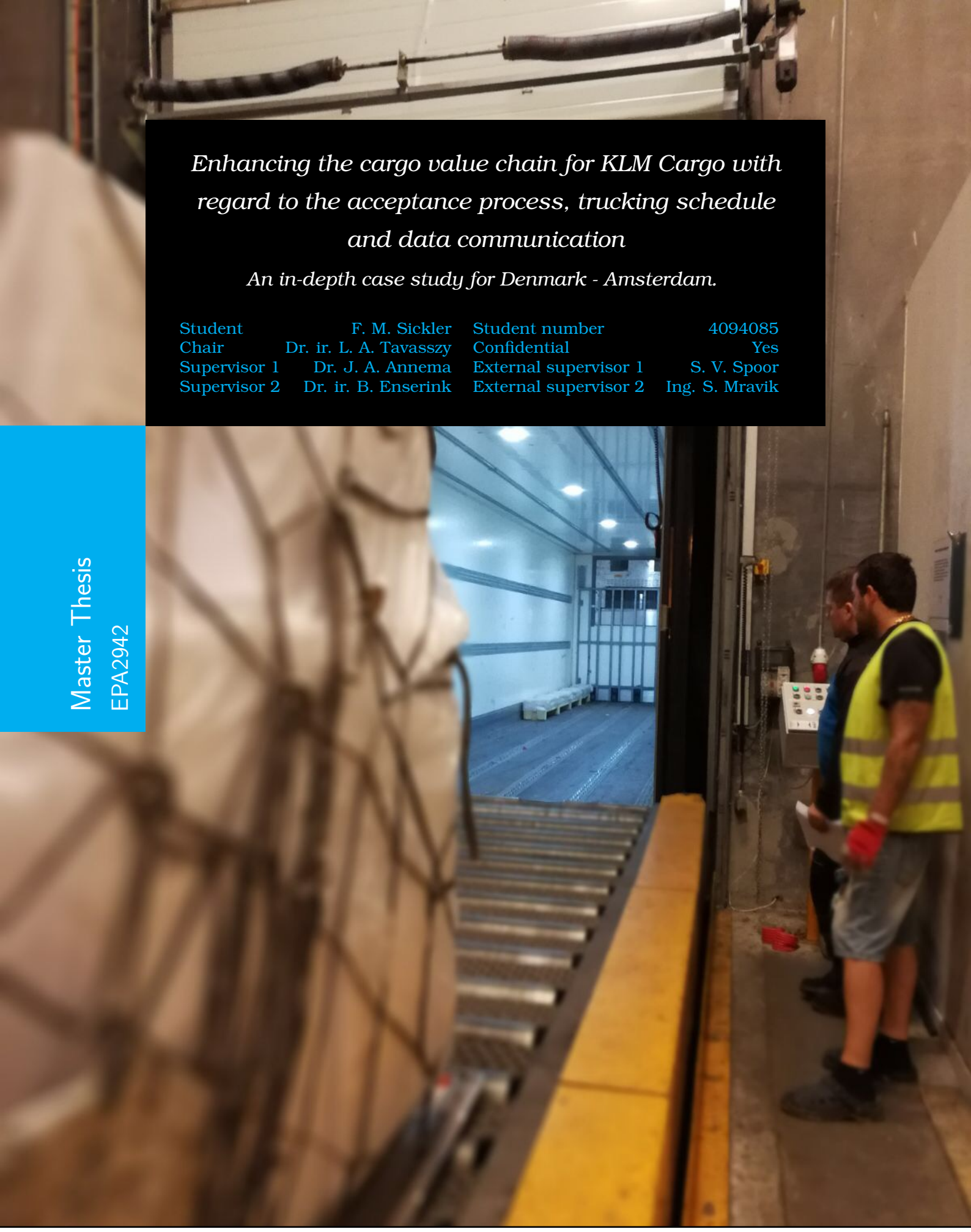

Enhancing the cargo value chain for KLM Cargo with regard to the acceptance process, trucking schedule and data communication

An in-depth case study for Denmark - Amsterdam.

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Master Thesis
EPA2942

TU Delft Delft University of Technology

TPM - Engineering & Policy Analysis

August 16, 2017

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An in-depth single case study for Denmark – Amsterdam

Master Thesis

By

F. M. Sickler

In partial fulfilment to obtain the degree of **Master of Science**
in Engineering and Policy Analysis
at the Delft University of Technology,
Thursday August 10, 2017

Master Thesis

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AIRFRANCE KLM Martinair CARGO

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AIRFRANCE KLM Martinair CARGO

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Preface

This thesis is the final research performed for the completion of the degree of Master of Science in Engineering and Policy Analysis (EPA) of the faculty of Technology, Policy and Management at the Delft University of Technology. The purpose of the master thesis research is to apply the theory and knowledge gained in the two-year program in an real-life problem situation. After completing my Bachelor degree in Aerospace Engineering and executing the double degree program in combination with MSc. Transportation Engineering and Logistics at the faculty of Mechanical Engineering, I wanted to combine all knowledge gained during my education with company experience. I feel extremely blessed and grateful to have had the opportunity to perform my master thesis research at Air France KLM Cargo.

This research has been conducted for Air France KLM Cargo from February 2017 till August 2017. During this period, the cargo value chain from Denmark to Amsterdam has been studied in order to analyze the possibility of implementing the new European Green Fast Lanes (EGFL) project for this route. This innovative, pioneering and challenging project allowed me to experience the project management, people management and data availability challenges that are encountered in large technological problems. The learning curve has been extremely steep, but I believe these challenges were successfully overcome and as a consequence made me a better engineer. I'm proud of the finished product and believe that additional knowledge has been created for all parties in the cargo value chain. With further development of the EGFL project the innovative approach may inspire other carriers to follow.

First, I would like to specially thank my supervisor at Air France, KLM & Martinair Cargo, Simon Spoor, for providing me with the opportunity to execute my thesis with his project, for the support and trust in this period. Secondly, I would like to express my deepest gratitude to Sanja Mravik, who assisted me with all problems encountered on the trade lane Denmark - Amsterdam, information assistance, allowed me to gain insight in the KLM Cargo processes, patiently answered all my questions, interesting discussions, valuable advice and guidance with the thesis project. I'm also thankful to the graduation committee and the help each one of its members provided. Lorant Tavasszy, for his trust in my abilities and guidance in the right direction. Jan Anne Annema, for his commitment, motivation, unlimited assistance and thorough feedback to help me bring this master thesis to a higher level. Last but not least, Bert Enserink, for assisting me with the entire double degree program, enthusiasm and valuable guidance. This work could not have been completed without you.

This has truly been an amazing experience and I appreciate every single person who assisted me with this master thesis research. Many have taken the time to allow me to interview, answer my extensive and frequent questions, give me a tour or allowed me to participate in the process; to fully understand, not only on management level but also on operational level. The field research journeys to Denmark, exploring the ground handlers' warehouse and being be part of the team are moments I will never forget.

Lastly, I would like to thank my family, who in spite of being far, are always present in my life through their unlimited love, motivation, guidance and providing opportunities for exploration. This achievement is for you and your unconditional support throughout the difficult times and your sincere joy in the good ones. There are no words that can express my gratitude and love to you. Finally my friends, for being always there for me, not just for the duration of this project, but for the support during my entire studies at the TU Delft, encouraging me to the end and for being part of this memorable adventure.

I wish you a pleasant reading,

F. M. Sickler
Delft, August 2017

Executive Summary

KLM Cargo is responsible for the transportation of cargo by road and air from 83 stations in Europe to the hub at Amsterdam Schiphol Airport. In recent years, the playing field of KLM Cargo has become increasingly dynamic and competitive. To remain competitive, KLM Cargo has to improve the delivery performance of the cargo in terms of timeliness and overall quality of the cargo (such as quality of the documentation, packaging, labeling and checks performed), which will reduce re-work / correction cost. Currently, part of the cargo arrives outside the scheduled arrival time, incomplete and / or incorrect at the hub. This requires re-work / correction time, results in possibly missing connecting flights, which leads to reputation and monetary damage for KLM Cargo. To improve the delivery quality of the cargo and create a clean input towards the hub, the 'European Green Fast Lanes' (EGFL) project was launched.

It is important that the start of the cargo is flawless as the affects will have several consequences down the value chain. It must be ensured that shipments are entering the network according to International Air Transportation Association requirements and decrease re-work / correction time and associated cost for the remainder of the chain. Therefore the analysis and improvements must start at the beginning of the chain. As there are many actors involved, no actor has the power to single handedly change the current situation, and therefore a holistic approach involving all actors in the value chain is needed.

The general problem in the air cargo industry is that cargo often arrives too early or too late, with insufficient quality at the hub, inducing costs. To remain competitive, a structural solution must be designed, in which the entire value chain is involved. Current scientific research confirms that limited research has been performed in the field of air cargo value chain coordination and the theoretical research that has been performed often falls short on meeting the practical requirements that are encountered in real-world air cargo value chain coordination problems [Feng et al., 2015]. A method to address the structural issues in the field of air cargo value chain coordination is yet to be designed and therefore a method is developed in this thesis. This thesis will contribute to scientific research by providing a practical example of air cargo value chain coordination, in the form of an in-depth case study for export cargo originating from Billund and Copenhagen. In **the scope of this research** the value chain for the trade lane Denmark - Amsterdam is analyzed, from the perspective of the arrival performance at the hub in Amsterdam. The following research question is answered in this thesis:

How can the cargo value chain be improved with regard to the acceptance process, trucking schedule and data communication for cargo originating from Billund and Copenhagen, in order to increase the arrival performance at the hub in Amsterdam?

The research question is answered using the methods of literature study, survey research and an in-depth case study. For the case study, field research at the ground handling agent in Billund and Copenhagen was conducted. First the **current state** is researched for both outstations to identify the bottlenecks in the value chain. Bottlenecks that are identified:

1. For the **acceptance procedure** often all cargo is accepted in the network before the 'ready for carriage' checks are performed, resulting in non-performance for the airline instead of non-performance for the forwarder. This requires re-work / correction actions from multiple other actors in the remainder of the cargo value chain, resulting in re-work and monetary losses.
2. The current **trucking schedule** focuses solely on the arrival performance in Amsterdam and is not based on the delivery pattern of customers, realistic transit times and / or realistic handling times of the different parties and connecting flights. In the current schedule all trucks by design, depart later than the baseline on which the shipments are booked, resulting in failed milestones on dashboards whereas the operations might go as planned. The failed milestones on the dashboards result in monetary losses and reputation damage for KLM Cargo and therefore requires in-depth research to analyze the root-cause.
3. For **data communication** it was found that data is often lacking or incorrectly registered and if available it is not shared with the various parties in the value chain. No structured communication channels exist between the actors in the value chain and no structural feedback is provided.
4. The **arrival performance** is dependent on the entire performance of the value chain. The contracted arrival performance is [redacted], however currently only [redacted] of the cargo arrives on time from Billund and [redacted] on time from Copenhagen. [Savelberg and Bakker, 2010] have researched that early arrival (at the hub) induces costs, but late arrival induces even higher costs. Therefore it is of utmost importance that the cargo arrives on time in Amsterdam. Structural issues as identified above are deeply rooted in the air cargo industry.

To address these bottlenecks in the cargo value chain the EGFL project is designed and implemented for the trade lanes Billund and Copenhagen. In the **future state**, the changes for the current process are designed and the effect of these changes will be monitored for a measurement period of 1 month.

1. For the **acceptance process** the new International Air Transportation Association milestone 'freight on hand' is implemented, making KLM Cargo the first carrier requiring two milestones on acceptance (freight on hand and received cargo from shipper). The systems and procedures of the ground handling agent need to be adjusted to provide this service. In addition, late-show, no-show, high-show (cargo with higher volume / weight than booked) and go-show (cargo without a booking) rules were implemented for the acceptance process. Next to that, the customers are requested to deliver the cargo ready for carriage, according to the official requirements and before the latest acceptance time. If not, the ground handling agent is instructed to reject the cargo and request a new booking. New requirements request [redacted] weighing of the cargo including weight slip. Weight discrepancies should be registered and communicated through an updated air waybill.
2. For the **trucking schedule**, the focus on trucking performance is moved from solely the arrival performance in Amsterdam to reporting 'ready for loading' at the ground handling agent. In addition a new simplified trucking schedule is designed taking into account the delivery pattern of customers, opening hours and peak hours of the ground handling agent, possibility for combined loading, contracted transit times and actual transit times of the trucker, peak hours at the hub in Amsterdam, minimal handling times at the warehouses in Amsterdam and connecting flights on the most booked destinations.
3. The **data communication** can be improved by providing insight in the responsibilities and tasks of each actor. It is important that milestone and deviation data are correctly entered in the systems and available to all parties in the chain. The performance of each actor can be closely monitored and structural issues and bottlenecks can be identified based on this data. In current dashboards, the key performance indicators show a performance increase in percentages for the departure, arrival in Amsterdam and 'received cargo from flight'. However, the key performance indicators do not only reflect the trucking performance but also the flight and direct pick-up performance. The flight- and direct pick-up performance is outside the scope of the EGFL project and should therefore be omitted from the reports.
4. The improvements for the acceptance process, trucking schedule and data communication result in an increase of the **arrival performance** for Billund from [redacted] to [redacted] and for Copenhagen from [redacted] to [redacted].

In **conclusion**, the cargo value chain of air cargo transportation can be improved by implementing the EGFL project. The aimed improvement of arrival performance to the contracted [redacted] was not achieved. However, the increase in arrival performance for Billund with [redacted] to [redacted] and for Copenhagen from [redacted] to [redacted] can be observed. To achieve the last [redacted] increase, continuous improvement is required on all the elements. [Flyvbjerg, 2016] has argued that one cannot generalize based on a single (in-depth) case study, but an in-depth case study can greatly contribute to scientific research as an example. The conclusion from the in-depth case study relevant for the air cargo industry is that by structurally improving the quality of the cargo, documents and the data at the beginning of the value chain, improvements can be achieved not only on the arrival performance but for the overall performance throughout the value chain. The method developed is a pioneering approach, which if successfully implemented can be used throughout the air cargo industry to improve the air cargo transportation value chain performance. By structurally solving issues at the beginning of the value chain, instead of symptom addressing, this method can be seen as a robust solution.

