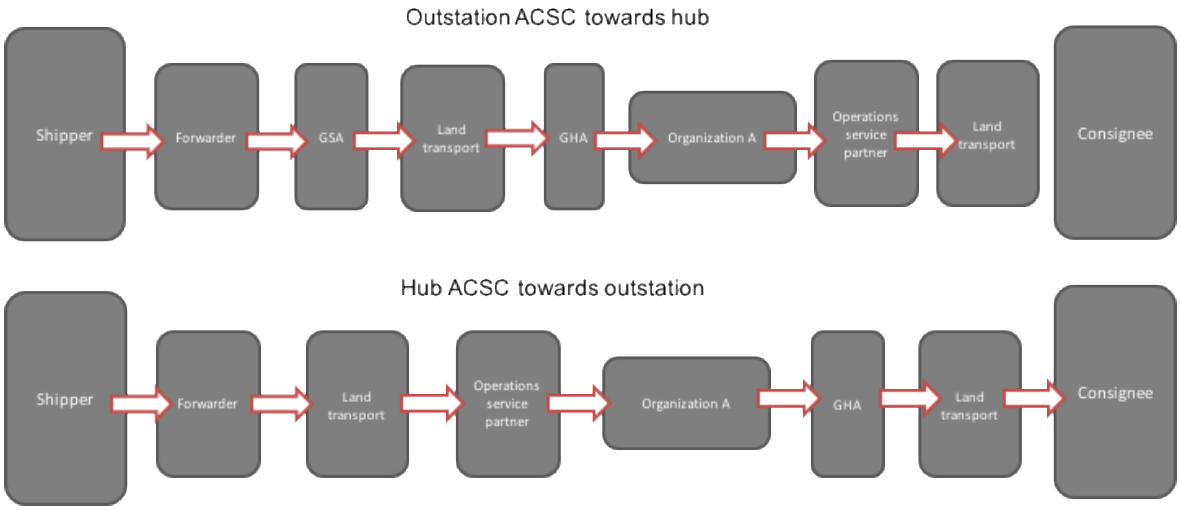

Figure 5. Organization A, 2017, Air cargo supply chain (towards hub/from hub)

The service providers can be categorized both geographically and by function as they either operate within cargo operations or cargo sales and operate either in the hub or outstation throughout the network. Organization A has a designated service partner that operates its cargo handling and terminal operations in its main hub station. This setting has been in place already before the new operational environment but the partnership has been developed further when planning for the rollout of the new operational environment as the designated service partner has been heavily involved in the process. The service provider handles all the operational processes that are executed at the premises of cargo terminal both outside and inside. (Organization A, 2017c)

The air cargo handling process includes the unloading of the cargo from the previous method of transport, which in the case of the hub is from trucks or other vehicles, acceptance of cargo according to International Air Transport Association ("IATA") standards and according to the standards of the Organization A, preparing the cargo for air transport and transporting the cargo to and from the aircraft. The same process structure is in place industry-wide and is executed by specialised service providers at each station that Organization A operates to. These specialised service providers are known as ground handling agents ("GHA") and offer service in all areas of cargo handling. The outstation

cargo GHAs that Organization A utilizes are sourced centrally by the group sourcing department based on the services offered and the price. However, the relationships upheld with these service providers are not highly developed partnerships as in the case of the hub, which is of strategic importance to Organization A. (Organization A, 2017c)

The sales function in Organization A can be divided into two separate parts. The sales management function and the sales operations function. The sales management function is an internal function within the Organization A consisting of account management and sales development. The external part consists of the general sales agents ("GSA") that operate much like the GHA. The GSA are specialised air cargo sales professionals selling and marketing the capacity of the airlines they service and make air cargo bookings. Organization A utilizes GSA throughout its network in most of its destinations with some internal sales managers present at key markets. GSA and GHA are often in close cooperation and in many stations the same service providers offer both GHA and GSA services. (Organization A, 2017c)

3.5 New operational environment of Organization A

The new operational environment that consists of the new air cargo terminal and the new ERP system, ERP-A, formulate the basis of Organization A future operations. The new IS and terminal will substantially increase the scale of operations that Organization A will operate but more importantly, the new operational environment will seek to swift Organization A's current hub station-centric strategy towards a network-centric strategy. The new hub terminal strengthens the hub-centric structure of the network itself, but the management design of the new terminal which is managed by the CC will act as a basis for the swift to a network-centric strategy. (Organization A, 2017d)

3.5.1 Cargo management system

The ERP-A system, which is supplied by a software vendor that specialises in air cargo industry IS has been developed in parallel to the design process of the new air cargo terminal to ensure highest possible level of compatibility between the IS architecture, terminal operations and the operational processes. The new ERP system that is generally referred to

as a cargo management system due to the high-level of specific air cargo industry specifications is a major advancement for Organization A. ERP-A has been designed as a general purpose IS, which has a modular structure similarly to most major ERP system in the market. Organization A uses ERP-A to manage its whole air cargo supply chain from the point of preliminary booking that can be made upon 21 days prior to the operation of the flight to delivery at the destination station. ERP-A acts also as a master system towards the IS that operates the automation of the terminal. The cargo terminal has its own IS that controls the warehouse automation system within the terminal and therefore manages all the cargo movements within the terminal. (Organization A, 2017d)

3.5.2 New air cargo terminal

The initial decision to the build a new cargo terminal and thereby significantly scale up the cargo business unit's operations goes back a long way. As mentioned above, the new cargo terminal is in line with the long-term strategic growth plan of Airline A and the most significant advancement in the cargo business throughout its history. The new terminal is a substantial change in scale, technology and automation as well as in terms of organization and strategy for Organization A. The capacity of the new terminal is more than double compared to the present terminal and it has throughput that can serve significantly larger cargo flows than what Organization A is currently transporting through its network. In terms of the warehouse automation, the new terminal is a significant technological leap for Organization A that currently operates a terminal that has very little automation. (Organization A, 2017d)

The new facility has an automated storage and retrieval system ("ASRS") that manages all the stored cargo within the terminal and an elevating transfer vehicle ("ETV") that moves and stores the ULDs in terminal. The ASRS, the ETV and the above-mentioned terminal IS together form a system that increases the efficiency of the terminal operations significantly. The organizational change that the new terminal brings is in the form of the CC, which will control and manage the terminal operations and oversee all the cargo flows which will be transported through the hub terminal. (Organization A, 2017d)

3.5.3 Hub terminal production process

The production process within the new hub terminal does not fundamentally differ from the standard air cargo terminal production process, which can be found in most of the air cargo terminals of similar capacity. The terminal has two kinds of physical inputs that are needed to perform the terminal production process. These are the cargo that will be processed through the terminal and the transportation materials needed to prepare the cargo for air transport. In addition, the terminal production process utilizes a variety of cargo handling equipment, high level of warehouse automation and manual labour to complete the processes. (Organization A, 2017d)

The terminal production process within the hub terminal consists of two initial cargo flows. These are the import and the export flows that both flow towards each direction from the terminal. The logic behind the cargo flows is based on the fact that all internationally transported goods are either imports or exports for the country where the hub terminal is located. From the viewpoint of the Organization A, a cargo shipment can be both if it is only transiting through the hub terminal. (Organization A, 2017d)

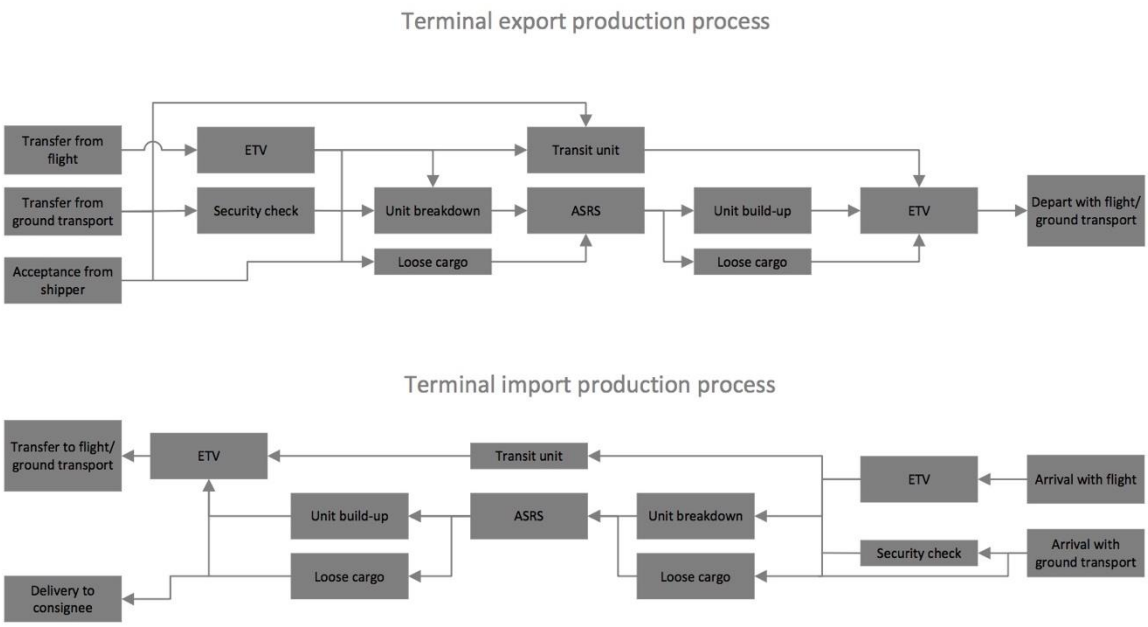

Figure 6. Organization A, 2017, Terminal export and import production processes

The terminal production process has significant variance in terms of complexity due to the different needs of cargo that is transported and how the cargo is transported through the terminal. The shipments can be transported either as loose cargo or within ULDs. Loose cargo indicates that the cargo is not built into a ULD before loading to the aircraft or ground transportation. This is the case for only a relatively few shipments that are small and generally do not require any special handling processing. Most of the cargo that is processed through the terminal production process is loaded into different types of ULDs. (Organization A, 2017d)

Irrespective of the special needs of the cargo, the terminal production process always consists of the process steps that are visualized in Figure 6. The starting point for the terminal production process is the acceptance/receiving process to the terminal from a flight, ground transportation or from a shipper in the case that the terminal is the first point of entry to the air cargo transportation chain. After the cargo has entered the terminal it will be security checked if it has not been security checked at any prior point. After the security check, the cargo will be either entered into the ASRS system or to the ETV system based on whether it is import or export cargo in the view of the terminal system. (Organization A, 2017d)
If the cargo arrives with a flight to the terminal it will be first processed through the ETV system in the unit it arrives with or in the case of loose cargo, assigned an in-house container for this purpose. If the cargo arrives by ground transportation in an ULD it will be either unloaded from the ULD in the breakdown process and fed into the ASRS system or in the case of arriving as loose cargo, fed directly into the ASRS system. In the case of transit units that are always full ULD units, the cargo will be fed into the ETV system immediately after arrival to the terminal, where it remains intact until it is processed through to the connecting mode of transportation. (Organization A, 2017d)