It is **recommended** for KLM Cargo to continue the roll-out of the EGFL project to other stations in Europe. However several changes to the blue print could generate a more complete and improved concept. One of the main recommendations is to improve the data availability to identify structural issues to drive continuous improvement. The deviations in the value chain can be used to systematically provide (preferably automatically) feedback to all involved parties. Finally the key performance indicators used to monitor the EGFL project should be scoped so they reflect the influence of the project and not reflect the entire performance of the station (including flights and direct pick-ups). Also showing messaging errors or cargo movement errors in dashboards. To provide the actors in the chain with clear data, separate dashboards for each actor can be designed to show their performance and clear topics which can be improved. Future research should be performed on the shift from a technocratic culture (many procedures and documentation requirements) towards a more open culture (more time, more discussions and more communication) in the entire air cargo transportation industry segment. In addition the overall complexity of the air cargo transportation can be researched, the numerous (small) contracted parties in the value chain result in high complexity and difficulties in developing and implementing (high-tech) solutions.

Management Samenvatting

KLM Cargo is verantwoordelijk voor het weg- en luchttransport van vracht uit 83 stations in Europa naar de hub van Amsterdam Schiphol Airport. In de afgelopen jaren is de markt van KLM Cargo dynamischer en concurrerender geworden. Om competitief te blijven moeten de leveringsprestaties van KLM Cargo verbeterd worden met betrekking tot het tijdig leveren en de kwaliteit van de levering (zoals complete en correct ingevulde documentatie, verpakking, labels, en alle benodigde checks uitgevoerd) van de levering, wat de reparatiekosten zal verminderen. Momenteel wordt een deel van de vracht buiten de geplande aankomsttijd, onvolledig en / of onjuist geleverd aan de hub, welke tekortkomingen hersteld moeten worden, waardoor de vracht soms door gebrek aan tijd de vlucht zal missen. Dit resulteert in kosten en reputatieschade voor KLM Cargo. Om de kwaliteit van de aanlevering te verbeteren en een schone invoer naar de hub te creëren is het 'European Green Fast Lanes' project gelanceerd. Omdat 'afval in' resulteert in 'afval uit', moet er worden gezorgd dat vanaf het begin van de vrachtketen, de zendingen het netwerk in gaan in overeenstemming met de International Air Transportation Association vereisten, zodat het benodigde herstel door de rest van de keten verminderd kan worden. Daarom moet de analyse van de huidige situatie en de suggesties voor verbeteringen starten aan het begin van de keten. Aangezien geen enkele partij de macht heeft om zelfstandig de huidige situatie te verbeteren is er een overkoepelende benadering nodig met medewerking van alle belanghebbenden in de vrachtketen.

Het algemene probleem in de luchtvrachtindustrie is dat vracht vaak te vroeg of te laat arriveert en in slechte staat, resulterend in kosten. Om concurrerend te blijven, moet een structurele oplossing ontworpen worden, waarin de totale vrachtketen betrokken wordt. Huidig wetenschappelijk onderzoek bevestigt dat beperkt onderzoek is verricht in het gebied van coördinatie van de luchtvrachtketen en dat theoretisch onderzoek dat is uitgevoerd vaak niet kan voldoen aan de praktische vereisten die in werkelijke luchtvracht aanvoerketen coördinatie problemen nodig zijn [Feng et al., 2015]. Een methode om de structurele problemen te adresseren in het domein van luchtvrachtaanvoerketen coördinatie moet nog worden ontworpen en daarom wordt deze methode ontworpen in dit proefschrift. Dit proefschrift zal bijdragen aan wetenschappelijk onderzoek door een praktisch voorbeeld te geven van de coördinatie van de luchtvrachtaanvoerketen in de vorm van een diepgaande casus studie voor uitvoervracht vanuit Billund en Kopenhagen. De **systeemgrens** van dit onderzoek is de toeleveringsketen van Denemarken naar Amsterdam, geanalyseerd vanuit het perspectief van de aankomstprestatie op de hub in Amsterdam. De volgende onderzoeksvraag zal beantwoord worden in dit proefschrift:

Hoe kan de vrachtketen worden verbeterd met betrekking tot het acceptatie proces, vrachtwagen vertrekschema en gegevens communicatie voor de vracht uit Billund en Kopenhagen om de aankomstprestatie op de hub in Amsterdam te verhogen?

Deze onderzoeksvraag wordt beantwoord met behulp van een literatuuronderzoek, interviews en een diepgaande casus studie. Voor de casus studie is veldonderzoek uitgevoerd bij de grondafhandelaar in Billund en Kopenhagen. Eerst is de **huidige situatie** onderzocht voor beide stations. Knelpunten die zijn geïdentificeerd:

1. Voor het **acceptatie proces** wordt alle vracht in het netwerk geaccepteerd voordat de 'klaar voor vervoer' check is uitgevoerd, resulterend in slechte prestatie van de luchtvaartmaatschappij in plaats van slechte prestatie van de expediteurs. Dit vereist herstel van andere actoren in de rest van de keten, met extra werk en kosten als gevolg.
2. Met betrekking tot het **vrachtwagen schema**, wordt er momenteel alleen gekeken naar de aankomst prestatie in Amsterdam en niet naar het aanleverpatroon van de klanten, realistische transit tijden en / of realistische verwerkingstijden van de verschillende partijen en aansluitende vluchten. Het huidige vertrekschema is zo ontworpen dat alle vertrekkende vrachtwagens later vetrekken dan de referentie waarop de zendingen zijn geboekt, waardoor er in de dashboards veel niet behaalde mijlpalen te vinden zijn, terwijl de werkzaamheden eigenlijk zoals gepland worden uitgevoerd. De niet behaalde mijlpalen in de dashboards zorgen voor een extra kosten post en reputatie schade voor KLM Cargo en daarom is uitgebreid onderzoek nodig om de oorzaak te achterhalen.
3. Ten derde, op het gebied van **gegevens communicatie** is gebleken dat gegevens vaak onjuist zijn of niet geregistreerd worden. Indien de gegevens wel beschikbaar zijn worden ze vaak niet gedeeld met de verschillende belanghebbenden in de keten. Er bestaan geen gestructureerde communicatiekanalen tussen de verschillende partijen in de aanvoerketen en een gestructureerde terugkoppeling ontbreekt.

4. Ten slotte is de **aankomstprestatie** afhankelijk van de totale prestatie van de aanvoerketen. De contractuele aankomst prestatie is [redacted], echter in de huidige situatie arriveert maar [redacted] van de vracht uit Billund op tijd en [redacted] van de vracht uit Kopenhagen op tijd. [Savelberg and Bakker, 2010] hebben onderzocht dat te vroege aankomst bij de hub kosten creëert, maar dat te late aankomst nog grotere kosten creëert. Daarom is het van groot belang dat de vracht op tijd arriveert in Amsterdam. Structurele problemen zoals hierboven aangegeven, zijn diepgeworteld in de luchtvracht industrie.

Om deze knelpunten in de vracht aanvoerketen te adresseren wordt het EGFL project geimplementeerd voor de ketens van Billund en Kopenhagen. In de **toekomst situatie**, worden de aanpassingen voor de huidige situatie ontworpen, geimplementeerd en vervolgens het effect bijgehouden voor een metingsperiode van 1 maand.

1. Voor het **acceptatie proces** moet de grondafhandelaar vanaf nu, de nieuwe International Air Transportation Association mijlpaal 'freight on hand' gebruiken. KLM cargo is de eerste luchtvaartmaatschappij die 2 mijlpalen hanteert in voor het acceptatie proces (freight on hand en received cargo from shipper). De systemen en procedures van de grondafhandelaar moeten worden aangepast om deze dienst te kunnen leveren. Daarnaast wordt het acceptatie proces aangepast met nieuwe regels namelijk, late-, no-, high- (vracht met meer volume of gewicht dan geboekt) en go-show (vracht zonder boeking) procedures. Ook worden klanten verzocht hun vracht klaar te maken voor vervoer volgens de officiele eisen en voor de laatste acceptatie tijd aan te leveren. Indien dit niet wordt gedaan, wordt de grondafhandelaar verzocht om de acceptatie van de vracht te weigeren en moet er een nieuwe boeking worden aangevraagd. Nieuwe vereisten verzoeken [redacted] weging van de vracht met een gewicht bon als bewijs. Eventuele gewichtsverschillen moeten worden geregistreerd en gecommuniceerd via een bijgewerkte luchtvracht brief.
2. Voor het **vrachtwagen schema** wordt de focus van de aankomstprestatie in Amsterdam verlegd naar het rapporteren 'klaar voor laden' bij de grondafhandelaar. Daarnaast is er een nieuw, versimpeld vrachtwagen schema ontworpen met inachtneming van het aanleverpatroon van klanten, openingstijden en piekuren bij de grondafhandelaar, mogelijkheden voor gecombineerde lading, contractuele doorlooptijden en werkelijke doorlooptijden van vrachtwagens, piekuren op de hub in Amsterdam, de minimale afhandeling tijden van de magazijnen in Amsterdam en de aansluitende vluchten op de meest geboekte bestemmingen.
3. De **gegevens communicatie** kan worden verbeterd door inzicht te geven in de verantwoordelijkheden en taken van elke individuele partijen. Het is belangrijk dat data over mijlpalen en afwijkende gegevens goed wordt ingevoerd en beschikbaar is in de systemen. Op deze manier kunnen de prestaties van elke belanghebbende nauwlettend in de gaten worden gehouden en kunnen structurele problemen en knelpunten worden geidentificeerd. Over het algemeen kan worden geconcludeerd dat op basis van de belangrijkste prestatie indicatoren is een lichte stijging te zien in het prestatie % van het vertrek vanaf de grondafhandelaar, de aankomst in Amsterdam en de ontvangen vracht van vlucht in Amsterdam. De belangrijkste prestatie indicatoren reflecteren niet alleen de prestatie van vracht vervoert per vrachtwagen maar ook van de vracht vervoert per vlucht en van de direct-ophaal service. The vlucht en direct-ophaal prestatie is buiten de strekking van het EGFL project en moeten daarom uit de rapporten worden gehaald.
4. De verbeteringen in het acceptatie proces, vrachtwagen vertrekschema en gegevens communicatie resulteren in een stijging in de **aankomstprestatie** voor Billund van [redacted] naar [redacted] en voor Kopenhagen van [redacted] naar [redacted].

In **conclusie**, kan er worden gesteld dat de vrachtketen verbeterd kan worden door het EGFL project te implementeren. De doelstelling van de stijging van de aankomstprestatie naar de gecontracteerde [redacted] is niet behaald. Echter, is er een verbetering in de aankomstpresetatie te zien voor Billund van [redacted] naar [redacted] en voor Kopenhagen van [redacted] naar [redacted]. Om de laatste [redacted] te behalen is continue verbetering nodig op alle vlakken. [Flyvbjerg, 2016] beargumenteerd dat op basis van een enkele casus studie geen generalisaties geconcludeerd kunnen worden, maar dat een casus studie van groot belang is voor de bijdrage aan wetenschappelijk onderzoek als voorbeeld. De conclusie van de casus studie relevant voor de luchtvracht industrie is dat door gestructureerd de kwaliteit van de vracht en de data aan het begin van de keten te verbeteren, verbeteringen niet alleen voor de aankomstprestatie maar voor de totale presentatie door de hele keten heen bereikt kan worden. De methode ontwikkeld is een baanbrekende aanpak, die mits successvol geimplementeerd door de gehele luchtvracht industrie gebruikt kan worden om de luchtvracht aanvoerkreten prestatie te verbeteren. Door gestructureerd problemen aan het begin van de keten op te lossen, in plaats van symptoom bestrijding uit te voeren, kan deze methode gezien worden als een robuste oplossing.

Het wordt **geadviseerd** dat KLM Cargo de uitrol van het EGFL project ook voortzet voor de rest van de stations in Europa. Een aantal wijzigingen in het huidige concept kunnen echter een volledi-ger en verbeterd concept leveren voor de uitrol van de volgende groep stations. Een van de belangrijkste aanbevelingen is dat de beschikbaarheid van gegevens verbeterd moet worden, zodat er structurele problemen geidentificeerd kunnen worden. De afwijkingen in de data van de vereiste prestatie dienen te worden gebruikt om (bij voorkeur automatisch) systematische terugkoppeling aan de verschillende partijen in de keten te verschaffen. Ten slotte moeten de belangrijkste prestatie indicatoren waarop het project wordt gemeten aangepast worden zodat ze de daadwerkelijke invloed van het EGFL project weerspiegelen en niet de volledige prestatie van het station (inclusief vluchten en direct-ophaal service, die buiten het kader van het project vallen). Elke partij zou een afzonderlijk dashboard moeten ontvangen met informatie over hun prestatie en duidelijke weergave op welke punten verbetering te halen valt. Toekomstig onderzoek moet worden uitgevoerd over de mogelijkheid van een verschuiving in de luchtvaartindustrie van een technocratische cultuur (met veel procedures en administratieve verplichtingen) naar een meer tijd, meer dissussies en meer communicatie cultuur voor het hele luchtvaart aanvoerketen industrie segment. Daarnaast, kan de algehele complexiteit van het luchtvaart vervoer worden onderzocht. De talrijke (kleine) gecontracteerde partijen in de aanvoerketen zorgen voor hoge complexiteit en problemen bij de ontwikkeling en implementatie van hoogstaande technolgische oplossingen.