As visualized, the ASRS system is the centre point of the terminal system and all cargo expect transit ULD units are processed through the ASRS. When the cargo is ready for transportation it will be retrieved from the ASRS system, processed through the build-up processes in which it will be loaded into an ULD unit that is ready for air or ground transportation. In the case of loose cargo, the build-up process is physically not executed but the cargo is processed through the process step nevertheless. After the build-up process, the unit will be fed into the ETV system either in a ULD unit or an in-house container. From the

ETV, it will be transported either to the aircraft parking stand or the truck dock. (Organization A, 2017d)

3.5.4 CC operation model

The new CC unit that Organization A will implement oversees and controls the practical aspects of the operations management in the new operational environment. The conceptual grounds for such a control unit bear much resemblance to similar CC functions that exist within Airline A, namely their general operations CC and the hub airport CC. These functions manage and coordinate the execution of the daily operations within their respective domains. (Organization A, 2017e)

The general operations CC is the operational nerve centre of Airline A responsible for flight dispatch, fleet control, crew control, maintenance and any irregularities related to these aspects or any other external factors that might affect the execution of the airlines daily operations. The hub airport CC focuses on the operations control at Airline A's main hub airport. Its primary purpose is to manage and coordinate the daily operations at the hub airport focusing primarily on airline ground operations and passenger flows in and out of the hub. (Organization A, 2017e)

The CC functions are designed to manage complex chains of interdependent processes through a holistic overview. Such a function has not been previously utilized in the sphere of air cargo within Airline A, even though there could be clear benefits to do so as the ACSC is very highly-regulated service production process that has strict control mechanisms in place similarity to the airline industry in general. Organization A has previously managed its operations in a very hub terminal centric manner. The shift to the new operational environment is an excellent opportunity, but at the same time demands for a change in the way the operations are managed. As previously mentioned, the implementation of the CC function is seeking to develop the cargo operations management away form a hub terminal-centric management perspective towards a network-centric management perspective. (Organization A, 2017e)

With the significant increase in size of the operations, high level of warehouse automation and utilization of modern cargo handling equipment combined with a network-centric

operations management perspective, Organization A has developed a new cargo CC unit that will manage and coordinate the network and hub terminal operations. The CC unit is divided into four different functions that all consist of a team of professionals trained for that specific function. (Organization A, 2017e)

The primary CC function is network supervision that oversees the commercial and operational control over the current and short-term cargo volume transported throughout the network. The network supervision function is meant to have ownership over the whole ACSC process with an operational and commercial crossover perspective. Organization A wants the function to combine up-to-date situational awareness of the state of operations network-wide with a strong overall knowledge of the current commercial situation, commercial plans, commercial strategies and cargo product offerings. In addition to the operational and commercial knowledge, the function must have the ability to seamlessly communicate with all GSAs, GHAs and with other relevant external parties. (Organization A, 2017e)

The three other CC functions are landside supervision that is responsible for all incoming and outgoing ground transportation related coordination and control, the terminal supervision that is responsible for the coordination and control of the terminal production process and the airside supervision, which is responsible for the coordination of all cargo ground transportations around the hub airport. These roles have a responsibility in the execution of the operational short-term plans when applicable to the hub operations. The operating model of the CC is planned to be setup so that the functions within it work side-by-side allowing the unit to form an organizational structure that supports effective communication and organic develop into a unit where knowledge is shared cross-functionally through a compact environment that is built on transparency. (Organization A, 2017e)

3.6 Analysis of the new operational environment and implementation process

The change that the new operational environment will bring for Organization A can be divided into three different areas. These are the change of IS, physical systems and organization. The IS, namely the ERP-A, is currently the only one of the changes that is operational. The new IS provides a more holistic view into the ACSC that Organization A

manages. The functionalities that the new system has correspond well with the complexities and dynamic changes that characterise the air cargo market. From an external perspective, it provides increased visibility and transparency for the customer about the state of the shipments throughout the whole air ACSC and it also communicates any relevant information concerning changes into the planned execution of the air cargo service process. From an internal point of view, it allows Organization A to manage the whole operational process through the same system in an effective manner based on real-time data and process transparency.

The change the new hub terminal brings for Organization A is significant in terms of capacity, ways of working and physical system functionality. The current operations are centred in a terminal that is essentially a warehouse utilizing very little automation and the processes within the terminal are not controlled or monitored by a comprehensive IS that would utilize aspects of production control. The high-level of automation introduced with the new hub terminal significantly changes the ways of working for the terminal staff as many of the currently manual processes will be carried out with the help of new automated systems that are supported by the terminal's internal IS. The changes in the working methods have two significant impacts towards the execution of the work.

The primary change in the field of working methods is the level of process discipline that will be applied to the working methods through the implementation of automated systems. This will guide the execution of individual tasks in a very structured manner. This a clear change in respect to the current terminal work, which relies on a clearly defined process architecture but where the physical execution of the work is not controlled by any automated systems. The secondary change is the high-level real-time transparency and visibility towards all the individual tasks made possible by the terminal's in-house IS. The in-house IS controls majority of the terminal's production processes' individual steps. It also controls the execution of individual tasks in accordance with the set process. These aspects align the new hub terminals operations with that of a manufacturing plant and allow the terminal to be managed similarly to a manufacturing plant. The production process of the new terminal visualised in Figure 6 resembles a production process that manufactures physical products as it has clear inputs, transformation processes and outputs thereafter. This clearly indicates

that the comparison of the terminal production process with a production process that produces tangible products is plausible.

The third area of change is the organizational change that will be crucial to the new operational environment. The implementation of the new CC will have effect throughout the whole organization. One of the key aims of the CC unit with its four different functional areas is to the smooth flow of the new operational processes within the terminal and its clear integration to the network. The processes within the terminal have increased in complexity due to the digitalization and industrialization of the processes. The processes have not fundamentally changed in terms of functionality in comparison to the current terminal but the overall process architecture is more complicated and has more characteristics of a developed system. Therefore, the effective management of this system requires individuals with more advanced skillsets to take ownership over the system.

The network supervision function of the CC is central to the change from a hub-centric to a network-centric perspective. The network supervision function on a conceptual level is new to Organization A, which has not previously had such a role that is solely dedicated to coordinating and overseeing the cargo flows with network-wide responsibility. The implementation of the role in parallel with the new operational environment brings clear synergies as Organization A is going through such a significant overall change. From the perspective of the research questions, the network supervision function is a crucial element in the application of the hierarchical planning concepts. All the frameworks rely heavily on the existence of integration within the organizational structure. The main enabler of the analysed hierarchical planning concepts is the transparent sharing of information and effective communications. The higher-level plans are communicated to the lower levels through structured communication and organizational links that are implemented to the operation of the organization. The network supervision function can support the integration of the operations with the commercial side of the Organization A as it seems like a natural handover point on a holistic level.

The general implementation process of the new operational environment is a significant effort for Organization A and managing it is a complex task requiring a tremendous amount of planning, control and follow-up from Organization A. All the aspects presented above are

separate projects within the general implementation project but they are managed in parallel as there are interdependencies between them. Based on the material provided by Organization A and the project meetings attended, the implementation process of all key areas related to the new operational environment follows a well-defined plan that is managed in a robust way. There are, however, some clear challenges in terms of outlining the forthcoming state of new operational environment comprehensively. This statement refers mostly to the organizational changes that the implementation of the CC brings with and especially the network supervision role.

The role of the network supervision function is defined on a conceptual level and on high degree also the technical descriptions of the tasks typical to the function are defined. However, the potential of the function as a team of operational specialists with a potentially very broad set of skills and knowledge of the cargo operations has not fully been considered at a concrete level. Organization A outlines that the network supervision function will have an operational scope of responsibilities supported by significant understanding of the commercial aspects of the business. Such unit is an extremely important team of professionals that should be either actively or semi-actively integrated to managerial forums that exist within Organization A. This would enable to enrichment of the management's perspective that lays out the long-term plans with relevant knowledge concerning the current state of the operations. This analysis indicates that the network supervision function is a key role in integrating the operations to the other functions of Organization A and should act as the main communications link in the offer of matching the operational feasibility with the commercial offering to fulfil the market demand efficiently and with high quality and reliability.

3.7 Hierarchical Planning in Organization A

As a business unit of Airline A, Organization A is highly dependent on the decision-making process of the whole airline and the strategic long-term plans that are made on group level. Airline A is primarily a passenger airline and secondarily a cargo airline. Airline A's business is to operate profitably on routes that have a steady or growing passenger volume and manageable seasonality. These routes are operated with suitable aircraft types that are optimal for the present and forecasted passenger volumes of the route network. Other key elements that Airline A considers on a short-term horizon, is the price of the jet fuel, airport

fees and ground operations costs. For the long-term, Airline A considers the technical development of aircrafts and the purchase or leasing costs of new more technologically advanced aircraft that can fly more economically and are more environmentally friendly on the preferred routes. The long-term development of the route network that Airline A operates is dependent on the business and leisure travel market trends and its market position towards is competitors which operate roughly on the same routes. The hierarchical planning structure of Airline A and the different levels within it are visualised in Figure 7. (Organization A, 2017f)

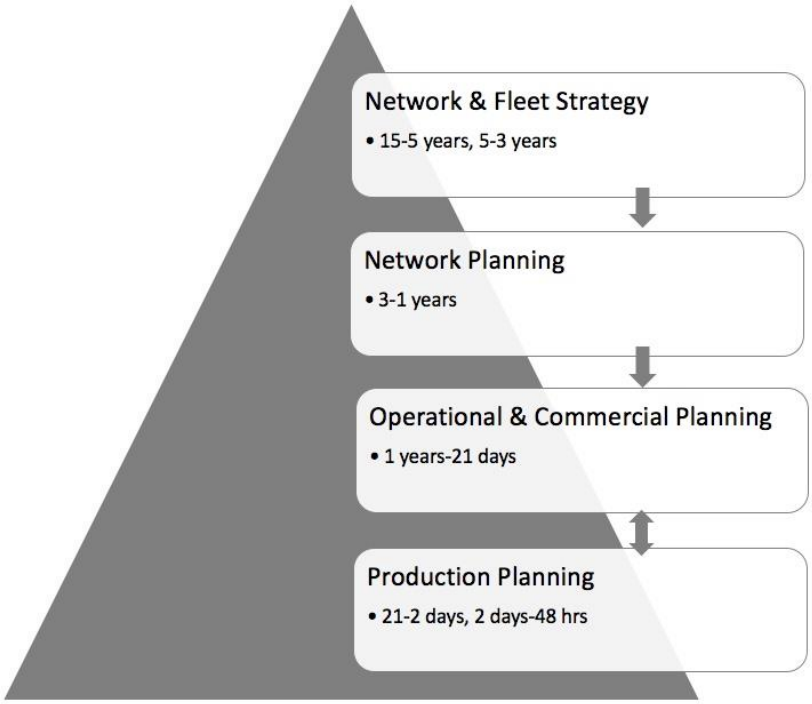

Figure 7. Current planning levels, Organization A, 2017

These key areas of commercial and operational planning are all dependent on the passenger business of Airline A. The cargo business operated by Organization A is secondary in the long-term strategic focus when evaluated from a holistic point of view. In the process of Airline A's long-term strategic planning regarding its future fleet and route network, the passenger business has a central role. This is logical as Airline A is mainly a FSNC as mentioned in study of airline business models by German Aerospace Center and earlier in section 3.1 of this thesis. (Dlr.de, 2008 and Organization A, 2017f)

Even though the strategic long-term focus of the business of Airline A is primarily passenger air transportation, the revenues that the cargo business generates throughout Airline A's network is evaluated carefully especially for the long-haul routes that are flown with wide-body aircraft that have a significant cargo capacity. The contribution of the cargo business is carefully evaluated in the process of strategic decision-making. An example of such a decision could be the opening of a new route, which is a complex process that in most cases requires the contribution of the Organization A. The aspects that are significant for the cargo business, but to which the cargo business unit doesn't significantly contribute to, are the choice aircraft types utilized and the number of scheduled frequencies to be operated. (Organization A, 2017f)

These aspects can have a significant impact on the potential revenues that Organization A can generate on that specific route. If the potential cargo demand and the potential for cargo business development is relatively high on the potential new route, it is feasible to choose an aircraft that is also suitable for larger cargo volumes and develop a schedule that also supports the cargo business. Hence, the feasibility of the route's total revenue generation is therefore in some cases significantly affected by the cargo volumes transported. (Organization A, 2017f)

3.7.1 Network & fleet strategy

The highest level of business and operational planning conducted by Airline A is known as network & fleet strategy. Strategic long-term planning that considers these aspects of the airline business is quite typical in the domain of a commercial airline as the aircraft fleet is one of the main resources utilized by an airline and thus, the route network is the primary service that is produced with that resource. (Organization A, 2017f)

At this level, planning focuses on the positioning of the airline into a strategically beneficial market position based on the key goals that are set at highest level. The planning at this strategic level is based on market analysis of the currently served markets and of potential new markets, analysis of the current network structure and the future development of it based on the market analyses and overall development of the whole airline industry.

Airline A. has developed strategic long-term plans that focus on doubling its long-haul capacity and network towards its key long-haul target market by the end of the decade. This plan is supported by the previous key strategic goals set by Airline A that heavily concentrated on the almost complete renewal of its long-range and to some extent also the short-range fleet. As noted in the literature review, such extensive developments are generally considered as strategic plans as these plans have a significant effect on the focal company overall. The modernization of the whole long-haul fleet or extensive network and scheduled frequency development influence the corporate financial plans, overall competitiveness as well as the governance of the company and its policies. In the case of Airline A, such plans have varying time horizons but on average such plans reach at least 5-8 years into the future. (Organization A, 2017f)

3.7.2 Network planning

In the case of Airline A, network planning focuses on the long-term planning of its current and future operations on route level within the network that is currently operational. The time horizon applied to network planning is 1-3 years into the future. Issues dealt with on this level relate to the feasibility of operations based on financial, regulatory and market seasonality factors. Network planning can be categorized as long-term tactical planning based on the time-horizon that it applies. On the network planning level, the contribution of the cargo business unit is similar to the strategic level in the sense that the Organization A is responsible for providing the cargo business insight on route level in reference to the profitability and operational feasibility of the cargo business. The clear difference between the contribution of Organization A at this level is that the network planning level is concerned with the already operational network of Airline A. (Organization A, 2017f)

In the literature review, tactical planning is referred to as being the link between the strategic and the operational plans that concentrate on long-term balancing of supply and demand. However, in the case of the Airline A, the focus seems to be on more general planning that does focus on the feasibility of the operations, which is naturally based upon current market demand and supply of capacity that Airline A offers but also on financial aspects such as overall cost development and regulatory developments that affect the business of Airline A. (Organization A, 2017f)

3.7.3 Operational & commercial planning

Operational & commercial planning is the first level where Organization A as a business unit of Airline A creates its own business unit specific plans. From the perspective of the Organization A, operational & commercial ("OP&C") planning is the long-term scope of their business planning and therefore the highest level of planning that will be considered when formulating a conceptual future planning framework in reference to the initial research problem and the concepts defined in the literature review. (Organization A, 2017g)

OP&C planning is the term that is used in Organization A to describe the plans that several organizational functions of Organization A take part in creating with a time horizon of 1-12 months ahead. The basis of OP&C planning is the bi-annual schedule season determined on group level for the whole Airline A. The schedule season that lasts approximately 6 months and changes roughly once in a 12-month period is the overall network plan that Airline A lays out on group level and which is executed with best possible accuracy and timeliness. The configuration of the network, meaning what sort of aircraft type is to be utilized, the route traffic schedule, the estimated passenger capacity and thereafter the cargo capacity, is pre-determined for each schedule season. The network configuration is based on long-term and short-term analysis of both passenger and cargo markets. These analyses are done both on strategic and tactical levels as mentioned above. (Organization A, 2017g)

The bi-annual schedule season determined on group level constraints the cargo specific OP&C planning. Group level resource planning, which is responsible for the allocation of the resources throughout all hierarchical planning stages, determines the constraints within which the cargo business will execute its operations during the schedule season. The network configuration is the constraining factor for the cargo business unit's planning as it determines the capacity that the cargo business can utilize in each schedule season and the OP&C planning of Organization A is done accordingly. (Organization A, 2017g)

As mentioned previously, Organization A has a revenue contributing strategy within the group based on the determined significance of the cargo market potential. The cargo business is either important or less-important on a given route. This revenue contribution is known within Airline A as the cargo contribution. Organization A seeks to maximize the cargo

contribution for each schedule season and a crucial part of this task is its own OP&C planning process. With its OP&C planning, Organization A tries to utilize the cargo capacity that it has been allocated by the group resource planning with a rate as high as possible and with as high as possible rate per kilogram. The aim is to have a yield as high as possible for the capacity that is utilized by cargo. In practice, this means that Organization A seeks to transport as much as possible of such air cargo that can be transported with a high per kilogram rate. In a simplistic manner and in a perfect market-setting, the execution of this strategy will maximize the cargo contribution throughout the network. In reality, this is not possible but it is a fundamental aim, which is fulfilled to the best of the Organization A's ability in each market situation. (Organization A, 2017g)

3.7.4 Operational & commercial planning process

The operational & commercial planning process that Organization A conducts is a plan that consists of separate plans that are created by different organizational functions within Organization A. The most significant parties that take place in process are the revenue management & pricing ("RMP") department and sales department. Also, the business control department has a cost managerial contribution aspect to the plans, however, this is not discussed due to the scope of this thesis. The operations department of Organization A is clearly an external organizational function in the current setting, which is not in line with the principals of integrated planning. Figure 8 visualizes the current OP&C planning process as well as the production planning process which will be explained in detail below. (Organization A, 2017g)

The RMP unit is responsible for the name-sake areas as well as the capacity planning. On a general level, the task of the RMP function is to manage the revenue that is generated by the cargo business through the network. In practice, this is done through effective capacity management and cargo pricing adjustment based on forecasted capacity estimates and the estimated cargo demand. Even though the cargo capacity plan is pre-determined for each schedule period based on the group level capacity allocation that Organization A is given, it does fluctuate. Fluctuation means that there are always some changes into the factors that constrain or enable the cargo business. These changes mainly relate to route schedule or aircraft changes, significant passenger volume changes or some external factors that have a significant effect into the execution of the operations. (Organization A, 2017g)

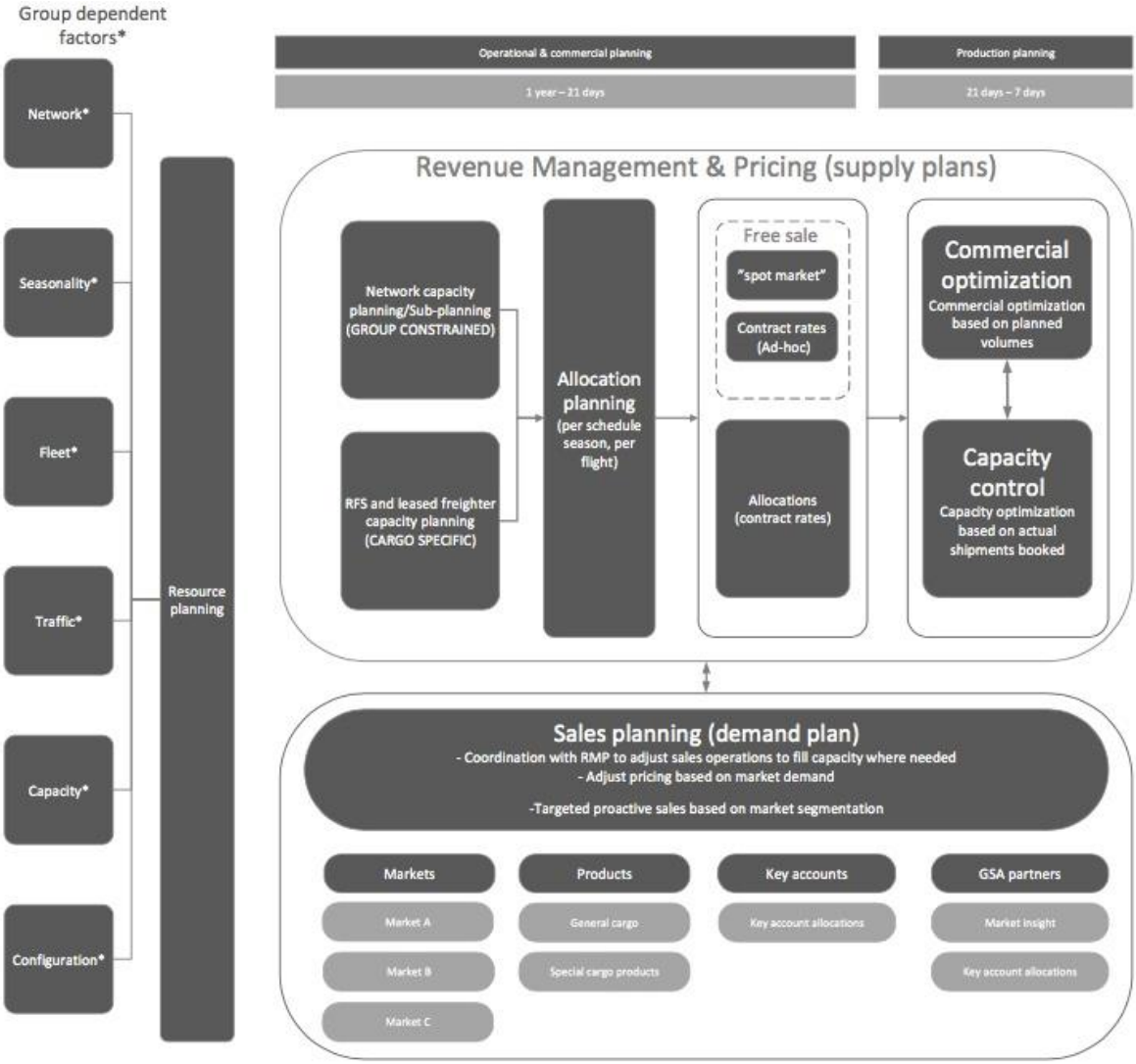

Figure 8. OP&C planning and production planning processes, Organization A, 2017

The network capacity plan and thereafter the sub-planning is one of the main planning elements that are created by the RMP function. The capacity plan comes as given from group level and changes made are known sub-plans, which are done during each schedule period. Through the sub-planning efforts, the RMP function adjusts its capacity forecast to the best of their ability to support the overall commercial & operational plan and the sales function that is very much dependent on accurate capacity information. As mentioned above, Organization A does also utilize RFS services and some leased freighter aircraft capacity that act as feeder service to its primary and secondary hubs. The configuration of this feeder

network that consists both volume and frequency-wise mostly of trucking routes is under the management of Organization A. This indicates that Organization A can design the construction of the feeder network to best support its network capacity and therefore the overall cargo contribution. The RFS and leased freighter feeder network capacity planning support the overall network capacity and sub-planning that the RMP function creates. The two planning elements form the overall capacity plan of Organization A. When aligned with the scope of this thesis, the overall capacity plan forms the supply plan of Organization A as it represents the production capacity that Organization A can utilize when it produces the air cargo transportation service. (Organization A, 2017g)