Table of Contents

List of Abbreviations

Abbreviation	Full Meaning
AF	Air France
AFKL	Air France - KLM
AFLS	Accenture Freight & Logistics Software
ARR	Arrival
ATA	Actual Time of Arrival
ATD	Actual Time of Departure
ATR	Actual Time of Reporting
AWB	Air Waybill
BKD	Confirmation Booking
BLL	IATA Airport Code for Billund
BPI	Business & Process Improvement
BQY	IATA Airport Code for Bologna
CCB	Cargo Centre Billund
CDG	IATA Airport Code for Paris Charles de Gaulle
CHM	Cargo Handling Manual
CPH	IATA Airport Code for Copenhagen
CSO	Customer Service Organisation
CT	Connection Time
DAP	Delivered As Promised
DEP	Departure
DG	Dangerous Good
DGR	Dangerous Good Regulation
DPU	Direct Pick-Up
DUS	IATA Airport Code for Dusseldorf
ECSD	Electronic Consignment Security Declaration
EGFL	European Green Fast Lanes
EHC	Exception Handling Code
EPA	Engineering & Policy Analysis
FAP	Flown As Planned
FBL	Flight Booking List
FFM	Flight Forwarding Message
FHL	House Manifest
FIFO	First In First Out
FLR	IATA Airport Code for Florence
FOH	Freight On Hand
FRA	IATA Airport Code for Frankfurt
FTL	Full Truck Load
FWB	Freight Waybill
FWB'	Adjusted Freight Waybill
GHA	Ground Handling Agent
HAWB	House Air Waybill
IATA	International Air Transportation Association
IRPTW	Inventory Routing Problems with Time Window
JdR	Jan de Rijk
KL	IATA Airline Code for KLM
KLM	Koninklijke Luchtvaart Maatschappij
KPI	Key Performance Indicator
LAR	Live Animal Regulations
LAT	Latest Acceptance Time
LNZ	IATA Airport Code for Lienz
LTL	Less than Truck Load

Abbreviation	Full Meaning
MAWB	Master Air Waybill
MAD	IATA Airport Code for Madrid
MAN	IATA Airport Code for Manchester
MOP	Master Operating Plan
MP	IATA Airline Code for Martinair
NP	Network Planning
REST	Remote Explosive Scent Tracking
RCF	Received Cargo from Flight
RCS	Received Cargo from Shipper
RFC	Ready For Carriage
RM	Revenue Management
SDE	Schedule Delay Early
SDL	Schedule Delay Late
SHC	Special Handling Code
SPL	IATA Airport Code for Schiphol Airport
STA	Scheduled Time of Arrival
STD	Scheduled Time of Departure
STR	Scheduled Time of Reporting
T-ULD	Through-ULD
ULD	Unit Load Device
VIE	IATA Airport Code for Vienna
VRP	Vehicle Routing Problem
VRPTW	Vehicle Routing Problem with Time Window
WFS	Worldwide Flight Services

Definitions

Name	Definition
Air Waybill	A paper document made by, or on behalf of the shipper, which evidences the contract between the shipper and airline(s) for carriage of cargo over the routes of the airline(s) [Leger et al., 2009].
Carrier	Airline [IATA, 2016].
Consignment	One or more pieces of goods accepted by the airline from one shipper at one time and at one address, receipted for in one lot, and moving on one air waybill or one shipment record to one consignee at one destination address [Leger et al., 2009].
Export AMS	Export at the hub means that the cargo has the origin in Amsterdam [IATA, 2016].
Export GHA	Origin is at Billund or Copenhagen [IATA, 2016].
FFM Message	The FFM message provides the details of consignments loaded onto a specified flight [Leger et al., 2009].
FHL Message	Provide a check-list of Freight Forwarder house waybills associated with a Master air waybill [Leger et al., 2009].
Flight Manifest	Details of consignments loaded onto a specified flight [Leger et al., 2009].
Freight	Physical Freight [IATA, 2016]
Freight Forwarder	The party arranging the carriage of goods including connected services and / or associated formalities on behalf of a shipper or consignee [Leger et al., 2009].
FWB message	Transmit a complete set of Air Waybill data [Leger et al., 2009].
FWB' message	The message that contains Air Waybill data sent by the Origin Freight Forwarder with potential updates made by the Origin Ground Handler on data such as weight, number of pieces, volumes [Leger et al., 2009].
Ground Handling Agent	The entity authorized to act for or on behalf of the carrier, for accepting, handling, loading/unloading, transiting, or dealing with cargo, passengers and baggage [Leger et al., 2009].
House Waybill	Document made out by an agent / consolidator which specifies the contract between the shipper and the agent / consolidator for the arrangement of carriage of goods [Leger et al., 2009].
House Manifest	Document containing the same information as a cargo manifest and additional details on freight amounts [Leger et al., 2009].
Import AMS	Cargo that has the destination AMS [IATA, 2016].
Import GHA	Final destination is in Billund or Copenhagen [IATA, 2016].
Information	Electronic data or paper related to freight [IATA, 2016]
RCS Message	The consignment has been physically received from the shipper and is considered by the carrier as ready for carriage on this date and this location [Leger et al., 2009].
Shipment	Freight + Information [IATA, 2016]

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1 Introduction

Air France-KLM Cargo is responsible for the transportation of cargo from 83 stations in Europe. Cargo is transported by trucks and small-belly aircraft to the two European hubs Paris and Amsterdam.

From these two hubs a worldwide network of [redacted] destinations is offered. Together they are responsible for [redacted] million tons of cargo flown, €[redacted] billion combined revenue, [redacted] aircraft and [redacted] employees worldwide [Air France KLM Cargo, 2017]. This research is an initiative by KLM Cargo and will therefore be executed by KLM Cargo specifically for the hub Amsterdam. Although officially operating under the joint name Air France KLM Cargo, for the remainder of this report only the name KLM Cargo will be used. KLM consists of 3 divisions, namely cargo business, passenger business and engineering and maintenance as shown in Figure 1.1. This project will be carried out for the cargo business, specifically KLM Cargo for the department Business & Process Improvement (BPI).

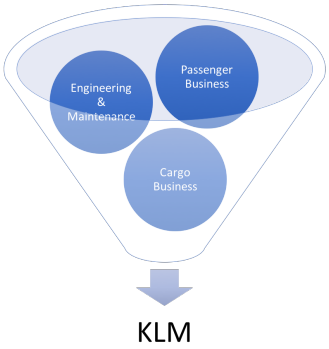

Figure 1.1: Divisions of KLM

In recent years, the playing field of KLM Cargo has become increasingly dynamic and competitive. Due to the economic crisis of 2007-2011 and the emerging of competitors, such as Middle-East freight transporters, the air cargo industry has been forced to improve their performances. To remain competitive, KLM Cargo has to improve the performance and thus resolve the inefficiencies in the supply chain. KLM Cargo faces these inefficiencies due to lack of real-time information, lack of data sharing among the different parties, no steering or coordination of the integrated flow of cargo bound on Schiphol, data does not reflect the latest actual details and data is only available on paper and / or outdated. KLM Cargo is dependent on changes in this entire network to ensure successful implementation. To improve the quality and creating a clean throughput at the hub, KLM Cargo has launched the project 'European Green Fast Lanes' (EGFL). The goals of this project are to [KLM Cargo, 2016]:

- Increase the milestone flown-as-planned by a stricter acceptance process (rubbish in is rubbish out) and reduce total transit time (by at least 2 hours) in order to provide a superior customer offering.
- Achieve cost savings and enable future volume growth under given capacity restrictions by reducing repair, rework and peak workload levels at the hub.
- Increase aircraft load factor by effectively prioritizing freight at the hub ('hot' or 'not').
- Enhance collaboration and information sharing throughout the chain.
- Enable proactive customs handling.

KLM Cargo has designed an EGFL pilot program for the most complex location of the KLM Cargo Europe-network, namely Frankfurt. As they want to extend and standardize this program for all other 83 stations located in Europe there is a large need for research to identify the current situation at the other stations and design how this blue print can be implemented at another specific station. There is a discrepancy between the current situation and the desired situation at the outstations. The blue print designed for the pilot in Frankfurt will be used to implement the EGFL program for the rest of the stations in Europe. The determination of the stations that were selected for roll-out is explained in Chapter 5.6. The stations which are most critical are selected to be studied. To solve the discrepancy between the current situation and the desired situation, the stakeholders have to be identified and their relation to each other. The interactions between the stakeholders have to be explained and the bottlenecks identified. Due to the many actors, no actor has to power to single handedly change the current situation of the air cargo transport supply chain and therefore it is important to acknowledge that a holistic approach is necessary to synchronize the local and network wide operations [Vogt, 2010].

Purpose:
This master thesis will answer the research question:
How can the cargo value chain be improved with regard to the acceptance process, trucking schedule and data communication for cargo originating from Billund and Copenhagen, in order to increase the arrival performance at the hub in Amsterdam?

Research was conducted by performing a literature study on the air cargo operations and the cargo arrival performance, interviews with stakeholders and an in-depth case study on Billund and Copenhagen. The case study consisted of field research at the Ground Handling Agent (GHA) in Billund and Copenhagen. As part of the EGFL project, weekly reviews took place allowing verification of the designed products.

Scientific Relevance
This master thesis contributes to scientific research on several aspects. First of all, airlines have neglected research in the air cargo industry during the last few decades. Passenger transportation has proven to generate more revenue compared to cargo transportation and therefore less research has been performed on the latter [Nobert and Roy, 1998]. However as the level playing field of KLM Cargo has become increasingly competitive, airlines have to manage their operations very carefully to remain competitive. Therefore this master thesis will contribute with a practical in depth case study to the scientific research in the air cargo supply chain. Secondly, the International Air Transportation Association (IATA) has developed the Air Cargo Industry Master Operating Plan (Industry MOP) [IATA, 2016]. This Industry MOP assigns several milestones in the air cargo supply chain to measure the performance of these processes. The industry MOP is only a prescription and is not mandatory for carriers to follow. KLM Cargo is pioneering in this field and they will be the first airline to implement some of the new performance indicators. This master thesis will contribute with an in depth case study to the practical study of implementing these new milestones. Thirdly according to [Feng et al., 2015] many real-world problems remain unsatisfactorily solved in the air cargo operations due to the complexity and many systems and players. [Feng et al., 2015] has performed a literature review and has identified that on the 'air cargo supply chain coordination' almost no theoretical research has been performed. In addition the theoretical research that has been performed falls short on meeting the practical requirements that are encountered in real-world problems. This master thesis will contribute to this research field with a practical example of the implementation of a project which has the aim to improve the air cargo supply chain by coordinating the entire chain.

In this research the air cargo value chain is analyzed from the perspective of the arrival performance at the hub in Amsterdam. Following the entire supply chain is taken into the design process to make this arrival as reliable as possible. Congestion or delay might lead to delayed departure of the flight or which is more often the case the cargo misses the flight [Ou et al., 2010], resulting in financial losses for KLM Cargo and reputation damage. Rescheduling costs for trains are researched by [Savelberg and Bakker, 2010]. This research can also be applied with air cargo operations. Cargo is booked by customers based on the preferred time of arrival at the consignee. When the cargo misses the flight, monetary losses can be experienced by the customer and increases the handling costs of the carrier as inventory costs and re-booking procedures have to take place.

In this master thesis, a method will be developed to address the problem of air cargo supply chain coordination. This methodology is a pioneering approach, which allows for structural problem solving instead of symptom addressing, involving all actors in the supply chain. This transition in the air cargo industry, from symptom addressing towards structural issue solving is studied using an in-depth case study for Billund and Copenhagen. Although in this research no mathematical model will be developed, it can serve as a practical in depth case study, contributing to a general method.

Structure
To answer the main research question of this master thesis, the research outline will be presented in Chapter 2 first. A road map for this research is presented including the boundary conditions. Secondly in Chapter 3 the methods used for research are described. Thirdly in Chapter 4 a literature study is performed on air cargo operations and air cargo arrival performance to identify the research already performed in these area's and the scientific gap. Chapter 5 introduces the European Green Fast Lanes (EGFL) project. The EGFL project is monitored on the basis of key performance indicators (KPIs) which are introduced in Chapter 6. Next the general information about Billund, Copenhagen, trucking transit times and handling times are introduced in Chapter 7. The current state arrival performance is discussed based on the pillars of acceptance procedure, trucking schedule and data communication in Chapter 8. Next, the future state, in which the EGFL project is implemented in Billund and Copenhagen, is described based on the same pillars of acceptance procedure, trucking schedule and data communication to determine the influence on the arrival performance in Amsterdam. The future state and the influence on the KPIs is described in Chapter 9. Concluding, the discussion of the results is presented in Chapter 10 and the road-map for future stations in Chapter 11. Finally, the conclusion is presented in Chapter 12 and the recommendation and suggestions for further research are Chapter 13 respectively.

2 Research Outline

In this chapter the research design of this master thesis is described. The research outline and the research boundaries are presented and discussed. The research outline consists of four phases; the exploration phase, current state phase, future state phase and concluding phase, as illustrated in Figure 2.1. In this figure, each phase is indicated by a box and within each box the chapters, including chapter number, contributing to this phase are shown. Each of these phases will be discussed below, including the methods used and the (sub-)research questions answered.

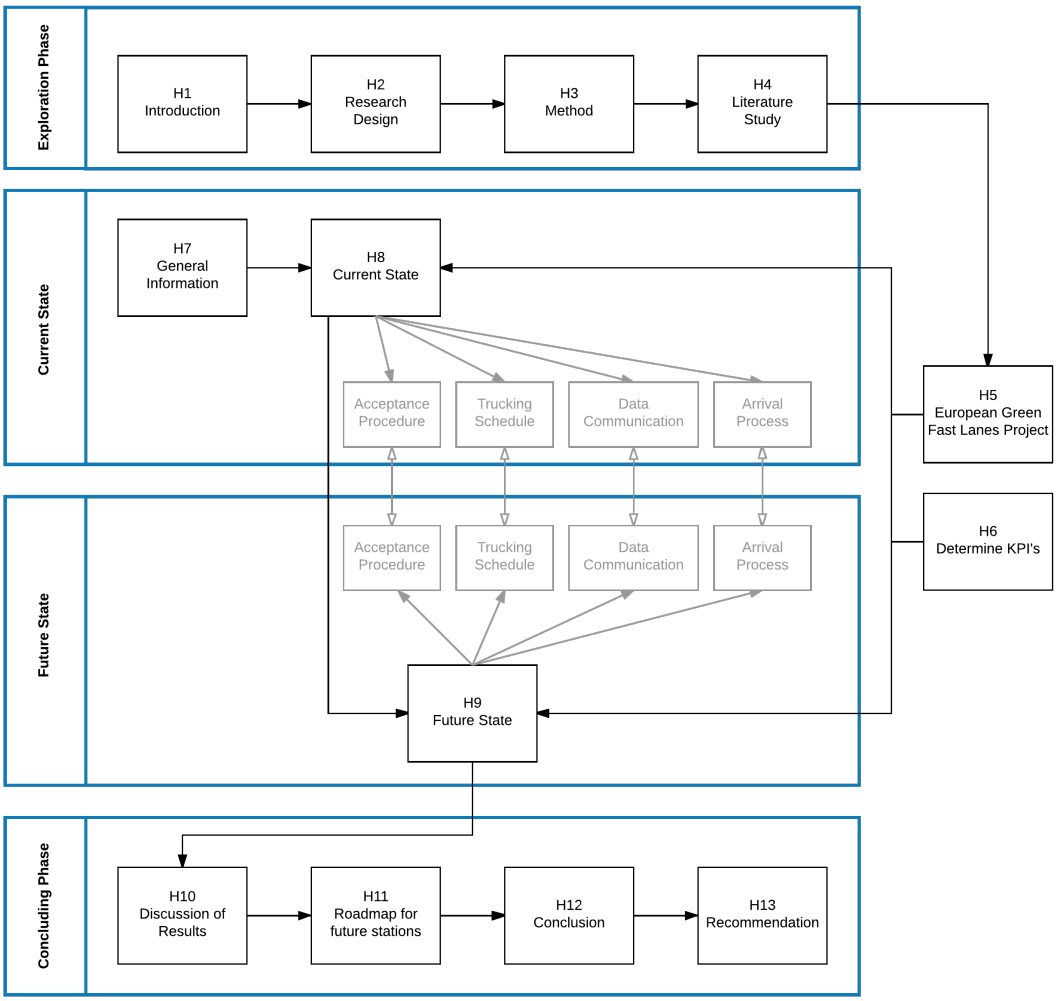

Figure 2.1: Research outline consisting of the four phases: exploration phase, current state phase, future state phase and concluding phase.