The cargo sales department is the second key function that contributes to the OP&C planning. The main function of the sales organization in Organization A is to contribute to the maximization of the cargo contribution but also act as the main contact point for the customers. Whereas the RMP function seeks to manage the capacity and pricing of the capacity in a way that support the maximization of the cargo contribution, the sales department seeks to effectively sell the capacity to the customer with a price that will generate profit margin as high as possible for Organization A. (Organization A, 2017h)

The sales organization of Organization A itself is rather lean but still holds a global presence. This is possible through a network of well-developed relationships with its GSAs around the network. The GSAs are considered as external parts of the sales department, especially when they operate in key markets. Generally, the GSAs communicate through cargo area sales management when they need the support of the RMP function. This route of communication is in place to make sure that the GSAs are constantly aware of effects their sales efforts have on a larger scale. However, in key markets where the GSAs are in contact with customers that are strategically relevant for Organization A, they communicate directly with the RMP unit. This is to take advantage of the agile and compact organizational structure of the sales department. This way Organization A can have an advantage against its competitors in terms of being able to react swiftly when needed. (Organization A, 2017h)

The sales agreements that Organization A has with the GSAs vary based on what market the GSA operates in. In general the agreements with the GSA are “descriptive”. This means that Organization A clearly specifies the targets and goals of the GSAs and develops service level

agreements (“SLA”) around these, but does not dictate the way the GSAs reach the set goals. Naturally, the GSAs must comply with all the policies that Airline A has in place for its suppliers, comply with overall rules of good business conduct and with all industry regulations and standards. (Organization A, 2017h)

The air cargo market is very diverse and consists of many kinds of air cargo as has been mentioned earlier. There is also significant geographical difference in terms of what kind of cargo is transported into different destinations. Due to these significant differences Organization A has segmented its air cargo market into three different segments. In this thesis, the markets will be known as Market A, Market B and Market C. All the markets have different characteristics based on which Organization has separated them. (Organization A, 2017h)

Market A is the market segment with the largest share of revenue and where Organization A has a strong market position. This market is serviced with tailored air cargo products that fit the needs of the cargo that is transported in large volumes. Market B is the market segment that has a lot of growth potential and Organization A seeks to utilize economies of scale in terms of this market. In practice, the economies of scale are utilized in the way that there is added capacity through RFS capacity and leased freighter feeder capacity in these markets to be able to offer lower rates through lower unit cost. Market C is the market segment that is not in the focus of Organization A as it does not offer growth potential in cargo volumes based on industry present nor the existing network that serves this area. Market C is mainly serviced with narrow-body aircrafts that cannot transport big volumes and there is no RFS or freighter feeder network present. The key aim in terms of market C is to keep the overall cost level as low as possible. (Organization A, 2017h)

Organization A’s strategy focus is clearly on Markets A and B. In terms of Market A, the strategy is to keep it on the current level and achieve some moderate growth. Market B is the market segment where Organization A sees the most growth potential and where significant new business potential exists in terms of the industrial and economic climate of the market. The strategy in terms of Market C is to support the other market segments. In practice, this is done through a push and hold sales strategy. The sales remains relatively passive in terms of the Market C and sells proactively in that market only when it needs to

fill the capacity in certain routes to fulfil the cargo contribution. The same strategy is utilized in all the market segments based on the current market situation. (Organization A, 2017h)

The sales strategies that the sales department of Organization A and its external GSA partners utilize are based on balancing the capacity and demand. When capacity is filled on a certain route well in advance, the sales department or the GSA communicates with the RMP unit on whether the price rate should be raised and if the capacity is not filling up quickly enough whether the price rate should be lowered to gain more demand. These actions are done in a very proactive and transparent way to enable all GSAs in all market segments to be aware of the current overall situation and what their optimal course of action is to support that situation. (Organization A, 2017h)

By performing all these actions and processes, the global sales management upholds a route and market level demand forecast throughout the whole schedule season and beyond. This demand forecast gathers together all insight on a global scale. All the GSAs contribute to these forecasts and in many parts of the different markets they have the most local and regional insight that Organization A relies on. (Organization A, 2017h)

After the overall capacity plan and the demand plan are done, the RMP and the sales organization create in cooperation the allocation plan. The allocation plan is the allocation of the capacity that has been determined in the overall capacity plan to customers. As mentioned in the literature review, the main cargo customers for non-integrated FSNC airlines are forwarders. In the allocation plan, the capacity that Organization A has available during the schedule season is pre-sold as capacity allocations mainly to the key customers of Organization A. The allocations are not solely available for key customers but the size of the allocation and how commercially beneficial it is depending on the importance of the customer for Organization A. In practice, most of the allocations are sold to large globally operating forwarding companies. The allocations that Organization A sells to its customers are both capacity purchase as well as capacity guarantee agreements that specify the route, schedule, time-period level and how much of the available capacity is reserved for a certain customer. The allocation planning is very much a cooperative planning element done by the RMP and sales departments. The sales department is in constant communication with the customers and has the most current insight on the projected demand the customers is

expected to require for certain routes and time-periods. This is done in close cooperation with the GSAs on a global scale. (Organization A, 2017h)

The allocation plan dictates the amount of capacity within a schedule period that is designated for certain forwarders and how much it takes up of the total capacity that Organization A can utilize during a certain period. The total amount of allocations varies between every period but on a general level it is approximately 50% of the total capacity. Rest of the capacity is known as free sale. Free sale capacity consists of capacity that is freely available for all customers except for the contract rate capacity that is based on contractually agreed upon per kilogram rates. These are offered to certain forwarders as part of the free sale capacity. In practice, the contractual rates are not a separate part of the free sale capacity or a capacity guarantee agreement. They are contracted rates by which forwarders can buy up capacity with a set price. The feasibility to utilize the contract rate option is up to the customers as the contract rate can be either higher or lower than the market rate. (Organization A, 2017h)

The rest of the free sale capacity is sold on a “spot market” basis, which indicates that the demand for capacity dictates whether the prices are high or low. The spot market priced cargo booking begins 21 days prior to actual operation of the transportation. For large customers, most of the shipments which are booked with spot market rates are on ad-hoc basis due to overbooked capacity allocations, current market rate being below contract rates or due to other special circumstances. (Organization A, 2017h)

The plans within the OP&C plan are adjusted when needed during the time-period of the schedule season. When a flight level plan reaches the point of 21 days prior to operations it is considered as being part of the scope of the production plan. The production plan commercially and operationally optimizes the usage of the actual available capacity versus the actual volume of booked shipments that have actualized in to real shipments and not just bookings. (Organization A, 2017h)

3.7.5 Production planning

In the OP&C planning process, the production planning phase is the last mode of planning before the actual operational execution of the ACSC begins. From Organization A’s time

horizon perspective, production planning is done 21 days to 48 hrs before the actual operation. As visualized in Figure 8, the tasks within the production planning scope are divided into two different areas. The commercial optimization is done by the RMP department's business managers that have ownership over the commercial optimization of the production plan. The commercial optimization plan is not on specific flight level but on the level of a group of flights that will be operated within the short time horizon. The commercial optimization is the higher-level task within the production plan that considers the commercial priorities that the different booked shipments have. The commercial prioritization is a rather complex system of business rules that are based on several aspects that an air cargo shipment can have. The shipping customer or the shipped cargo, the cargo kilo rate, the physical characteristics of the cargo such as temperature control or hazardous materials and previous delays or other operational aspects are aspects that have strategic importance. (Organization A, 2017g)

After commercial optimization of a group of near future flights, the capacity control team takes ownership of the operational optimization. The operational optimization, which is done by an outsourced delivery centre of Organization A, is always flight specific and therefore different to any higher-level plans that are mostly aggregated based on either market, route or timeline. The operational optimization is considered with flight level optimization of the cargo that is allocated to a certain flight and how it is best loaded to the aircraft so that the capacity available can be used in the most efficient manner. Similarly, to the commercial optimization also the operational optimization is based on certain business rules. The difference to the commercial optimization is that operational optimization is highly computer-aided as it is done through the cargo management system ERP-A. Nevertheless, the capacity controlling team needs to verify the final production plan before it is handed over to operations for execution. These tasks are done in clear coordination between the business managers in charge of the commercial optimization and the outsourced delivery centre in charge of the capacity control. This way, the production planning process remains agile and allows the swift commercial and operational adjustments to be made. (Organization A, 2017g)

3.8 Analysis of the OP&C and production planning process

The procedure executed by Organization A as their business unit specific planning process has been explained in detail in the previous sections. in the explained process is in the form currently utilized by Organization A and the description of it is based on the information and data received form Organization A as well as data gathered during interviews with key representatives of the relevant departments.

The OP&C of Organization A is a part of the overall hierarchical planning framework that Airline A has in place. OP&C is a planning process that is utilized on approximately the same time horizon as tactical planning presented in the literature review. In the hierarchical planning process of Airline A, it is a planning level that is mostly concerned with steering of the airline operations in a way that the commercial plans are in line with the operational plans.

From the perspective of Organization A, it is the highest business unit specific plan that Organization A has full ownership over. As mentioned above, the business operations of Organization A are dependent on the strategic business plans of Airline A. Therefore the scope of Organization A's business operations is somewhat limited. However, the limitation of the business operations has a two-way effect on the business of Organization A. The group level plans can also act as enabling factors for the cargo business in the sense that if Organization A is able to communicate its demand forecast well, it can have a significant effect on the network configuration and how beneficial it is for Organization A. The effectiveness of the communication between hierarchical planning levels is essential as only robust communication processes and transparent sharing of information can help hierarchical planning function effectively as emphasised in the literature review.

The OP&C planning process is the main framework that Organization A has in place to steer its business operations and balance the capacity it supplies to the air cargo market with the demand the market has for the services provided by Organization A. The functionality and purpose of the OP&C planning process is very similar to that of S&OP. However, it does lack much of the planning infrastructure, integration and transparency of S&OP. In the manufacturing environment, S&OP integrates seamlessly the demand and supply side of the

business. In practice this integration means that the sales operations having the most accurate information regarding the demand of a certain manufactured product, integrates its forecast with the production side having the most accurate information regarding the production capability of an organization. This is partly true for Organization A as the OP&C planning process does seek to balance the transportation capacity or, if aligned with the manufacturing environment, the production capacity with the demand of the market.