2.1 Exploration Phase

The exploration phase as indicated by the first box in Figure 2.1 starts with the introduction in Chapter 1, in which the background information, motivation, main research question and a general outline of the thesis is provided. The next chapter, research design is discussed currently. Following the methods used to perform this research; literature review, survey research and in-depth case study analysis, are presented and discussed in Chapter 3. The final chapter of the exploration phase, is the literature study presented in Chapter 4, in which the current state-of-the-art knowledge about the air cargo operations and the air cargo acceptance procedure is discussed.

The main research question answered in this thesis is:

How can the cargo value chain be improved with regard to the acceptance process, trucking schedule and data communication for cargo originating from Billund and Copenhagen, in order to increase the arrival performance at the hub in Amsterdam?

The sub-research question that will be answered in the exploration phase will be:
1. *What scientific research has already been performed on cargo operations?*
2. *What scientific research has already been performed on cargo arrival performance?*

2.2 Introduction of the Project

In Chapter 5 the European Green Fast Lanes (EGFL) project will be introduced. The overall goal of the EGFL project and the business case are discussed. The goal of the EGFL project is to increase the reliability and the efficiency of the handling and transportation of cargo, to reduce the cost and transit time. A pilot of the EGFL project was performed for Frankfurt. However the blue print developed during this pilot can't be directly implemented at the other outstations in Europe, as each outstation has its own layout, equipment, rules and regulations. Therefore an in-depth case study for Billund and Copenhagen has to be performed. The topics researched during this case study are selected from the blue print, namely the acceptance procedure, trucking schedule and data communication, further referred to as the three pillars, as shown in Figure 2.2.

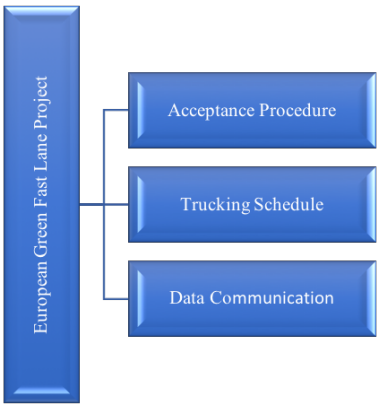

Figure 2.2: Pillars of EGFL

The suggestions for improvement that are designed and implemented in the case study of Billund and Copenhagen are based on these three pillars. In Chapter 6 the key performance indicators (KPIs), as used by KLM Cargo for the monitoring the EGFL project on a daily, weekly and monthly basis are presented. Finally, the improvements designed for the three pillars are implemented in the future state and their effects are monitored based on the KPIs.

2.3 Current State

Based on the literature review, several gaps in scientific research are identified. Among which; theoretical research that has been performed on the air cargo supply chain, falls short on meeting the practical requirements that are encountered in real-world situations. Based on this, certain KLM trucking stations are selected, on which an in-depth case study can be performed. Billund and Copenhagen, both stations in Denmark are selected based on several arguments as explained in Chapter 5.

The current state as indicated by the second box in Figure 2.1 starts with Chapter 7. In this chapter, a summary of the stakeholder analysis is given. The detailed stakeholder analysis can be found in Appendix C, including an actor inventory, the interests, objectives and problem perceptions of the stakeholders and maps the relations and inter-dependencies between stakeholders. This information is gathered by conducting interviews, online data sources and verification with KLM employees. The stakeholder analysis is used as input for the current state. In addition, this chapter provides general information about the outstations such as the opening hours, statistics about the cargo transported in 2016 and statistics during the EGFL measurement period and general information about KLM trucking and handling information at the Amsterdam hub.

The second chapter in the current state, Chapter 8 discusses the acceptance procedure, trucking schedule, data communication and the arrival process at the hub in Amsterdam are introduced in Chapter 7. The 3 pillars and the arrival process discussed are compared with the future state as indicated by the two-sided arrows connecting the pillars in Figure 2.1. The general bottlenecks are identified for the hub in Amsterdam and GHA in Billund and Copenhagen. The current state is analyzed by performing field research in Amsterdam, Billund and Copenhagen, in addition to analyzing data extracted from the KLM Cargo data warehouse system, cargoal, cpworkflow, CargoIQ milestones and arrival performances. An analysis of the current process is performed by interviewing operational and management staff, field observation and participation. The field observation and participation is done at different days, different employees, busy and quiet times to get a detailed analysis of the current state. An overview of the total process in Billund can be found in Appendix A and for Copenhagen in Appendix B.

The sub-research questions that will be answered in the current state phase will be:

3. Which stakeholders are involved in the process and which are most critical?
4. How is the current export cargo arrival process organized?
5. What is the performance of the current cargo arrival process?
6. What is the relation between delay in cargo arrival and the acceptance procedure, trucking schedule and data communication?

2.4 Future State

In the third box in Figure 2.1 the future state phase is presented. On the basis of the EGFL program as introduced in Chapter 5 several changes are designed to tackle the bottlenecks and challenges identified in the current state in Chapter 8. The proposed design options should allow for an improved cargo arrival process and therefore score higher on the KPIs used for monitoring the EGFL project. KLM Cargo use the agile design method for the EGFL project. Each sprint in the agile design method, allows for many design iterations and the daily meetings (scrums) allow for continuous verification of the suggested improvements by KLM staff members and other actors. In addition, the suggested designs are presented to the affected stakeholders, to discuss the opportunities and possibilities for the specific stations. Information is gathered using interviews and field research at the locations in Billund and Copenhagen. In consultation with KLM Cargo it was decided to use the existing agile design method opposed to a simulating method and within these system boundaries, this thesis shall propose several verified design options.

In Chapter 9, the future state will be described using the same pillars as the current state analysis for consistency in the thesis. The acceptance procedure, trucking schedule, data communication and the arrival process at the hub in Amsterdam are discussed in the future situation. These 4 topics will be compared with the performance in the current state as indicated by the two-sided arrows in Figure 2.1.

The sub-research questions that will be answered in the future state phase will be:

7. What does the EGFL project change in Billund and Copenhagen to increase the arrival performance of the cargo in Amsterdam?
8. What impact do the EGFL changes have on the KPIs identified for the EGFL project?

2.5 Concluding Phase

In the concluding phase shown in the last box in Figure 2.1, first, Chapter 10 discusses the observations found in the results of the future state. Next the improvements for the EGFL blue print are presented, based on the lessons learned from the in-depth case study of Billund and Copenhagen. These are presented in a road-map for the future roll-out of the EGFL project at other stations in Europe, in Chapter 11. This road-map is based on the current design of the blue print, the lessons learned from the implementation at Billund and Copenhagen and the practical considerations that should be taken into account. Finally the conclusion in Chapter 12, answers the main research question and Chapter 13 provides the recommendations for the EGFL project and suggestions for further research.

2.6 Research Scope

In this section the research scope is discussed. It is of great importance to identify the system boundaries for this thesis research, to effectively answer the main research question. The scope has been determined in advance of the research and has been adjusted accordingly during the research.

In Figure 2.3 the general air cargo transportation process is shown. The numbers displayed next to the different steps in the cargo value chain, indicated by # , will be used to describe the process below. The cargo in the country of origin, Denmark, is transported (#3) from the customer(#1), sometimes consolidated by a forwarder (e.g. DHL, #2), to the warehouse of the ground handling agent (GHA, #4). Following the GHA (#4) consolidates all packages for a carrier (airline, #7) and builds-up the ULDs according to the planning received from the Network Planning (NP) in Amsterdam (#6). NP plans the cargo according to the connection time in Amsterdam. Following the trucking company (Jan de Rijk, #5) transports the cargo from the GHA to the hub in Amsterdam. The hub in Amsterdam (#6) handles the cargo and prepares it for the connecting flight. Next, the cargo is flown (#7) to the country of destination where it is handled by the handler located at the airport (#8). It is transported (#9) either directly to the client (#13) or to a warehouse (#10) where it is consolidated per forwarder (#12) again. The forwarder (#12) collects it from the warehouse and delivers it to the customer (#13). The red square in Figure 2.3 indicates the system boundary of this research. Within the system boundary, only the transportation of cargo from the GHA to the hub by truck, is taken into account, not the transportation of cargo by flight or direct pick up (DPU) from large customers in Billund or Copenhagen.

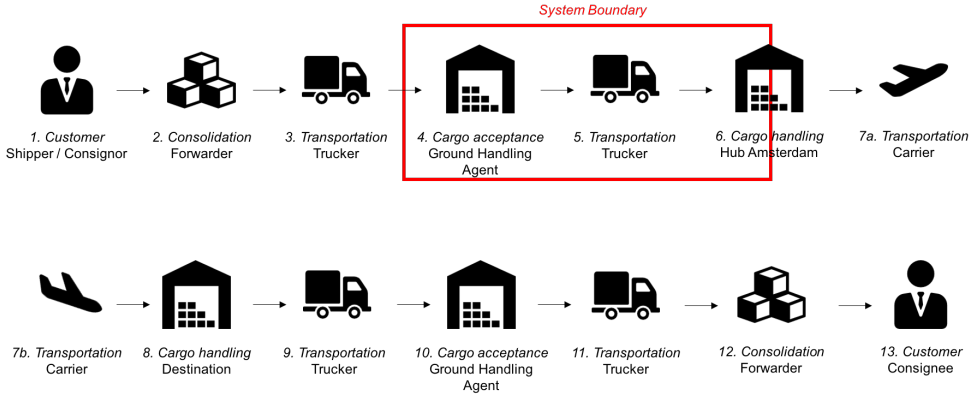

Figure 2.3: Air cargo transportation process.

This research will mainly focus on the arrival performance of the cargo at the hub in Amsterdam. Due to the fact that a significant amount of cargo misses the connecting flight, the arrival performance has to be improved on the two aspects of timeliness and quality. The quality of the cargo delivered (physical acceptance and document acceptance) has to be improved such that the promised connection time at the hub of 5 hours, can be realized. In order to ensure that the trucks with documentation and physical cargo arrive on time, the process at the GHA, trucker and the arrival process in Amsterdam are analyzed. All other aspects of the supply chain are not taken into account in this research. The hub in Amsterdam is partly taken into account as the arrival performance is improved but the cargo process inside the warehouse is not taken into account. The hub does however pose requirements on the state of the delivered cargo which have to be taken into account in the remainder of the supply chain.

According to the consultant decision support department of KLM Cargo [Consultant Decision Support, 2017] there exist 6 types of ways that the cargo can be delivered to the hub. They performed measurements for 1 week in March 2017 and based on this research the following statistics have been determined. Below the different types of cargo handled by the Amsterdam hub and their equivalent percentage of total cargo records is presented. This research will only take into account the export cargo originating from Denmark (Billund and Copenhagen). The import, transit and export cargo from other countries will be outside of the scope of this research.

- **Transit cargo aircraft - aircraft**: Cargo that arrives at the hub by aircraft and departs from the hub by aircraft - [redacted].
- **Transit cargo truck - truck**: Cargo that arrives at the hub by truck and departs from the hub by truck - [redacted].

- **Transit cargo aircraft - truck**: Cargo that arrives at the hub by aircraft and departs from the hub by truck - [redacted].
- **Transit cargo truck - aircraft**: Cargo that arrives at the hub by truck and departs from the hub by aircraft - [redacted].
- **Import cargo**: Final destination of the cargo is Amsterdam. This cargo is collected from the hub by forwarders. - [redacted].
- **Export cargo**: Cargo that has the origin AMS. This consists of local delivery to Amsterdam and Direct Pick Up (DPU) from Europe with acceptance in Amsterdam. - [redacted].
- **Other**: unclassified - [redacted].

As each outstation has a different supplier, culture, rules and regulations, the cargo acceptance at each outstation is different. It is the wish of KLM Cargo to work via a standardized work process at all stations [Spoor, 2016]. The location of the research is determined to be the trade lane from the outstations in Denmark to Amsterdam. Therefore only the specific outstations being, Billund (operated by Cargo Center Billund (CCB)) and Copenhagen (operated by Worldwide Flight Services (WFS)) will be analyzed. In Chapter 5.6 it will be substantiated why Billund and Copenhagen were chosen for the in depth case study. The acceptance procedure at these outstations has been outsourced to third parties, CCB for Billund and WFS for Copenhagen. These third parties have contracts with multiple airlines and multiple trucking companies however in this research it will be limited to the KLM (KL) / Martinair (MP) freight and KL / MP trucks. The actions performed by the GHA will be on behalf of KLM Cargo.

For the cargo arrival process, two aspects will be researched, the material flow and the information flow. The information flow starting from the moment that the cargo is booked and the material flow starting from the moment that the cargo is delivered to the GHA. The information flow will end as soon as the documentation is accepted at the hub in Amsterdam and the material flow will end as soon as the physical cargo is unloaded from the truck at the hub in Amsterdam.