The essential difference is the fact that Organization A's RMP department does not represent the operational department of Organization A nor its operational suppliers, which have the most accurate network-level operational awareness of the cargo businesses' production capabilities. Therefore, the supply side of the current OP&C planning process is lacking the "production plant" level insight of Organization A's the production capabilities. The operations, whether they are the internal operational units of Organization A or the GHAs in charge of operations at outstations throughout the network, are currently only an executing arm of the planning process. The operational departments do not have a clear two-way line of communication or contribution to any of the higher-level plans. In all cases the operational functions are responsible for executing the operation according to the specified plans. Due to this reason, there is a lack of commercial and operational visibility, integration and transparency in the planning processes.

The current OP&C planning process integrates the demand and supply side plans in the allocation planning process as presented above. The integration of the different parties is not as complete as it should to be able to form a true consensus and transparency over the plans that effect the whole Organization A. The allocation plan, which is essential in the balancing of the supply and demand plans that Organization A creates, is not iterative in nature in the sense that the allocation plan would be updated on a rolling time-horizon. This is most likely since there is no clear planning infrastructure in place within Organization A that would integrate the planning processes of the departments by providing a forum for it.

Nonetheless, the alignment of the OP&C process with S&OP seems reasonable due to the similarity of the purpose, planning granularity and time horizon. The purpose of the OP&C is to form a consensus of the capacity that Organization A has available and balance that with the demand that it estimates it will get from the air cargo market. The planning

granularity that is utilized in the OP&C planning process is on an aggregated level regarding market segments, cargo products, routes and key accounts. This bears much resemblance to the product group or product type aggregation level that is common in the S&OP planning framework in a manufacturing setting. The time horizon that is utilized in the OP&C planning process is similar to that of S&OP, even if S&OP tends to look a bit further into the future. The feasibility of a longer outlook in the future in the air cargo industry would be questionable due to the relatively high volatility of both capacity and demand within a relatively short time frame.

The production planning process that Organization A has currently in place seems to be a well-developed and clearly structured process that takes advantage of the small size of the relevant organizational units responsible for the production plans. The commercial optimization tasks are clearly on a higher-level as these deal with a group of flights versus a single flight, which clearly indicates that this method allows the business managers to have more leeway in their optimization task. The operational optimization tasks thereafter seem to be tasks that are clearly dependent and designed to be handled by the ERP-A in place. This leaves the supervision of these tasks to the dedicated capacity control team. The three-week booking timeframe within which the production planning process is utilized is an essential “order book” for Organization A and the production planning process is the proactive management of the order book, when put into manufacturing industry terms.

The aspect clearly lacking in the production planning process is the non-existent two-way communication process with the operational departments of Organization A. The production planning is a planning process that falls in the category of operational planning based on definitions presented in the literature review. Operational planning is concerned with activities that are planned to be executed soon with a time horizon from a couple of days to a couple of months. The granularity of operational planning is on the production unit level and therefore the accuracy of the planning is also of high importance as it is already more of a precision tool and not a higher-level steering method. This of course is very much dependent on the time horizon that is present but in the case of Organization A’s production planning it is on a unit level as it is concerned with flights.

The alignment of the Organization A's production planning process with the planning frameworks presented in the literature review is not as clear as in the higher-levels of the OP&C planning. The tasks that are executed in the production planning process are associated with that of the MPS, which essentially plans what to produce, the quantity, the time and the used material. However, the nature of MPS as a more tactical planning tool because the time horizon and granularity is a bit broader than that of Organization A's production planning. Nevertheless, MPS is the framework that is most suitable when aligning to the reviewed planning frameworks. This is because both MRP and PAC are rooted to a great extent in the scope of manufacturing of tangible goods and they do not align with the purpose of the planning. The alignment of MPS where applicable can provide more valuable insight to the production planning process as it would require a clear communication process to be established with the operational department that could provide the needed operational insight.

3.8.1 Current OP&C planning process maturity

The qualitative data related to the current OP&C planning process and the production planning gathered from Organization A were analysed in the previous section in relation to the academic literature reviewed in the literature review. The analysis states that the alignment of OP&C process as well as the production process to the S&OP and MPS planning frameworks is viable and that these frameworks can be used as reference where applicable when developing a new planning process framework for Organization A. To analyse the existing planning processes of Organization A, the literature review presents an S&OP process evaluation framework developed by Crimson & Pyke (2007) known as the S&OP integration framework. The framework, which is presented in Appendix 1, analyses the maturity of the S&OP process in a focal company in five different categories and evaluates the maturity on a scale of 1-5. In the framework "No S&OP process" (1) is the lowest and most immature stage and "Proactive" (5) is the highest most mature stage. (Crimson & Pyke, 2007)

The meetings & collaborations category assesses how well the planning process is organized in terms of organizational collaboration between relevant departments and whether there are designated meetings in place to support this. In the OP&C planning process, the sales and

RMP departments of Organization A share information during the planning process in form of their latest insight in terms of forecasted capacity and forecasted market demand. The sharing of information is not limited to specific meetings as it is shared whenever needed between the representative of the sales and RMP departments. This rather agile way to communicate makes the process of information sharing relatively efficient but also relatively informal. Much of the real-time knowledge is shared between different individuals through different means of communication, such as emails. There is no clear, transparent and robust process in place.

Meetings held weekly do exist but both the content and analyses presented of the meetings varies. The topics discussed in the meetings relate to current and on-going issues. The meetings have some variable executive presence based on the current situation. The operations department does not take part in these meetings and as a default no issues regarding the operations department are discussed in the meetings. (Organization A, 2017g)

In the S&OP integration framework, the planning process of Organization A is in between stages 2-3 as it does include aspects of both the stages in all the five categories. The most important issues to be developed are the content of the meetings, the agenda of the meetings and the participants of the meetings. These should all be developed to support the integration of the plans and thereafter the iterative synchronizing of the plans. This requires the clear outlining of the content that remains as the constant basis for the meetings, a clearly outlined agenda that discusses the agreed topics to be discussed in a certain, agreed order and the participation of individuals that all have a clear role in the meetings.

The organization category evaluates the existing organizational structure that is in place to support the integrated planning if there is an organization to support integrated planning. In the case of Organization A, there is no organization in place that would be solely responsible for the OP&C planning process or the production planning process. In the case of the OP&C planning process, the sales and RMP departments are responsible for the different parts forming the OP&C planning process. There is no organizational body that would govern the OP&C plan as a separate entity. In that sense, the different parts that build the OP&C planning process are more important than the OP&C plan itself as there is no party that would have ownership of the OP&C planning process on a holistic level. This is not to say

that the OP&C plan would not be important nor that it would lack meaning to Organization A but that the governance of integrated planning is currently non-existent. This would rank the planning organization of Organization A to stage 1 but as there clearly are components of S&OP in different organizations that have clear ownership of these different planning elements it is more justifiable to evaluate Organization A's planning organization at stage 2, reactive.

The measurements category in the S&OP evaluation framework assesses the maturity of the measurement systems that is in place to the measure the performance of the integrated planning process as well as the specific S&OP performance metrics. In Organization A, the measurements presented are developed around the planning elements that comprise the OP&C planning, namely the plans that sales and RMP departments manage. There are no metrics that would measure the overall OP&C planning accuracy, as it is more of an umbrella term that comprises and loosely integrates all the plans. Therefore, it is possible but not feasible to measure the OP&C planning accuracy. As the operations department is not linked to the OP&C planning process, there are no operations related measurements in place in the sphere of the OP&C planning. The planning process maturity of Organization A is between stages 1 and 2 as there are measurements in place but these are not developed from an integration perspective that would allow the use of the measurements on a comprehensive level. Ownership of the measurements is department based and there is no universally understood measurements that would be clearly shared throughout the whole organization to project transparently the current state of the business.

The IT category evaluates the maturity of the implemented IS and the processes around the use of these systems in the focal organization. The IT category has an emphasis on the governance of the planning data and the designated planning systems. In terms of the IT category, Organization A, has a very strong basis due to the newly implemented cargo management system ERP-A. The new system manages the cargo business process throughout the whole air cargo supply chain of Organization A. Although ERP-A is the main system that governs all data related to the air cargo supply chain of Organization A, it is not a dedicated planning tool. The plans that comprise of the OP&C plans are managed through spreadsheet and business intelligence software and each department manages their own data. (Organization A, 2017g) The updating of the data requires relative amounts of manual work

based on the skill level of the people that manage it. Consolidation of the data and integrated utilization of the data is not managed through any IS or process, which makes the current structure siloed. Currently in the IT category, Organization A is between stages 2-3 as the planning work is done in multiple non-consolidated spreadsheets that are managed separately by different people. The existing IT architecture in place is, however, very advanced and modern that would most probably support well the implementation and integration of a new dedicated planning tool.

The S&OP plan integration category measures the focal organization's overall planning integration maturity level. In the case of Organization A, the current level of planning integration is explained in detail in the sections above. In short, planning integration exists currently and efficient information sharing is in place but no clear process framework to support this exists. Currently, both capacity and demand plans are created, revised and synchronised and the information relating to these plans is communicated between some departments. However, there is no real integrated planning framework in place, the planning is department-centred and in many cases top-down and the operations department is not involved in the planning process leaving it to chase the plan in the execution phase. Due to these reasons, the S&OP plan integration category in Organization A, is currently between stages 2 and 3. The most important first steps to develop the integration of the plans further would be to develop a transparent and inclusive planning process that would support the integration of the operations department and enable a two-way communication throughout all units that have accountability over the plans.

Based on the analysis conducted with the support of the S&OP integration framework, the most prominent changes that Organization A should consider is developing the overall OP&C planning process towards a more S&OP like integrated planning process that relates to processes, organizational changes, tools and development of an integrated plan. In terms of processes, Organization A should develop a process of meetings bringing together all the relevant parties that should contribute to the integrated plans. These meeting should follow a robust structure that produces one set of plans that the whole organization contributes to and has accountability over. The organizational change that should be considered is the creation of a designated team that has or individuals that have full ownership of the

integrated planning process. Such a team or individuals could act as the process owner(s) that validate the follow through of the process and the contribution of all relevant parties.

In terms of tools, Organization A should make use of ERP-A that is in place and seek to integrate dedicated and integrated planning IS into the implemented ERP-A. The seamless integration of the systems would allow the utilization of the data produced by the forecasts created in the planning process throughout the whole ERP-A efficiently. The development of the integrated plans is possibly the largest and most complex task that Organization A should tackle to develop the planning process further. As stated in the analysis of the OP&C planning process, the most feasible way to do this is to find validated points of references from the S&OP and MPS planning frameworks. Through the validated points of reference, the existing OP&C planning and the production planning process can be developed to a more integrated, transparent and robust end-to-end planning framework that comprises of all the relevant information that is needed to govern the business operations of Organization A from a network-wide point of view. In the following sections the alignment and application of the S&OP and MPS process frameworks will be presented.