The final boundary that this research thesis will be limited to is the agile method. KLM Cargo's department Business Process Improvement (BPI) uses the agile method for the EGFL project. In Appendix H a literature study will be performed on the agile method to gain more insights in this method. Within the system boundaries of the agile method, the adaptations for Billund and Copenhagen, improvements for the EGFL project and a road-map for further roll out will be designed. A large advantage of using the agile method is that twice a week the stand up takes place allowing for the design options to be verified by the participating stakeholders. The time period in which the research is conducted is also a system boundary of the research. The period of the current state is based on information over 2016. The period in which the iterations for the future state are implemented and tested using the agile method, is from the 16th of May till the 16th of June 2017.

2.7 Societal Relevance

The EGFL project is on the interface of the private and public domain. The overall goal of the project is to implement a stricter acceptance process and restricting the peaks in Amsterdam resulting in a higher flown as planned. According to the project description for 2017 the current process is designed for truck optimization, if a shipment is delivered late, the truck will be delayed to allow the shipment to still make the truck, resulting in an optimized truck load factor. This results in a delayed departure of the truck from the GHA, often resulting in a late arrival of the truck in Amsterdam and the shipment will miss the booked connecting flight. In the current process the load factor of trucks is optimized opposed to the load factor of flights.

The EGFL project optimizes the flight load factor opposed to the truck load factor, resulting in a reduction of the CO_2 emissions. As an example; the KL611 is a Boeing 747-400 combi-aircraft from Amsterdam - Chicago allowing for 5 upper deck ULDs (11300 kg/ULD) and 16 lower deck ULDs (3175 kg/ULD). This is a total weight of 107300 kg on this route resulting in 591 tonnes of CO_2 emission. The truck emission for the route Billund - Amsterdam is 750 km resulting in 0.763 tonnes of CO_2. For 16 lower deck ULDs and 5 upper deck ULDs are 13 locations needed resulting in around 4 trucks producing a total of 3 tonnes of CO_2. This is 200 times less CO_2 emission than the aircraft produces. It could be stated that for public domain it would benefit to optimize the load factor of the aircraft opposed to the load factor of the truck from the CO_2 emission point of view. An additional benefit for the public sector is if the load factor of the flights are increased less flight movements are required, to transport the same amount of cargo, resulting in less disturbance of the inhabitants.

3 Methods

In this chapter the methods used to perform this research will be discussed. Several research methodologies will be used for this research proposal. Interviews (surveys), literature reviews (desk research) and case studies will be applied.

3.1 Literature Review

The literature review method will be used to answer the sub-research questions stated below. In addition, the added value of a literature review and how the literature review was conducted is explained.

1. *What scientific research has already been performed on cargo operations?.*
2. *What scientific research has already been performed on cargo arrival performance?*
5. *What is the performance of the current cargo arrival process?*
7. *What does the EGFL project change in Billund and Copenhagen to increase the arrival performance of the cargo in Amsterdam?*

Literature review contribution
By using a literature review (desk research), the data is not collected empirically but material produced by others is used [Verschuren and Doorewaard, 2010]. A literature review will be conducted, meaning that books, articles, conference papers and other publications will be reviewed. However also secondary data (empirical data compiled by other researchers) will be used. Although this data can partially be gained by the survey research, the case study also identifies many parameters, that are already measured by other researchers. Using this data can save time and effort as a literature review is a quick way to obtain a large amount of data. Caution should be in mind when using the data, the purpose and biased data should be clearly identified. To design the new acceptance procedure, trucking schedule and data communication, the knowledge from other researchers can be used to determine which methods work and which don't.

Literature review data gathering
Books, articles, newspapers, magazines, brochures, conference papers and other published matter will be used for the literature study. Also secondary data from other researchers will be used. This literature review can be found in online academic databases for scientific papers such as Scorpus, Google Scholar, Sciencedirect and the digital and hard copy library of the Delft University of Technology. Keywords used for research are: air cargo, operations, supply chain, ground handling agent, carrier, IATA standards. All available data from KLM Cargos' internal databases and online information will also be used. This information will be analytically analyzed using excel. No extensive model will be build as this is specifically not requested by KLM Cargo, as they won't be able to work with the model when this thesis is finished due to lack of knowledge of modeling programs.

3.2 Survey Research

The survey research method will be used to answer sub-research questions:
3. *Which stakeholders are involved in the process and which are most critical?*
4. *How is the current export cargo arrival process organized?*
7. *What does the EGFL project change in Billund and Copenhagen to increase the arrival performance of the cargo in Amsterdam?*

Survey research contribution
The survey research is used to gain an overall picture of a comprehensive phenomenon spread out over a stretch of time and / or space [Verschuren and Doorewaard, 2010]. By interviewing experts from all fields about the current situation at KLM Cargo and their view on future changes, new insights and data can be obtained. Experts and employees will be interviewed to discover what the current bottlenecks are and what, in their opinion should change on location, so that a sustainable and robust alternative can be designed. First the key departments and managers will be identified using informal interviews.

Next semi-structured interviews will be performed with the identified managers and operational staff from the air cargo departments to discuss intra- and inter-department problems.

An advantage of using the interview technique (or survey research) is that an overview of the stakeholders and the current situation, is generated and with this data statistical relationships can be determined. Survey research has also been standardized to a large degree, which will benefit both the interviewee and the interviewer. As the depth and knowledge obtained by survey research are limited, also a literature review and a case study will be performed.

Survey research data gathering
Project managers, operational staff, administrators, operators, researchers, external parties etc. will be interviewed. The important and relevant comments of the interview will be collected and send in a document to the interviewee. The interviewee is allowed to propose additional information and / or changes to the written comments. Following this information will serve as the empirical data for the research. In addition, several meetings, attended by multiple stakeholders have taken place. These meetings are facilitated by the researcher to discuss the new EFGL project. Multiple stakeholders can attend the meetings and a discussion might take place. In Appendix E and overview of the interviews and meetings that have taken place can be found, including the date, event, attendees, which company they are representing and their function.

3.3 Case Study

An in depth case study will be performed for the outstations Billund and Copenhagen. Currently it might seem that these locations have already been determined. However a process has been conducted previously to determine these two stations based on the criteria: current quality performance of all outstations, monthly / daily volume, ground handler maturity, trucker maturity, freight priority, current offset times and the current process at Schiphol. This selection will be addressed in Chapter 5.6.

The in-depth case study will be used to answer sub-research question:
4. *How is the current export cargo arrival process organized?*
5. *What is the performance of the current cargo arrival process?*
6. *What is the relation between delay in cargo arrival and the acceptance procedure, trucking schedule and data communication?*
8. *What impact do the EGFL changes have on the KPIs identified for the EGFL project?*

Case study contribution
The case study is used to gain a full insight into the outstations Billund and Copenhagen. Unlike the survey research, the case study will result in a depth research [Verschuren and Doorewaard, 2010]. The basis of a case study is to compare and interpret the results. During the case study also interviews will take place, only now they will be face-to-face consisting of open questions and topics. With the case study, a general overview of the operations at the hub in Amsterdam, GHA in Copenhagen and GHA in Billund as a whole is illustrated. The air cargo transport processes (with regard to the acceptance procedure, truck scheduling and data communication) at the GHA, trucker and arrival in Amsterdam are observed, based on the feedback from the interviews. The data from the GHA, trucker and arrival at the hub, will be used to determine the bottlenecks and opportunities.

The methodology of an (in depth) case study has been criticized in literature by some researchers, however there are also many in favor of in depth case studies. [Ruddin, 2006] argues that an in depth single case study not necessarily needs to make generalizations but that it is a great scientific contribution to the use of what others make of them. In addition the advantages of case studies are that they capture reality to a greater extend and allow for the analyzing of more parameters. [Flyvbjerg, 2016] argues that a discipline without enough examples, such as case studies is an ineffective discipline. One can not generalize based on one single (in depth) case study but it can contribute greatly to the research methodology for social sciences. In Chapter 4 the scientific gaps in literature are identified and the research area that this thesis is located in.

Case study data gathering
The situation at; KLM Cargo hub in Amsterdam, GHA in Billund, GHA in Copenhagen and the trucking company named Jan de Rijk, will be analyzed. KLM Cargo has contracts with 11 trucking companies, however only Jan de Rijk is investigated in this thesis as this is the only trucking company contracted to operate between Billund - Amsterdam and Copenhagen - Amsterdam. The available data sources of these parties will be made available and the data will be analyzed. In addition several visits to their locations will be made to observe the local situation (field research).

3.4 KLM Method

For the EGFL project of KLM Cargo, the agile scrum method of working is used. In 2016 during the agile hackaton supervised by McKinsey & Company the agile manifesto was adapted and re-written by KLM Cargo for business process design [Spoor, 2017b]. To the best of our knowledge, KLM Cargo is the first company to apply the agile method to change business.

Agile splits large projects into small sprints (iterations) of 2 to a maximum of 4 weeks. Each iteration is a project on its own. The agile approach allows for the project team to adapt swiftly to a changed environment or changing demands of clients [LeanSixSigma, 2016]. For agile it is important to embrace change. It also means that the project is started without all the details known. As this master thesis will take place with the EGFL project of KLM Cargo, the agile scrum method will be followed and this way of working is described in Appendix H. A new iteration of the deliverable will be made every 2-4 weeks.

The project team will have a meeting twice per week (called weekly stand-up or daily scrum), in which the progress of the project will be discussed. The stand-ups also allow for validation of the suggested improvements for Billund and Copenhagen. The stand-ups allow for participatory observation and may motivate for mutual discussions. The results will be processed in the proposed designs and the final result will again be presented to the participants of the stand up to check if the observations made are supported by the participants. Simultaneously with the roll-out of Billund and Copenhagen, 8 other stations are rolled out as described in Chapter 5. This allows for cross feedback and improvement suggestions from bottlenecks found in other stations. In Appendix E, a list of attendees at the stand-up meetings can be found. The 8 other stations are managed by 5 other interns and spread over 3 other operations development managers. During the roll-out a daily conference call with all the interns and supervisors would take place. This is described in Appendix E in Section E.3.

4 Literature Review

According to [de Haan and de Heer, 2015] transportation problems have a large influence on society, as they are affecting many countries, people and organizations. The challenges faced therefore can be identified as global problems and complex problems, as not one single solution is available due to the level of complexity. Air cargo operations is one of these global and complex problems. In this section an overview of the air cargo operations will be provided including the challenges and opportunities. In addition the challenges of the air cargo arrival performance are highlighted. The research questions stated below, will be answered in this chapter:

1. *What scientific research has already been performed on cargo operations?.*
2. *What scientific research has already been performed on cargo arrival performance?*
5. *What is the performance of the current cargo arrival process?*
7. *What does the EGFL project change in Billund and Copenhagen to increase the arrival performance of the cargo in Amsterdam?*

4.1 Overview of Air Cargo Operations

In Figure 4.1 and Figure 4.2 an overview of the processes in the air cargo industry are shown. The air cargo industry starts with a customer that would like to transport a shipment by air. The customer / shipper wants the shipment to be sent at a low cost with the required service level [Feng et al., 2015]. Often a forwarder is included as middle man to provide the ground transportation services between the shipper and the airline. The airline handles and transports the cargo by air, where the consignee will receive the shipment at the final destination. The typical service flow will start with the cargo delivery to the warehouse of the GHA where the cargo is unloaded and sorted according to its destination and other information on the shipping documents. Bulk cargo is consolidated into a container or stacked on a ULD covered with a net. Secondary airports or fragmented markets often do not have the capacity to justify the costs of freighter operations and depend on trucking connections with larger hubs [Heinitz et al., 2013]. For KLM Cargo Billund and Copenhagen are secondary airports and Amsterdam is the larger hub. According to [Nobert and Roy, 1998] airlines have neglected research and optimization in the air cargo industry until now, as passenger transportation generated their main revenue. However with the increase in demand for air cargo transportation and the competition in a dynamic environment, airlines have to manage their operations very carefully to remain competitive.

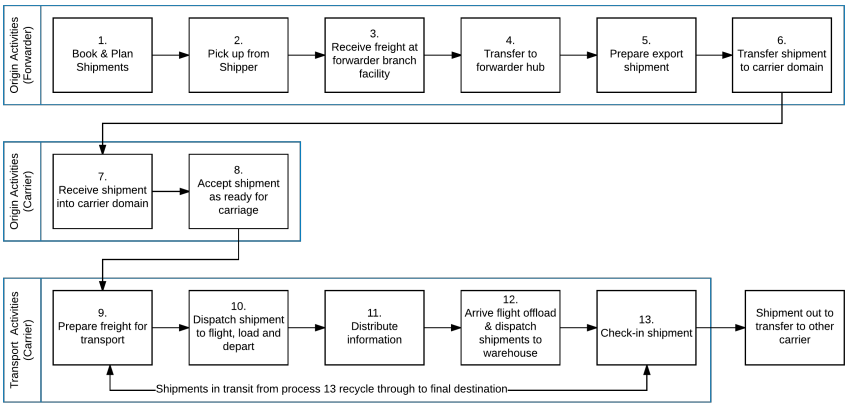

Figure 4.1: The air cargo operations according to [IATA, 2016]

The International Air Transportation Association (IATA) has developed the air cargo industry master operating plan (Industry MOP) [IATA, 2016]. This is a description of the air cargo industry transportation business process in general. The industry MOP maps the processes and sub-processes typically involved in the planning and movement of air cargo from shipper to final consignee. The entire process consists of 19 processes. The main processes are: origin forwarder, origin carrier, transport carrier, des-

tination carrier, destination forwarder indicated on the left side of each flow in Figure 4.1. Regarding the research scope of this thesis only the first 3 processes are reviewed, the origin forwarder, origin carrier and transport carrier. These 3 main processes are illustrated in Figure 4.1. The processes behind each step are explained in more detail in Appendix F in Figures F.1 and F.2.