4 DISCUSSION

This thesis has at this point presented the research problem, reviewed relevant academic and industry sources in terms of the research problem and presented a case organization that is in midst of significant development. All the elements above have been analysed separately in detail to lay the grounds for the following chapter that will propose a new planning framework. Before the new conceptual framework can be proposed, the most important points from all the analyses should be gathered to form a complete picture of all the underlining factors that affect the proposed framework. The proposed framework is constructed as a concept that seeks to answer the research question presented as well as to consider the specific factors that characterize Organization A.

As mentioned in the beginning, the academic contribution of this thesis is based on the study of the ASCS and the application of hierarchical planning frameworks mostly known from the manufacturing industry to the ACSC to gain the same positive effects that integrated planning has proven to have in other industries. The air cargo industry is profoundly different from the manufacturing industry as it is a service industry but it does contain similarities as well. The high level of regulation that characterise the whole airline industry affects also the air cargo industry by making it an industry known for complex processes. In addition, the nature of air transportation has shaped the production processes within the ACSC into processes that resemble a manufacturing processes. The processing of goods to an air transportation worthy state being a great example of such a process. Thus, the alignment of an ACSC with that of a SC of the manufacturing industry seems feasible.

While there are similarities, the ACSC can be deemed a service supply chain that produces a transportation service, which has elements that make it a production intensive process. It requires that the organization managing the process to have significant amount of special knowledge and specialised assets at its disposal. These assets, in the case of Organization A, are the air cargo terminal and other physical assets within the terminal system, the transportation equipment, trained personnel, the IS architecture and the specialised organization. These assets form the physical and knowledge infrastructure of Organization A that is then completed with the assets of Airline A to enable the producing of the transportation service. These aspects strengthen the alignment of the ACSC Organization A

manages to that of an organization that produces a tangible product as well as with the industry domain where presented hierarchical planning frameworks were first developed.

Organization A represents an example in which the applicability of the hierarchical planning frameworks is tested to determine whether it is possible to utilize such frameworks in practice within an organization that is active in the air cargo industry. The incentive to study the application of the frameworks is based on the research problem grounded in the development aim of Organization A. Organization A seeks to transform its operations to be managed from a network-centric perspective that would allow greater visibility throughout its network and into the near-future operations. The substantial developments that Organization A is going through change the operational environment in terms of the organizational structure, the IS and physical systems. Especially the cargo management system ERP-A, which is already rolled-out in Organization A provides a modern IS infrastructure that enables the transparent management of a dataflow that connects all the relevant parties of the ACSC from the point of view of Organization A. Without the existence of such IS, the data needed to comprehend the state of the network would not be possible on an end-to-end level.

These characteristics of the change move Organization A towards a more favourable state in the sense of the research problem. The primary research question tries to answer what is the right level of planning to be applied to the CC's operating model in order to connect the network-centric operations planning with the higher-level plans. This is made possible by the changes that are currently ongoing and the integration of the operations plans wouldn't be possible without the development of the new CC organization that in turn is dependent on ERP-A. The network supervision function of the CC is the most crucial link in creating the network-centric perspective as it will manage and coordinate the execution of the operational business processes throughout the network. With the network supervision function and the hub terminal specific functions, the CC has both the visibility into the network and into the hub terminal that is essentially the most significant production platform that Organization A manages internally.

Without such an operational management and coordination unit, it would be unlikely that such broad operational awareness could be achieved. The physical systems that enables the

high-level of automation in the new hub terminal, the new processes and the new ways of working are all such significant changes to the current terminal system that the comprehensive management of the all these features requires a centralized control unit. Furthermore, the planning perspective changes as all these aspects adds relative complexity to the terminal as a system even though the visibility, control and predictability increase through the developments. Thus, the CC organization is key enabler in the process to integrate the network-centric operations that are grounded in the new operational environment with the high-level commercial plans.

The end-to-end planning process that Organization A as a business unit of Airline A utilizes has, is essentially a segment of the whole planning architecture that is in place within Airline A. The analysed OP&C planning process and the production planning process are business unit specific and fully managed by Organization A. Therefore, the comparison of these process with the reviewed processes is essential. The aim is not to find an exact match between the frameworks but to apply the applicable factors to form new planning process that is tailored to Organization A.

The alignment of the OP&C planning process with the S&OP process is feasible due to the purpose, granularity and time horizon. Based on these aspects, the primary task that the OP&C plan has is similar to that of S&OP, namely to balance the supply and demand. The planning granularity of the OP&C plan is aggregated, which applies also to S&OP. The time horizon during which the plans that form the OP&C are created also approximately match the time horizon used in S&OP. These similarities do not the necessarily mean that S&OP would be directly applicable in case of Organization A but as mentioned previously, S&OP as a framework is not set to the finest detail and can be modified. The biggest shortcomings the current OP&C planning process has it’s the lack of consistent planning infrastructure, the non-iterative nature of the planning process and the complete exclusion of the operations department.

The production planning process of Organization A currently exists in a form that functions well and is organizationally designed in an efficient way both in terms cost efficiency and process efficiency. The most commercially important production planning is done in-house, whereas the more routine tasks are outsourced to a delivery centre. The alignment with the

MPS framework will not necessarily change the processes that are currently in place within the production planning but provide a more focused perspective to the execution of the tasks. This would be more in line with the new operational environment. Also, in the case of the production planning process, the one-way communication with the operations department responsible for executing the outlined production plan is key concern that can be developed with reference to the MPS framework.

4.1 Application of S&OP

This section presents in detail the alignment of S&OP with the current OP&C planning process that Organization A has in place. With the alignment, S&OP as a tactical planning framework can be used as a point of reference to develop the existing OP&C planning process to a form that would correspond with the issues that were brought forth in the analysis. The current OP&C planning process lacks the planning infrastructure, which would allow it to develop to a level that could truly support integrated planning. With reference to the maturity of the OP&C planning process evaluated with the S&OP integration framework, the current process is on average either on a reactive stage or on a standard stage. This indicates that much of the right elements that are required to build a robust and scalable integrated planning process are either in place in a different format or need to be introduced as new aspects.

The essential purpose of S&OP and the OP&C process match to a degree that makes the comparison of the processes possible. The OP&C process uses aggregate data that is grouped to a level similar to that of S&OP. In OP&C, Organization A plans on the level of markets, key accounts, destinations and cargo products. These all are aggregate planning units that comprise of several AWBs transported through the network during a certain time frame. The time horizon for OP&C planning is determined on group level and therefore the alteration of it is not possible or necessary, which is similar to S&OP planning. The processes, organization and systems around the OP&C evaluated with the S&OP integration framework are in an immature stage and do not cover all relevant sources of information to be able to form comprehensive plans.

With regards to S&OP, the OP&C process should be structured as follows to gain similar benefits and to enrich the plans produced in a significant way. The sales department shares

its most current estimate of the demand throughout the network. The demand data used should be based on the most current knowledge that the sales department and the GSAs have available regarding the specific market segments, key accounts and other customers, cargo products and any external factors that might have an effect of the demand. The RMP that represents the supply side in the case of Organization A, shares its most current forecast regarding the capacity that is available to Organization A throughout the network and in the RFS and freighter feeders. The capacity data is aggregated to the level of markets, key accounts, destinations or cargo products, whichever are the most relevant. The forecast should always be based on the most current information that is available for the RMP unit and it should be adjusted when new information becomes available. The information can be related to changes in routes, schedules, passenger volumes, aircraft types or anything else external or internal that might affect the future capacity availability.

After the demand and supply forecasts have been presented, the plans should be cross-referenced and analysed to determine whether adjustments to either of them need to be made due to the changes in the other. With the demand and supply plans balanced, the operations department should be given the possibility to contribute their insights regarding the feasibility of the balanced plan. The operations unit has the most current information regarding the operational production capability of the network. Therefore, it should contribute to the plans by validating that the network can execute the plan. The information that the operations unit shares can be related to outstation operations, the hub terminal operations, RFS or leased freighter capacity operations, Airline A's flight operations, hub airport operations, regulatory changes such as customs or any external changes that affect the operational capabilities of the network. With reference to the information sources that the operations department controls, the integrated OP&C plans can be enriched and the operations and therefore, the network-centric perspective implemented on a holistic level.

4.2 Application of MPS

The alignment of the MPS with the current production planning process is initially justified by the similarities found between the air cargo production process, which transforms various goods to be transported by air into air transport worthy cargo and a standard manufacturing industry production process. MPS stems from manufacturing but the similarities make the

alignment between the two arguably possible. The time frame within which the production planning process is done is the three-week window in which the volume actualizes and the capacity optimization can be done. As stated in the prior analysis, the production planning process at present utilized by Organization A is well-developed and efficiently structured. ERP-A is used to execute the more rudimentary tasks related to the operational optimization and is well-suited to the task. Due to the comprehensiveness of ERP-A, the production plan is available throughout the whole ACSC. The primary issue with the prior production planning stated in the analysis was the exclusion of operations department from the production planning process. This is a crucial deficiency in the process especially when considering the new operational environment. As described, the operations department has the broadest insight in terms of the operational production capability of the network. Therefore, the production planning process must be verified by the operations department.

The air cargo production processes occur throughout the whole network of Organization A but every process is to some degree linked to the hub terminals production process. Therefore, the current production planning process could be broadened to serve not only as an optimization tool that maximizes the cargo contribution on route but also as a tool that smoothens the cargo flow processed through the hub terminal. As stated in the literature review, air cargo consists by default of a large variety of freight. The cargo that Organization A transports through its network can be characterized by differences such time sensitivity, commercial priority, physical characteristics and route network options. These are all characteristics that the commercial and operational optimization processes consider when allocating shipments to flights and shipments within a flight or other mode of transportation. This optimization could the extended to cover also the hub terminal's in- and outflows of cargo.

The flow of cargo that is processed through the terminal could the optimized to a level that is as constant as possible. This could be done by exploiting the characteristics of the air cargo that is transported. This process could shape the throughput that Organization A is managing in its new hub terminal in a way that would be beneficial for the operations planning that occurs in the sphere of the new hub terminal. This process would proactively manage Organization A's "order book" and affect the occurrence of certain higher peaks of capacity usage in the hub terminal. A more constant flow of cargo through the terminal would ease

the planning of resources such as workforce in the terminal and needed inventory of transportation materials in the terminal.

To be able to develop the production planning process in the above-mentioned way, it would require the inclusion of the operations department into the production planning process. The operations department can provide the needed information regarding the current production capability of the hub. With that information the production plan can be verified from the point view of the operations. This would integrate the tactical OP&C planning process with the short-term operational plans in a consistent and transparent way.

4.3 End-to-end planning framework

The following section presents a proposed end-to-end planning framework that is the primary output of the thesis research for Organization A. The initial assignment that led to the thesis problem formulation was to find out how to integrate the operating model and the key operating processes of the new CC with higher-level plans and through that integrate the operational side of Organization A and create a network-centric management perspective. Until this point, the thesis has proposed the development of the planning processes that are in place within Organization A with regard to S&OP and MPS. These frameworks are suitable due to the similarities that the ACSC has with a traditional manufacturing environment supply chain. The planning level of these planning frameworks can be defined as tactical, which is based on the purpose, time-horizon and granularity of the frameworks. The existing OP&C and production planning match to a various degree within all these aspects. Therefore, deeming the right level of planning that can integrate the CC operating model and its key operations processes with higher-level plans as tactical planning.