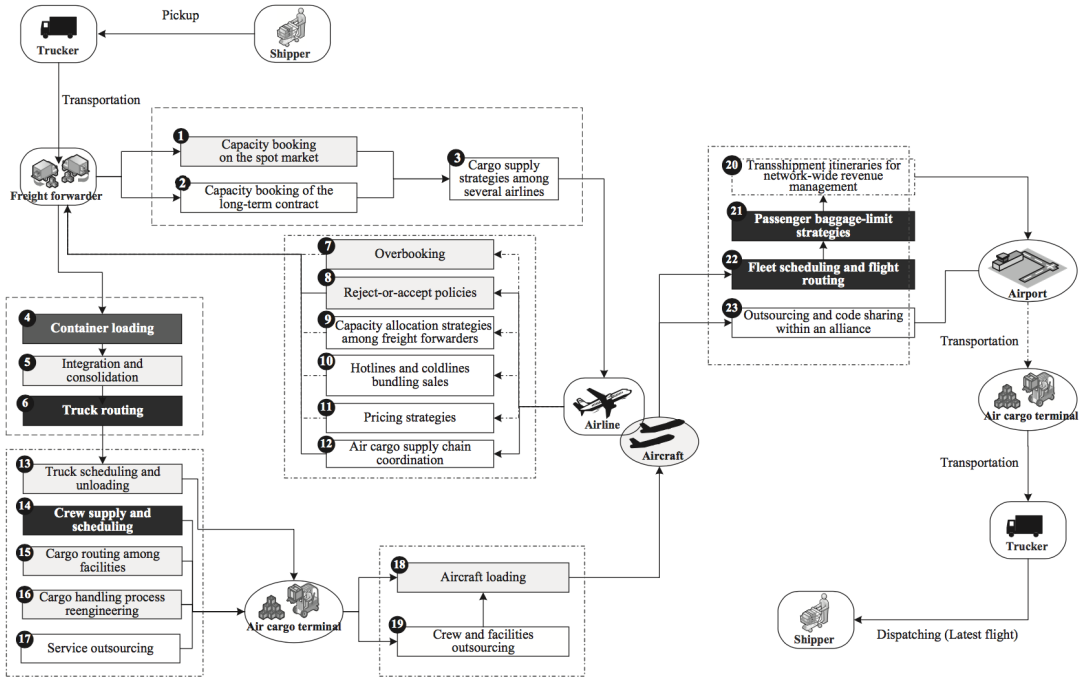

Figure 4.2: Research performed on air cargo processes [Feng et al., 2015]

[Feng et al., 2015] has performed a literature review on air cargo operations, comparing theory with practical problems. He concludes that most real-world problems, remain unsatisfactorily solved, due to the complexity of air cargo operations including the many systems and players. Often air cargo is regarded as more complex than passenger transport as it involves more players, processes and uncertainty, e.g. a passenger prefers a direct flight while for cargo the number of transits does not play an important role, only the costs and quality of shipping. One of the main problems in air cargo according to [Feng et al., 2015] is the uncertainty, complexity and flexibility. In the cargo industry capacity is booked often 6 to 12 months in advance [Amaruchkul and Lorchirachoonkul, 2011], with the exact shipment volume and weight unknown. Freight forwarders do not have to pay for unused capacity and therefore they often book more than required. The complexity accounts for that the cargo capacity is subject to volume, weight, containers or ULDs used etc. [Leung et al., 2009]. The flexibility that all major airlines operate a hub-and-spoke networks where cargo from different origins are consolidated at the hub, thus offering flexibility for the the number of transshipment and aircraft allocation [Amaruchkul and Lorchirachoonkul, 2011].

According to [Feng et al., 2015] literature mainly describes problems regarding revenue management [Kasilingam, 1997a], [Kasilingam, 1997b], [Popescu et al., 2006], terminal operations [Hall, 2001], [Lee et al., 2006], [Lau and Zhao, 2006], fleet routing and flight scheduling [Lin and Chen, 2003], [Yan et al., 2006b], [Yan et al., 2008], [Tang et al., 2008] and aircraft loading [Mongeau and Bès, 2003], [Yan et al., 2006a], [Yan et al., 2008]. In Figure 4.2 the entire air cargo supply chain is shown and above mentioned topics are indicated in dark grey.

The light grey areas according to [Feng et al., 2015] are discussed in literature but not as extensively as the dark grey topics. Often the theoretical work in the light grey areas falls short of meeting practical requirements that are encountered in real-world problems. The light grey areas are: capacity booking [Chew et al., 2006], overbooking [Wang and Kao, 2008], [Kasilingam, 1997b], [Popescu et al., 2006], [Kasilingam, 1997a], reject-or-accept policies [Amaruchkul et al., 2007], [Han et al., 2010], [Huang and chen Chang, 2010], integration and consolidation [Leung et al., 2009], truck scheduling, cargo routing and handling processes [Hall, 2001], [Lau and Zhao, 2006], [Ou et al., 2010] and [Khan, 2000].

The white areas in Figure 4.2 have not been investigated according to [Feng et al., 2015]. Among these is 'air cargo supply chain coordination'. The three most important players in the air cargo supply chain are the forwarders /customers and carriers. The customers delivering the cargo and the carriers responsible for handling and transportation of the cargo (including the GHA, trucking company and airline). An effective approach for information sharing and chain thinking could benefit all players in the value chain, however it is very complex to share information in a competitive environment. To the best of our knowledge the research in the field of air cargo supply chain coordination is limited. This master thesis will research this gap with a practical example using an in depth case study for Billund and Copenhagen.

4.2 Literature Study on (Cargo) Arrival Performance

It is of great importance that the cargo arrives on time at the hub in Amsterdam to ensure that the cargo can make its connecting flight. If the truck arrivals at the hub are coordinated with the departing flights, some of the shipments the through-ULDs (T-ULDs) can directly be transferred to the flights [Ou et al., 2010]. ULDs that are not directly connected will be stored at the hub's storage facility incurring extra handling and storage costs. According to [Ou et al., 2010] many customers arrive with their shipments just before the departure time creating congestion. The congestion might result in that either the departure time of the flight is delayed or that the cargo misses the flight. Therefore a spread delivery at the hub is of utmost importance.

[Solomon and Desrosiers, 1988] discusses the origin of these types of problems the VRP - vehicle routing problems. Which involve a set of minimum costs routes, originating and terminating at a central depot, for a fleet of limited capacity vehicles, which service a set of customers with known demands. In the Vehicle Routing Problem with Time Windows (VRPTW) the VRP has an extra constraint, namely the time window in which the vehicle has to be serviced. According to [Solomon and Desrosiers, 1988] two types of time windows exist, hard and soft time windows. In the case of a soft time window if the vehicle is either too late or too early a penalty will be issued. The time window constraints can be violated but at a costs. Soft time windows can flexibly reflect real world transportation situations such as rush hours, car accidents etc. Hard time windows state that if delivery is done outside the time window the delivery is rejected and the business is lost. If the vehicle arrives to early, it can wait but it can not arrive too late. When time windows are taken into account in a VRP problem, the total routing and scheduling costs not only include the travel distance, routing costs but also the costs of waiting which is incurred when a vehicle arrived to early at a customer location [Solomon and Desrosiers, 1988]. Inventory Routing Problems with Time Windows constraints (IRPTW) is a type of Vehicle Routing Problem with Time Windows which involves assigning a fleet of limited capacity vehicles to serve a set of customers. According to [Liu and Lee, 2011] IRPTW considers inventory and routing decisions simultaneously.

Research has been performed by [Yan and Zhang, 2015] on the arrival times of customers with regard to transportation costs and time window constraints. Customer service or cargo service both have a time window constraint in which time they have to be serviced. If a customer is serviced before the earliest specified arrival time extra inventory costs must be paid but if a customer is serviced after the latest arrival time a penalty cost must be paid [Yan and Zhang, 2015]. In the dynamic and competitive environment that the air cargo industry is operating, obtaining a maximum profit plays a key role in the success of the business. According to [Yan and Zhang, 2015] logistics make up a large costs of the business model but can be reduced through supply chain optimization. The transportation costs often consists of fixed costs and variable costs and these are determined by the time window constraints. [Yan and Zhang, 2015] concluded that existing literature on transportation problems with time window constraint is limited to vehicle routing problems and no study researched the time window constraint in the transportation cost model until now. Research performed by [Liu and Lee, 2011] agrees that IRPTW is rarely discussed in literature. Their research is pioneering with an IRPTW so that the supply chain cost can be decreased.

According to the research performed by [Savelberg and Bakker, 2010] about time costs involved with the the rescheduling of trains, passengers plan their journeys based on the preferred time of arrival at the destination. Similar, cargo is booked by customers based on the preferred date and time of arrival at the consignee. When booking their cargo they will select the flight and date on which their cargo will arrive at the desired time. If the cargo misses the flight due to an inefficient supply chain of the carrier monetary losses can be experienced by the customer. The arrival of the cargo early or late can be expressed in monetary values. According to [Savelberg and Bakker, 2010] arriving to early is defined as Schedule Delay Early (SDE) and arriving too late; Schedule Delay Late (SDL).

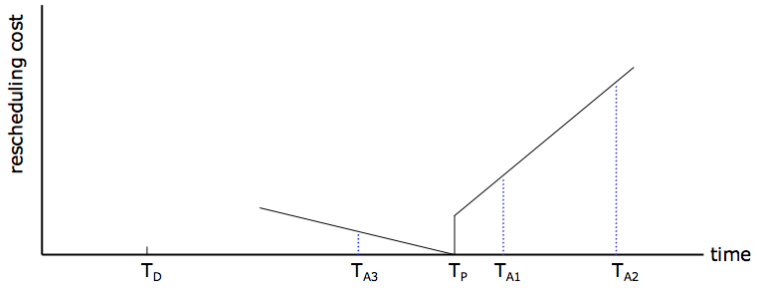

Figure 4.3: Rescheduling costs according to [Savelberg and Bakker, 2010]

In Figure 4.3 the rescheduling costs as a function of time are shown. This typically represents the case at KLM Cargo. If the cargo arrives too early the trucker either has to wait, incurring costs for the trucking company or the truck can be unloaded directly but the cargo has to be stored to a longer period of time. The longer the cargo has to be stored the higher the storage costs. If the cargo is delivered exactly on time indicated by Tp in Figure 4.3 the costs are minimal. If the cargo arrives too late the costs immediately jump up as a penalty for being too late is being issued. Further the cargo has to be stored in the warehouse until space is available on the next flight. A small side note should be made that this is merely a schematic reproduction, in reality the increase will not be linear nor will it indefinitely continue [Savelberg and Bakker, 2010].

5 European Green Fast Lanes

In this chapter the European Green Fast Lanes (EGFL) project is explained in more detail. First the reason for the EGFL project is explained. Secondly the goals formulated for the EGFL project and the EGFL Business Case are presented. Thirdly the effect of EGFL on the cargo value chain is described and finally the scope of the research within the entire project is determined.

5.1 Why EGFL?

The EGFL project was introduced as a project for KLM Cargo due to the problems encountered with the delivery quality of the cargo. Cargo was often delivered late, incorrect or incomplete, requiring extensive repair actions at the hub to ensure that the cargo could still make the connecting flight. However, as the problem increased cargo often missed the flight resulting in reputation and monetary losses for KLM Cargo. The aim of the EGFL project is to optimize the process from cargo acceptance at outstations to flight departure from the hub at Schiphol [Spoor, 2016]. The outstation Frankfurt was chosen as an operational proof of concept as input for a further business case. Many problems were encountered at the pilot in Frankfurt. A conclusion was drawn that not only these problems occur in Frankfurt but also in all other stations in Europe. Therefore a project to identify and solve all the structural issues was developed. From the current state analysis described in detail in Chapter 8 the following main problems encountered in Billund and Copenhagen are:

Acceptance Procedure
The cargo is often delivered to late, incomplete and incorrect by the customer. Sometimes special deals with customers are made. Such that the truck will wait with departure until a customer has delivered their cargo. The GHA who handles the cargo following has to perform all kinds of maneuvers to repair the resulting delay and ensure that the cargo can be transported to Amsterdam on time. Often as soon as the cargo arrives, the RCS milestone is given to the shipment by the GHA on behalf of KLM Cargo. Giving RCS signs the contract with the customer, however it may occur that no checks have yet been performed on the cargo (booking, packaging, labelling, documentation, weighing, volume etc.), but due to the contract KLM Cargo has to ship the cargo. The delivery of the cargo often happens in the middle of the delivery peak at the GHA, thus there is limited time to perform all required actions as more carriers are handled by the GHA. The ULDs, if available, are built up, but not according to connection time in Amsterdam, causing break down problems. Actual information on when and which truck to expect for loading and unloading is often not available.

Trucking Performance
If the trucker does report, which often does not occur, the trucker reports late at the GHA, reducing the time the GHA has to load the truck. Often the truck departs late due to the late arrival. According to schedule, the trucks often depart after the booking truck, thus failing the departure milestone. All shipments are booked on the booking truck. Depending on the amount of freight booked, shipments are rebooked to operational trucks. The truck that the shipment is booked on when RCS is given to the shipment is the baseline against which the KPIs are measured. If the operational truck departs later than the booking truck, the baseline is not met and therefore the milestone is registered as failed. If the operational truck departs before the booking truck, the time stamp of departure is earlier than the baseline and therefore the KPI milestone is registered as successful. Another problem encountered is that the trucking schedule is unclear and old trucks are still available in the system. This results in conflicting information for the users of the system. The trucks often depart in the middle of the departure peak hour at the GHA, requiring the GHA to do their best to ensure that the truck departs on time and with the correct cargo.

Arrival in Amsterdam
During the trucking journey several obstacles might have occurred delaying the truck. Therefore often the truck arrives later than scheduled in Amsterdam. In Amsterdam the truck can be unloaded, however the hub can only handle 6 trucks per hour. If the truck arrives in the peak in Amsterdam, congestion is created and the truck will be even more delayed. When unloading the truck, the types of cargo can be bulk (loose cargo), mix-ULDs or t-ULDs (through-ULDs). T-ULDs are ULDs that have only shipments loaded on them which all have to go to the same connecting flight. Therefore the ULD can directly be

transferred to the aircraft or to the ULD storage, when the connecting flight is not directly available. Mix-ULDs have shipments for different connecting flights or different destinations. The Mix-ULDs have to be broken down in Amsterdam and the individual shipments are sorted according to destination. With all other shipments to the same destination the ULD is following built up again to prepare for the transportation by aircraft. T-ULDs are preferred as they can be directly transshipped to the aircraft. Often shipments with short connections are not built together on 1 ULD, therefore all mix-ULDs have to be broken down to retrieve the shipments with short connections. In addition the shipments are delivered incomplete and incorrect (either physically or documents) at the hub for which the ground staff needs to perform repairs ([redacted] of all air waybills (AWBs)). If the cargo is incomplete or incorrect the cargo might be rejected by the customs department in the country of destination, resulting in high penalties for KLM Cargo. If the cargo does not make the flight, storage needs to be reserved, to temporarily store the cargo, resulting in storage costs. The cargo has to be re-booked causing extra work for the Network Planning (NP) department.