The research question that addresses this aspect of the thesis research problem emphasises the communication of key information through the hierarchical planning framework. The detailed analysis done for the thesis has found that the planning process in place is by default a hierarchical planning structure. The higher-level plans are the starting point for the more detailed short term plans and that key information is therefore conveyed through the process. The issues relating to the current processes have been addressed in detail in the prior

analyses. The proposed end-to-end planning framework is visualized in Appendix 2 and will be explained in detail below.

The end-to-end planning framework has the same group dependent factors presented in the left side of Appendix 2. These are network, seasonality, fleet, traffic, capacity and configuration. These are factors that are determined by the resource planning of Airline A and therefore constrain by default the business operations of Organization A. The timeline that is presented on top of Appendix 2 follows the same structure as the OP&C and production planning processes currently in place. The new OP&C is visualized on the timeline from 1 year prior to operations to 21 days prior to operations. The new framework is presented as a circular process that has three main participants. The circular process indicates the iterative nature of the process, which is proposed to be repeated monthly. The monthly process is visualized in detail in Appendix 3 and will be explained in detail in section 4.2.1. The three participants are RMP, sales and operations. Visualized above all the three departments are the key stakeholders that there planning elements relate to and contribute to. The links to the stakeholders can be of various form. Some stakeholders directly contribute by providing key information whereas others rely on the plans created or are just informed about the main developments conveyed by the plans.

In the case of the sales department, the stakeholders are the GSAs, Organization A's global and area sales management and the marketing team. In the case of RMP these are Airline A's resource planning, as the RMP manages the capacity within Organization A, passenger revenue management and the capacity control delivery centre. For the operations department, the key contributing stakeholders are the terminal service provider that operates the hub terminal, the airport services around the network, the GHAs in all outstation in the network, the new cargo CC ("cargo operations & network control" in Appendix 2), Organization A's hub terminal organization, flight operations and hub airport CC. These stakeholders contribute to the creation and support of the operational awareness that mainly the new CC will uphold in the operational environment.

The planning tasks and the plans created by each of the participating departments are presented in the three boxes found in the visualization. To emphasise the alignment with the S&OP framework, the boxes are named as supply side, demand side and operations

planning. The boxes contain a list of tasks that are executed by each of the departments. In the supply side, the tasks are the network capacity forecast, RFS capacity forecast, current allocation plan, current revenue forecast and current commercial optimization tasks. For the demand side, the tasks are network demand forecast, RFS demand forecast, market segment situation, sales action plans and any demand-shaping actions relating proactive sales operations. For operations, the tasks relate mostly to compiling the network-wide operational awareness by gathering information from all the different contributing stakeholders to form network-wide operational awareness as complete as possible and then to adjust the operational feasibility of the commercial plans set forth by RMP and sales.

4.3.1 Iterative integrated planning process

The integrated planning process conducted within the scope of the developed OP&C planning process describes what is done in practice to integrate the plans created by the different departments. The process is visualized in Appendix 3. The process follows a path similar to the S&OP planning process that is presented in the literature review. In the case of Organization A, the created plan is for the whole schedule season and can reach also further into the next schedule season. The process ranges across a four-week time-period within which the integrated plan is revised. The process utilizes the principal of the rolling time-horizon, meaning that planning process is iterated once a month to enrich the current plan with more up-to-date information and hence make the forecasts more accurate.

The first step of the process is the demand plan created by the sales department. This plan is constructed based on the different elements presented in Appendix 2. The demand plan is created by the sales department through a series of meetings where relevant parties meet and review the existing plan and update it based on the most current knowledge of potential demand constraints or enablers that have appeared since the last plan was created. After the meeting process, the sales department approves their respective plan. The supply plan is created by the RMP department through a series of meetings where relevant parties meet and review the existing plan and update it based on the most current knowledge of potential supply constraints or enablers that have appeared since the last plan was created. After the meeting process, the RMP department approves their respective plan. The OPS plan is the process where operations contribute to the integrated plan by evaluating the feasibility of the

commercial plans from an operational perspective. In their respective meetings, the operations department reviews the demand and supply plans and verifies them in terms of operational constraints or enablers that might have appeared since the last update of the plans. At the end of the operations meeting process, the supply and demand plans are approved from the perspective of the operations. In the balancing and decision phase of the process, the demand and supply plans presented by sales and RMP are analysed in a comprehensive way to find an operationally feasible balance between the demand and supply. This meeting is participated by representative from RMP, sales and operations. The main goal of the meeting is to formulate an updated plan that replaces the existing plan. After the meeting has formulated the plan, the plan is given to the executive board of Organization A for approval. After the executive board has approved the plan, it is handed over to the representatives of all the parties participating to the integrated planning process. The representatives are responsible for communicating the plan throughout the whole organization and the follow-up to ensure that all plans are executed as agreed.

The process described requires Organization A to develop a team that is responsible for the integrated planning process. The individuals that are responsible for each of the departments' plans should be trained professionals that are familiar with the existing OP&C planning process and the planning elements that are created by their own respective organization. In case of the sales department, the individual to participate should be an individual from the global sales organization as they have the most insight regarding the current demand on a global scale across all market segments. In case of the RMP unit, the most knowledgeable individuals to participate in the process would be the business managers that are responsible for the capacity and revenue forecasts that are crucial elements of the supply plans. From the operations perspective, the individuals that work in the new CC team's network supervision team would be the most suitable choice. They have the most current and broad operational knowledge that encompasses both network and the hub terminal operations. As the integrated planning process itself is rather complex and new to Organization A, it would valuable to have an integrated planning process owner role created. Such a role is common in the scope of S&OP and especially important as a disciplinary function that takes care of the proper follow-up execution of the plans.

4.3.2 Integrated production planning

The integrated production planning process is the short-term planning process developed based on the existing production planning process that is in place in Organization A. It is visualized in Appendix 2 on the right hand side of the integrated planning process presented in section 4.3. As mentioned above, the production planning process is essentially a scheduling process of the actualized volume that will be transported by Organization A. The time-period within which the process is conducted is 21 days prior to the actual operation of the transportation. The time frame remains the same in the developed process and the task executed as well. The most significant changes are the inclusion of the operations department into the planning process and the extension of the production planning to cover the cargo flow management through the hub terminal. The process is named in Appendix 2 as order book management as it essentially includes all current transportation service orders that Organization A has at hand 21 days prior to the operations.

Similarly to the developed OP&C planning process, the visualization of the production planning process features the key stakeholders of the process. These are the outsourced delivery centre responsible for the capacity control, the GSAs, the area sales, the outstation GHAs, the hub terminal service provider and the new CC unit ("cargo operations & network control" in Appendix 2). The developed production planning process is split into two different steps. These are the capacity plan step that is initially the tasks performed currently in the capacity control process including the commercial and operational optimization. The second part is the new extension of the production planning that introduces the hub terminal cargo flow optimization through the different air cargo characteristics. The two steps of the process are executed simultaneously within the three-week period. As described previously, the process that is in the proposed developed process concept known as capacity planning is conducted first on the level of a group of flights and then on the level of an individual flight. This will remain constant also in the developed process. The second part will be carried out on a flight level as it is the relevant level of granularity as a flight load is the standard batch that arrives to the hub terminal.

This process requires the clear integration of the operations department to the production planning process as it is the main link to the new terminal operations. The new CC's hub

terminal specific functions control the highly automated, well-structured and transparent terminal production process. With the integration of the process and systems knowledge that the airside, landside and terminal supervision function have, the hub terminal can be structurally linked to the developed production planning process and therefore into the whole end-to-end planning process of Organization A.

5 CONCLUSION AND FURTHER REASEARCH

This thesis has studied the possible application of hierarchical planning frameworks developed in the manufacturing industries to the air cargo industry. Air cargo industry is a segment of the transportation industry characterised by many features that differentiate it from more traditional segments of the transportation industry. In relation to these features, the ACSC and the processes within it were analysed and compared to a traditional manufacturing industry supply chain to determine how comparable the two supply chains are. Clear differences were highlighted and the importance of these differences analysed. The outcome of the analysis was that two of hierarchical planning frameworks presented in the literature review are applicable and can be used as sources of reference with regards to the thesis research. The two hierarchical planning frameworks are S&OP and MPS.

5.1 Answering the research questions

In more detail, the thesis introduced Organization A, which was the source of empirical data for the thesis research. Organization A presented a research topic that was modified to serve as the basis of this thesis. Organization A's main goal was to determine how it could link the operating model of the new terminal's CC and its operating processes to its long-term planning process. The future operations of Organization A are significantly larger, technologically more advanced and complex and therefore, the integration of long-term commercial and operational plans seamlessly with short-term plans is crucial. The thesis research aimed to find a solution for the presented research topic through the following research questions:

(Q1) What is the right level of planning that should be applied to the new cargo terminal's CC operating model and its operating processes to link it with higher-level commercial plans?

Based on the analysis of all the gathered data, the right level of planning that should be applied in the scope of the new CC and to be able to link it to the higher levels of the hierarchical planning process, is tactical planning. The literature review presents the concept and key characteristics of tactical planning which is defined as a resource allocation and performance measurement against projected demand within a 6- to 24-month time horizon (Stadtler & Kilger, 2008).

The presented planning frameworks characterized as tactical are S&OP and MPS. S&OP is often set to a 12-18-month time horizon with the key objective being to balance demand and supply. (Harrison & Van Hoek, 2008 and Olhager & Rudberg, 2002) MPS is a shorter-term framework concentrating on the effective use of the available capacity. (Olhager & Rudberg, 2002) The presented tactical frameworks were determined to fit the scope of Organization A's hierarchical planning process through similarities in purpose, planning granularity and time horizon.

(SQ1) What kind of end-to-end planning model should be applied to enable the key information to be communicated from long-term plans to operational short plans?

The analysis of the current hierarchical planning process found that the absence of the operations department from the process is a critical deficiency. The presented tactical planning frameworks build on the concept of one common plan that integrates all the relevant functions within the organization and creates joint accountability over the plans (Scott et al, 2011 and Stadtler et al, 2015). From the perspective of integrated planning, the inclusion of the operations department is imperative.

As stated in the case study description, Organization A wants to develop its operational management perspective to a network-centric perspective that is crucial in the new operational environment. This network-centric operational management perspective relies heavily on the new CC unit's network supervision functionality. The network-centric management perspective essentially means that the business operations of Organization A are managed holistically. This is in line with the concept of tactical planning that utilizes a long enough time horizon to be able to consider the seasonal developments of supply and demand on a broad scale (Stadtler & Kilger, 2008). This requires the network supervision function to understand the interdependencies that exist between the different parties and processes within the ACSC. To be able to sustain a holistic perspective, the CC unit must remain on a relatively high level and focus on the entire ACSC managed by Organization A. Therefore, the granularity, purpose and time horizon of tactical planning are suitable also for this holistic operations management perspective.