Data Communication
Data communication and structural feedback throughout the entire cargo value chain is missing. Data communication with the customer is lacking, the customer is unaware that they are polluting the entire cargo value chain by delivering the shipments, late, incomplete, incorrect or without a booking. Communication with the truckers is also lacking, there is no consequent collection of data, therefore it is difficult to assess the structural issues that occur and develop solutions. Communication with the GHA is lacking about the expectations, that RCS is a contract with the customer, the Flight Booking Lists (FBLs), the built-up plans for hot or cold cargo, information about the trucker, the communication when trucks are delayed, the responsibilities of the different parties are not clear (e.g. Customer Service Organization (CSO) vs. NP), information updates send by the GHA are not accepted, no structural information about the performance of the GHA is available. The deviation reports that are sent by the GHA are missing important information etc.

Concluding
Concluding all parties in the supply chain perform tasks which will contribute to correct and complete shipment according to their best knowledge. However due to the lack in communication in the supply chain this results in pollution throughout the chain. In the worst case solution KLM Cargo can not deliver the cargo as promised to the customer at destination and due to the fact that information is unknown the customer will not be invoiced for the weight and volume that is actually transported by KLM Cargo, resulting in monetary losses. All the above mentioned issues are a short summary of the problems that KLM Cargo experiences in the supply chain. A detailed analysis will be performed in Chapter 8 where a current state analysis is performed. To ensure that KLM Cargo can remain competitive in the dynamic air cargo environment the entire supply chain must be improved and issues structurally solved. The EGFL project aims to map the structural issues for each of the trucked stations in Europe and develop a blue print which with some adjustments can be implemented to solve these issues.

5.2 Goal of EGFL

According to [de Wolf, 2017] the main objectives of the European Green Fast Lane project are to increase the reliability and the efficiency of the handling and transportation of shipments, to reduce cost and transit time of the cargo. 5 Goals have been designed for the EGFL project namely:

- **Increase the booking reliability** and **reduce the total transit time**. The increase in booking reliability will result in a higher flown as planned (FAP) and the aim is to reduce the total transit time with 2 hours.
- Reduce the repair, rework and peak workload levels at the hub so that **costs can be saved** and **increasing handling volume** in the future.
- **Increase aircraft load factor** by effectively prioritizing freight at the hub ('hot' or 'not'). The increase in aircraft load factor will positively affect the environment and decrease the number of required aircraft movements. The increase in load factor of aircraft might come at the cost of a reduction in the load factor of the trucks. However the benefits of increasing the load factor of the aircraft are higher than the reduction in the truck load factor as is explained in Section 2.7.
- Enhance **collaboration and information** sharing throughout the cargo value chain.
- Enable **proactive customs handling**.

5.3 EGFL Business Case

In Figure 5.1 the business case for the EGFL project can be found. The business case consists of 5 parameters which will be adjusted to affect the value drivers which will benefit KLM Cargo. The benefits for AFKL cargo are lower costs and higher revenues.

figures/EGFLBusinessCase.png

Figure 5.1: EGFL business case [Spoor, 2017b]

The EGFL business case focuses on 5 parameters according to [Spoor, 2017b]. First of all the truck rationalization, focuses on the European trucking schedules considering the actual transit times, GHA capabilities, potential for spread delivery and peak volumes at the GHA and the hub. Secondly the acceptance procedure will be redesigned for the outstations so that late-show, no-show, high-show and go-show shipments can be handled, status messages are send and re-booking takes place. Thirdly weighing is implemented. The 100% weighing requirement of individual shipments at the outstations and updating the airway bill and capacity systems accordingly. Fourthly the compliance checker will verify that basic shipment information is correct and complete and proactively signals violations of customs requirements. The final parameter are the status updates which provide information about the shipments to the customers. Summarizing the parameters below:

1. **Trucking schedule**
2. **Acceptance procedure**
3. **Weighing**
4. **Compliance checker**
5. **Status updates**

As indicated in Chapter 2 the system boundary has been set for this research that the hub will function as a black box. This is shown again in Figure 5.2. This means that the functions in the hub are not taken into account and therefore the effect on the FAP might not directly be measurable by the EGFL project.

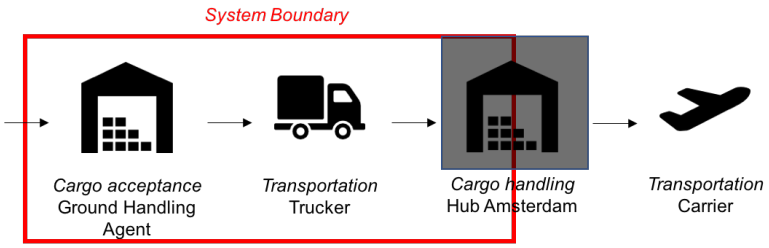

Figure 5.2: EGFL with the hub as a black box

The benefits of the EGFL project regardless of the hub performance are according to [Spoor, 2017b]

1. **Monetary**
   (a) Avoidance of storage charges: Difference in storage charges paid (€).
   (b) Less invoiced trucker waiting time: Difference in invoiced waiting time (€).
   (c) Avoidance of costly 'fast' trucking: Removal of fast trucks from schedules and associated savings (€).
   (d) Fewer customs fines: Difference in customs fines paid (€).
   (e) Higher revenue from weighing: Invoiced difference between booked and actual weight (€).
2. **Time**
   (a) Less re-booking work by flight planners: Difference in re-bookings performed and time associated (# hours).
   (b) Less repair work by hub ground staff: Difference in time spent on repair work (# hours).
   (c) Fewer documentation checks required: Difference in hours spent on documentation checks (# hours).
   (d) Shorter lead times: Difference in lead times (# minutes).
3. **Other**
   (a) Spread of delivery / later LAT: New schedules published per station.
   (b) Better information for trucking tender: Analysis on actual trucking times.
   (c) Improvement in RCF (%), T-ULD (%).
   (d) Improved Revenue Management (RM) flight optimization ability: Insight in actual weights, ability to optimize flight capacity utilization.
   (e) Better customer information provision: Messages sent to customers.

5.4 EGFL Changes in Cargo Value Chain

The EGFL project aims to improve the entire cargo value chain. The cargo value chain is revised starting at the end of the chain (the arrival of the cargo at the hub in Amsterdam) and working backwards to determine the changes needed to achieve a successful shipping of cargo.

5.4.1 Performance at the GHA

Customers / forwarders will have to deliver their cargo on time, complete and correct. Meetings with the customers will be planned to discuss the EGFL project and what is expected form them from now onward. This means that the Latest Acceptance Time (LAT) cargo IQ milestone will be enforced. After LAT the cargo can be rejected as 'late' unless the GHA has time and resources the repair the delay of the cargo, meaning that the truck can still depart on time. However, it becomes the GHA responsibility to ensure that the DEP of the truck can be made. In addition, it becomes the responsibility of the customer / forwarder to deliver the cargo correct and complete. Correct refers to the fact that the cargo must be delivered packed correctly, documentation is correct, a booking has been made etc. Complete refers to the fact that they deliver the number of packages that they have booked, the documentation is complete etc. If this is not the case the shipment can be rejected, meaning that RCS will not be given until a repair is performed.

5.4.2 Acceptance Procedure at the GHA

Improved acceptance is required such as checking if the booking is correct, physical check, document check, volume and weight measurement and custom requirements. When the cargo is delivered at the GHA, the status FOH will be given. FOH is a new status milestone that can be given to sent a message to the customer that their cargo has been received at the GHA. After LAT, no cargo will be accepted anymore, unless the GHA can repair. At the GHA it will be checked if a booking has been made by the customer, if the documentation and physical cargo is available correct and complete, if the special handling codes are correct, number of pieces, weight check, volume, check, dangerous goods check etc. If all is correct the cargo will be scanned through the x-ray and RCS can be given. If one of the checks is incomplete or incorrect the status of the cargo will remain FOH but no RCS is given. By not giving RCS no contract with the customer is made and no baseline is created allowing KLM Cargo to rebook the shipment. If the shipment is rebooked after RCS is given to a later time, the milestone for this shipment will fail by default as the offsets are not met (this is explained in Section 6.2.2). Following

the cargo can be build up on ULDs. Especially at smaller stations such as Billund and Copenhagen the cargo consists of cargo with a long connection time to the connecting flight in Amsterdam and cargo with a short connection time. For mixed ULDs the cargo with a short connection time ('hot' cargo) will be build on the same ULD and the cargo with a long connection time ('cold' cargo) on the same ULD. This makes it easier in Amsterdam as they only have to break down 1 ULD with the short connection shipments and the other ULD with long connection shipments, the breakdown can wait until the peak hour is over.

For the acceptance procedure 4 new concepts have been introduced. These are clear procedures with specific roles for departments [de Wolf, 2017]:

1. **No-show**: Shipment arrives after scheduled departure time of the truck (DEP) or not at all.
2. **Go-show**: Shipment arrives without a booking or after the booking was removed from the system due to late-show.
3. **High-show**: Shipment exceeds booked volume or weight.
4. **Late-show**: Shipment arrives after LAT, but before DEP.

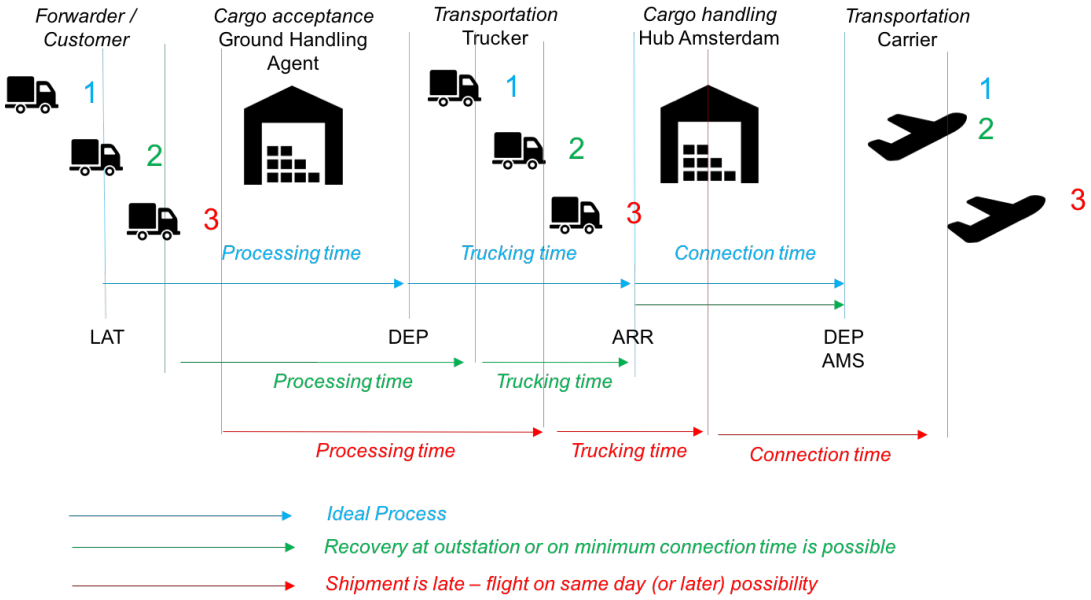

Figure 5.3: EGFL late show, blue, green and red process [Spoor, 2017a]

The EGFL project will affect the shipments as described below [Spoor, 2017a]. For clarification for each new concept a flow chart has been designed.

1. **No-show**: Shipment is canceled on all segments. If shipment arrived after DEP a new booking will have to be made.
2. **Go-show**: No booking, CSO will be contacted. A new booking will have to be made.
3. **High-show**: Shipment weight or volume differs from the booked value. Acceptance rules have been designed. High show is accepted, but the Freight Waybill (FWB) has to be adjusted and the invoice will be based on the actual weight and volume. High show will keep the same priority level within tolerance levels; otherwise the priority level will be changed. The weight slips of the shipment must be stored as proof.
4. **Late-show**: Shipment is too late. It will be re-booked on the first flight with available capacity. The FOH status will be given when the cargo arrives. The different possible processes are shown in Figure 5.3. A green process can be implemented also called the recovery process or the red process also called the re-booking process. The green process is the reparation of the cargo. This can only be assessed by the GHA. For the red process, all segments of the cargo are canceled and the cargo will be re-booked on the first available flight with capacity. The ideal process vs. green and red process are shown in Figure 5.3. Once RCS is given KLM will commit to a promise that it can keep.

   If time of acceptance permits recovery and/or if minimum connection time at the hub (check hub connections) can still be realized, the shipment can be accepted against the original baseline. If recovery is not deemed possible by the GHA, this is listed in the deviation report that the GHA

sends to NP. NP then cancels the initial booking and queues it to RM. RM will rebook on first available capacity. CSO informs the customer of new booking and will proceed if customer agrees. If not, a new booking is made or the customer can pick up shipment at GHA.

5. **Trucking schedule**
   (a) Trucking schedules are simplified and realistic.
   (b) Bigger spread of delivery times.
   (c) Flight optimization over truck optimization.

The exact procedures in case of a no-show, go-show, high-show or late-show are unclear to the different parties involved in the cargo value chain. Therefore based on meetings and discussions with Vincent de Wolf and Simon Spoor the following flow charts have been designed. In Figure 5.4 the no-show procedure is shown, in Figure 5.5 the go-show procedure, in Figure 5.6 the high-show procedure and in Figure 5.7 the late-show procedure.