The proposed end-to-end planning framework is developed based on the existing hierarchical planning process of Organization A and S&OP and MPS, which were found to be applicable to different stages of the hierarchical planning process. These frameworks fit the scope as the long-term purpose of the current hierarchical planning framework is to find a balance between the demand of the market and the capacity available. The short-term purpose is to commercially and operationally optimize the use of the capacity. The purposed end-to-end planning framework works on a tactical long-term and short-term time-horizon with the same initial purpose as the current planning process but enhances it to fit the new operational environment, namely the new hub terminal.

The clear integration of the operations department to the framework creates a clear link between the high-level commercial plans created up to a year in advance and the short-term operational plans measured in days. The crucial importance of effective communication between all the relevant planning participants is stated regarding both S&OP and MPS to emphasise accountability and transparency through all organizational units (Arnold et al, 2008). Therefore, also the proposed framework relies on the principals of effective communication between all the relevant participants and establishes clear planning processes to emphasise accountability and transparency across the whole organization. The accuracy of these plans is reliant on the concept of continuous iterative revaluation of the plans (Scott et al, 2011). To safeguard the integrity of the plans and to make them as accurate as possible, the proposed planning framework relies also on the iterative updating of the plan.

(SQ2) What is the key data input needed to link higher-level plan to short-term operations planning?

The plans are created using aggregate data grouped to a level that best serves the purpose and is applicable throughout the whole integrated planning process. In case of the OP&C planning, this data is related to the demand capacity and operational aspects. This data can be segmented based on markets, key accounts, cargo products, routes or any operational aspects. In the case production planning, the data is related to flights and cargo characteristics.

5.2 Limitations and further research

The presented planning framework provides a solution to the presented research topic that is conceptual but aims to provide a clear and practical input to the issues Organization A is currently considering. As the research methodology of this thesis states, the findings of this thesis are not to be considered quantifiable at present and seek only to define a conceptual framework within which the quantitative study can be later conducted to measure the quantitative value of the integrated planning process. Also, the general applicability of the result is limited due to the focus on a sole case organization. Nevertheless, the planning frameworks that were analysed and applied to the ACSC setting have led to both quantitative and qualitative positive outcomes in a traditional manufacturing environment supply chain. It is, thus, reasonable to assume this could be achieved also in a comparable setting.

This scope of the thesis research has been purely qualitative due to the research topic presented. Further courses of research that could be beneficial for Organization A are presented below. With researching the mentioned topics, Organization A could rather easily reap the low hanging fruit of integrated planning. As there are current developments ongoing, the situation will most likely remain the same in the near future.

As stated above, the proposed end-to-end planning framework sought to form a concept that could act as a blueprint for further quantitative studies analysing in detail the applicability of the integrated planning process. Such quantitative studies could focus on determining through data analysis what are the right levels of data aggregation that should be used, what is the exact time frame that should utilized and what KPIs are the most descriptive for such a tactical planning framework. Such quantitative studies would allow the measurement of the applicability of the proposed developments that the framework would bring and the comparison of these with the current hierarchical planning process. Such quantitative results would arguable support this qualitative study a great deal.

Another area of interest for further research could be the analysis of the end-to-end planning frameworks' implementation process form a change managerial perspective. As stated in section 2.2.2.2, the implementation of S&OP is a complex process for any organization that requires the contribution of the several departments and the executive level. Such complex

process can be hard to organize in a large international organization that operates in a very dynamic industry. The organizational changes that have been referred to also in the scope of this thesis will can cause distortions within the current organization. Integrated planning emphasises cross-departmental accountability high-level of process discipline. Such changes can encounter resistance to change and doubtfulness from the relevant parties that should participate in the process. Analysing what kind of change management frameworks and processes could be suitable for such process and how the implementation process could be efficiently managed would be a very interesting.

Thirdly, the further development of the proposed end-to-end planning framework regarding the integrated business planning concept would also be an interesting topic. A developed S&OP process often seeks to integrate financial plans to the process as well. Due to the limitation of this thesis, the financial planning of Organization A was not considered. However, the integration of the business control unit of Organization A would be a very interesting development path. The quantitative study of the proposed end-to-end planning frameworks financial impact is a useful topic that would lead to results that could justify the need for the implementation of the framework or then counteract it. In relation to the integrated business planning, the cross-organizational integration possibility could also be studied. As stated in the literature review analysis, the current dynamics of the air cargo industry counteract the integrated planning that would integrate more than just the main service suppliers within the air cargo supply chain. If the integrated plans could integrate the initial shippers of air cargo also the air cargo industry could benefit from end-to-end supply chain planning, which still is far from reality.

6 REFERENCES

The following chapter includes a complete list of the referenced source used in the thesis. The references are divided into sub-sections.

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Organization A, 2017g, Interviews with business development managers in revenue management and pricing function, May 2017

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6.2 Figures & Tables

Figure 1. Author's own contribution, 2017

Figure 2. Clausen, U., Frye, H. & Sieke H., 2013. Efficiency and Logistics. 1st ed. Berlin, Heidelberg: Springer.

Figure 3. Arnold, T. JR., Chapman, S.N. & Clive, L.M., 2008. Introduction to Materials Management. 6th ed. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Figure 4. Organization A, 2017

Figure 5. Organization A, 2017

Figure 6. Organization A, 2017

Figure 7. Organization A, 2017

Figure 8. Organization A, 2017

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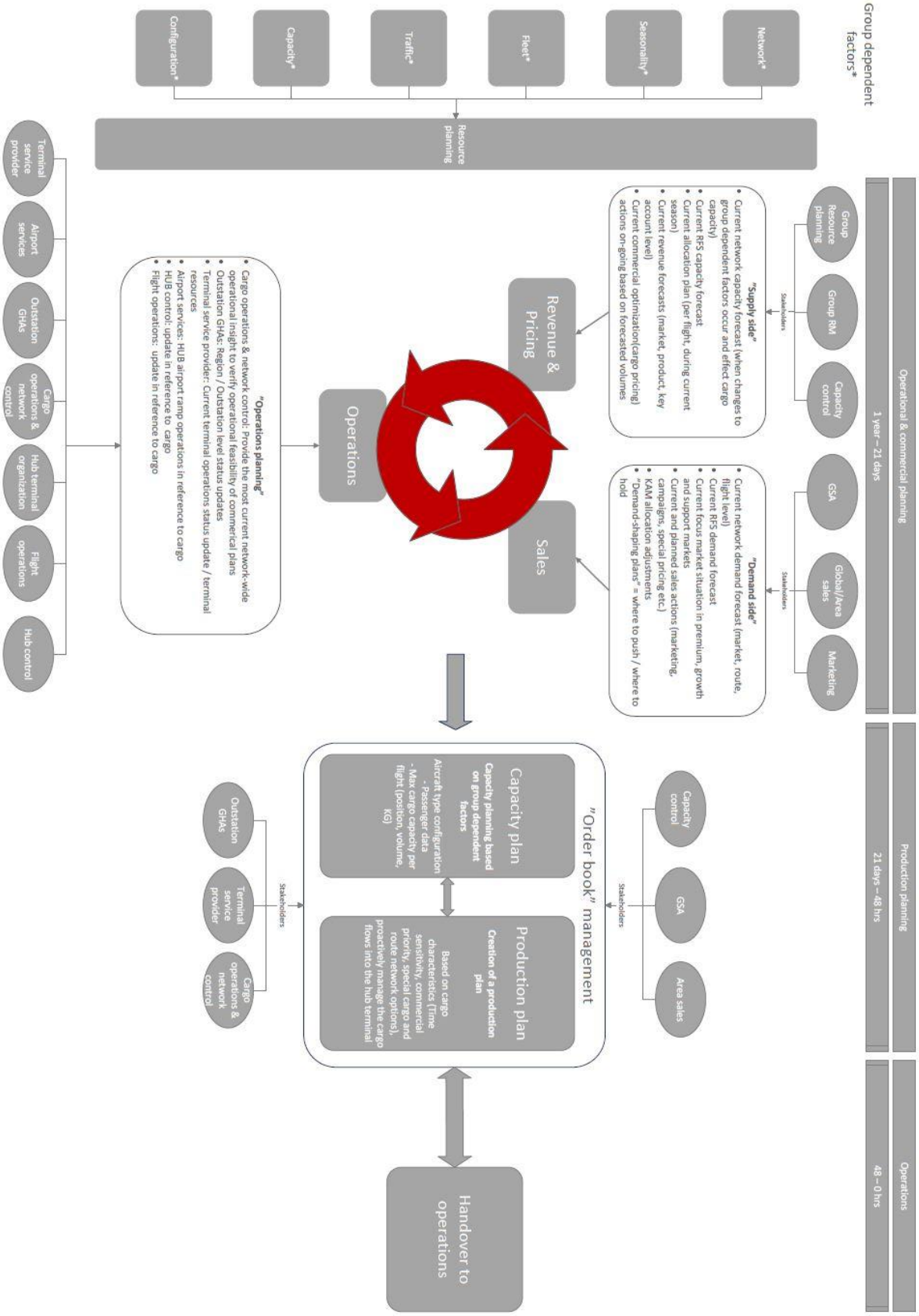
7 APPENDICES

Appendix 1. Grimson, J.A. & Pyke, D.F., 2017. Sales and Operations Planning: An Exploratory Study and Framework. The International Journal of Logistics Management, Vol. 18 No. 3, 322-346.

	Stage 1 - No S&OP Processes	Stage 2 - Reactive	Stage 3 - Standard	Stage 4 - Advanced	Stage 5 - Proactive
Meetings & Collaboration	• Silo Culture • No meetings • No collaboration	• Discussed at top level management meetings • Focus on financial goals	• Staff Pre-Meetings • Executive S&OP Meetings • Some supplier / customer data	• Supplier & customer data incorporated • Suppliers & customers participate in parts of meetings	• Event driven meetings supersede scheduled meetings • Real-time access to external data
Organization	• No S&OP organization	• No formal S&OP function • Components of S&OP are in other positions	• S&OP function is part of other position: Product Manager, Supply Chain Manager	Formal S&OP team • Executive participation	• Throughout the organization, S&OP is understood as a tool for optimizing company profit.
Measurements	• No measurements	• Measure how well Operations meets the sales plan	Stage 2 plus: • Sales measured on forecast accuracy	Stage3 plus: • New Product Introduction • S&OP effectiveness	• Stage 4 plus: • Company profitability
Information Technology	• Individual managers keep own spreadsheets • No consolidation of information	• Many spreadsheets • Some consolidation, but done manually	• Centralized information • Revenue or operations planning software	• Batch process • Revenue & operations optimization software - link to ERP but not jointly optimized • S&OP workbench	• Integrated S&OP optimization software • Full interface with ERP, accounting, forecasting • Real-time solver
S&OP Plan Integration	• No formal planning • Operations attempts to meet incoming orders	• Sales plan drives Operations • Top-down process • Capacity utilization dynamics ignored	• Some plan integration • Sequential process in one direction only • Bottom up plans - tempered by business goals	• Plans highly integrated • Concurrent & collaborative process • Constraints applied in both directions	• Seamless integration of plans • Process focuses on profit optimization for whole company

Appendix 2. The proposed end-to-end planning framework



Appendix 3. Integrated planning process