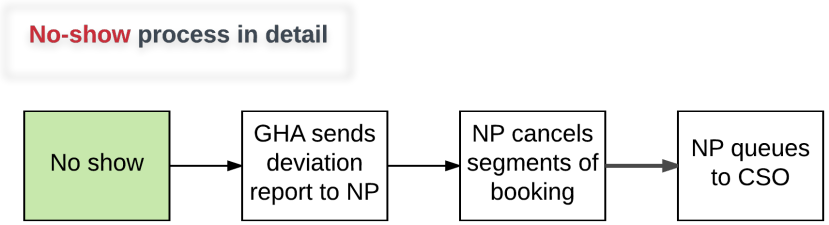

Figure 5.4: EGFL no show procedure

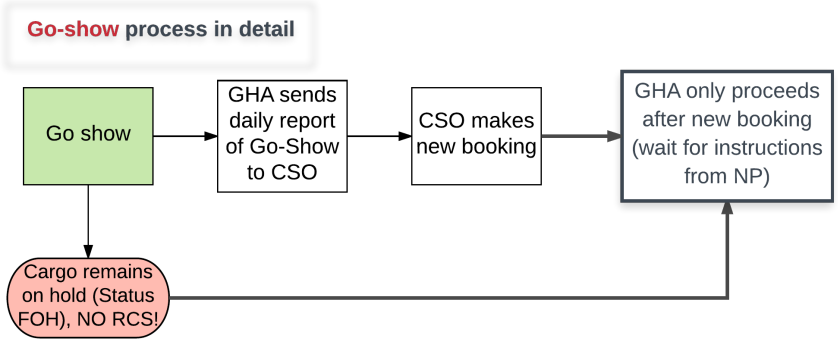

Figure 5.5: EGFL go show procedure

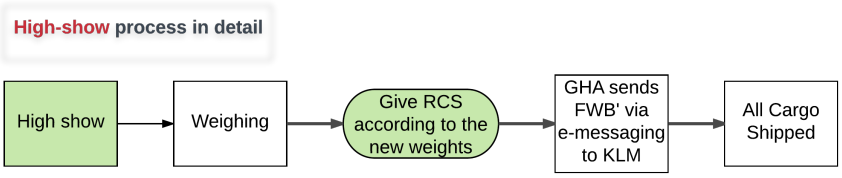

Figure 5.6: EGFL high show procedure

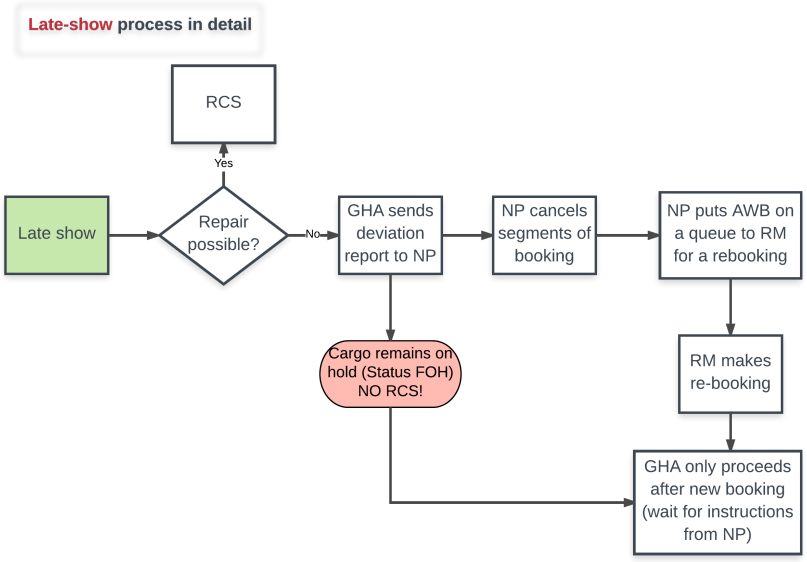

Figure 5.7: EGFL late show procedure

5.4.3 Truck Departure Performance at the GHA

All cargo will from now on be booked on the booking truck and re-booked to the operational trucks depending on the amount of cargo available. The booking truck will also be an operational truck. If the amount of cargo exceeds the booking truck, the remainder of the cargo will be booked on the next operational truck. The departure of the trucks will be scheduled outside the peak hours of departure at the GHA, allowing the GHA more time to perform all the additional checks required by KLM to give RCS to a complete and correct shipment. The truck schedule will be adjusted to the import truck of Jan de Rijk (JdR). In addition, the schedule will take into account the peak arrival time in Amsterdam and the connecting flights of the shipments. Meetings will be planned with the GHA and with JdR to discuss the schedule and in collaboration the final schedule will be developed. The schedule will also be discussed with NP to be implemented in all systems, so that there are no data differences in the new schedule and the database is cleared of all old schedules. Meetings with JdR will also be planned to discuss the structural issues that have resulted in late reporting or late departure in the past. With joint collaboration, a plan to solve these structural issues should be developed.

5.4.4 Truck Arrival Performance at the hub

With the new trucking schedule the expectation is that the trucks will arrive on time in Amsterdam. While developing the truck schedule, the peak hours at the hub in Amsterdam are taken into account. With on time arrival and a secured truck, the truck can directly be unloaded at the hub. As the cargo is all loaded on ULDs the un-loading process can be very quick. T-ULDs can directly be transported to the storage place or directly to the connected flight. Mix-ULDs with 'hot' cargo, cargo with short connection times, can be broken down immediately. Mix-ULDs with 'cold' cargo, cargo with a longer connection time can be broken down at a later moment. If the documentation and shipment are correct and complete, a clean throughput in the hub can be realized.

From the literature review in Chapter 4 it became apparent that the air cargo industry until now has not performed much research on the interaction of the entire supply chain. [Feng et al., 2015] identified that almost no research has been performed on air cargo supply coordination. All problems encountered in the past, solutions have been implemented to address the symptoms. The EGFL project will structurally improve some aspects in the supply chain to allow an on time, complete and correct arrival at the hub. This transition in the air cargo industry will be studied based on an in-depth case study for Billund and Copenhagen. To request correct and complete shipments at acceptation of the shipments from the customers at the GHA, this will affect the entire supply chain in a positive way. In the past all shipments were accepted in the supply chain, contaminating the entire chain. As rubbish in is rubbish out, eliminating the rubbish and ensuring correct and complete data improves the supply chain performance.

From the literature review it was also determined by [Savelberg and Bakker, 2010] that arriving too early at the hub will impose costs for KLM and arriving too late will also impose costs for KLM. Therefore it is of utmost importance that the cargo will arrive on time. With structurally improving some aspects in the supply chain such as the acceptance procedure, trucking schedule and data communication, the arrival at the hub can be made more reliable thus eliminating the extra costs for KLM.

5.4.5 Data Communication

Simultaneously with the EGFL project, the compliance project is rolled-out [Spoor, 2017a]. The compliance checker is introduced allowing to check if the information on the AWB provided by the customer, is complete and correct. Targeted feedback is provided on the compliance errors. This compliance checker will be made available to the GHA. Data communication throughout the entire supply chain is improved. Meetings with customers are planned to communicate the new EGFL project and what is expected of them. During the preparation of the EGFL project for Billund and Copenhagen the GHAs, truckers and other parties involved are included in the development. During roll-out KLM employees will be available at the location to guide the EGFL implementation and to help with any questions, inconveniences, clearance on the project etc. The aim is to be transparent for all stakeholders.

5.5 Scope of Research

As the scope of this thesis has to be limited the focus will be on 2 value drivers shown in Figure 5.1, namely the **reduced peak volume and higher % RCF** and **selective loading and reduced non-quality**, both indicated in green in Figure 5.1. The benefits provided by these two value drivers; lower costs and higher revenues will not be directly noticeable for Billund and Copenhagen. In terms of volume over 2016 the cargo from Billund represented [redacted] and Copenhagen [redacted] of the total volume from outstations in Europe. Therefore the effect on the total costs and revenues will be limited and can therefore not be used as a KPI. To indicate if the project is successful the KPI: RCF will be used. All KPIs in the project will be explained in more detail in Chapter 6.

5.6 Outstation Selection

In Europe there are 83 outstations from where cargo is transported to the hub in Amsterdam or Paris as shown in Figure 5.8. In this chapter the choice of outstations for the in-depth case study, Billund (BLL) and Copenhagen (CPH) will be explained. Based on the complete list of outstations including the country, market they are managed by, airline for which they provide cargo (Air France (AF) or KLM (KL)), the GHA operating, if the GHA is a preferred supplier, meaning that they are a purple supplier as described in Appendix C, the stations were high level analyzed. Also information such as the main trucking company that is operating from this station, the number of Flight Forwarding Messages (FFM), the volume transported by truck in 2016 in m^3, the weight transported by truck in 2016 in kg, the number of AWBs of KL, the Latest Acceptance Time (LAT) score, the RCS (Received Cargo from Shipper) score, Departure score (DEP) the Delivered As Promised (DAP) score and the Flown As Planned (FAP) score was taken into account. The higher the percentage the better the performance of the outstation.

The selection of the outstations is based on the following criteria [de Wolf, 2017]:

- GHA maturity
- Trucker maturity
- Volumes (kg)
- Current performance (LAT, RCS, DEP)
- Freight priority
- Current LAT offset times

The first selection criteria are the KL only trade lanes. As the EGFL project is a KLM initiative, only stations from which cargo flown from the Amsterdam hub are taken into account, eliminating the cargo trade lanes for AF. As Air France KLM Cargo operate under the same name, AF will follow in a later stage with the EGFL project. The second selection criteria is that it can not be Frankfurt (FRA) as this station has already been researched in the EGFL pilot program. The third criteria is the volume, weight and number of FFMs that have been transported over 2016. The fourth criteria is that the GHA should not be Swissport supplier. Swissport has already been included with Frankfurt thus is already introduced with the EGFL project.

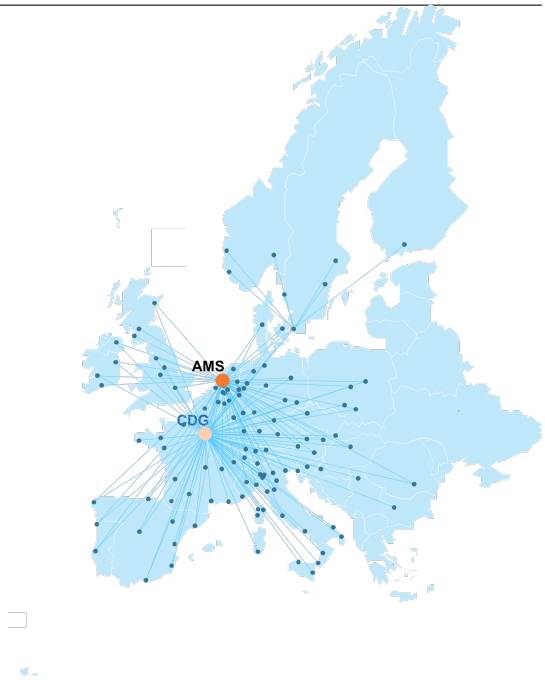

Figure 5.8: The Air France KLM Cargo trade lanes within Europe [de Wolf, 2017]

The fifth criteria is that the stations for the first roll-out are spread evenly across the four KLM Cargo geographies as explained in Appendix I. The specific geography that is selected for this research is the Nordics and France as this region has not been addressed until now. Finally 7 stations remain and based on the number of AWBs that are transported each year and the score on the LAT, RCS and DEP, Billund is selected as the location for the in depth case study.

The selected stations have been discussed with higher management who have approved the stations and requested some changes. One of the requests from the market manager in the Nordics was to include Copenhagen in the first roll out of the EGFL project. The market manager suggested this change due to the fact that Billund and Copenhagen have many similar customers and therefore the change in delivery requirements should be implemented at the same time for all customers. This way consistency in delivery for Denmark as a whole is guaranteed. Therefore in addition to Billund also Copenhagen will be studied in the in-depth case study. The total of the stations selected for the EGFL sprint in the first roll out are: [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted] and [redacted]. This thesis will only focus on the stations Billund and Copenhagen.

6 Key Performance Indicators

In this chapter the EGFL milestones used as Key Performance Indicators (KPIs) for monitoring the performance and improvements of the project are introduced. In addition the KPI offset times from before and after the EGFL project are presented.

6.1 EGFL Milestones

The KPIs that are used to monitor the EGFL project are presented. As explained in Chapter 5 the EGFL project focuses on improving the quality and timeliness of the supply chain. Within this research the physical flow and information flow is analyzed. In Figure 6.1 the milestones used to monitor the performance of the EGFL project are illustrated.

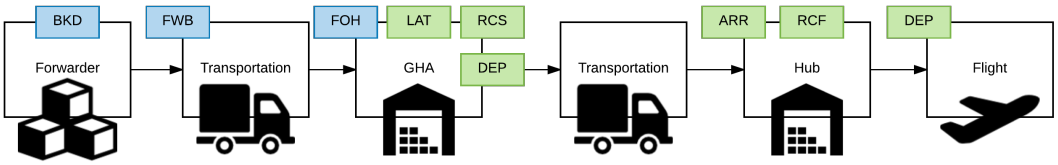

Figure 6.1: The European Green Fast Lane milestones

The EGFL project uses the air cargo process standards developed by the IATA-led Cargo IQ group [de Wolf, 2017]. Cargo IQ is developed by IATA as a system for the planning of cargo shipments and the performance monitoring of these shipments based on common business process and milestone definitions [International Air Transport Association, 2017b]. The Cargo IQ measurements are based on shipment level. These milestones are measured against the baseline of the booking truck. The baseline is created at the moment 'Received Cargo from Shipper' (RCS) is given on a shipment.

The entire air cargo process including all available milestones is described in Appendix F. In Figure 6.1 the blue milestones are the cargo IQ indicators that will be used to monitor the EGFL project and the green milestones are the status messages used. In Table 6.1 the explanation for each milestone / status message is given.

Table 6.1: Abbreviations used in Figure 6.1 [de Wolf, 2017]

Indicator	Type	Description
BKD	[Status message]	Booked - capacity is confirmed by the carrier and the route map is generated.
FWB	[Status message]	Freight Waybill - an electronic air waybill is sent to the carrier.
FOH	[Status message]	Freight On Hand - this message is sent to the forwarder upon warehouse receipt.
LAT	[KPI milestone]	Latest Acceptance Time - cargo must be delivered to the GHA before this timestamp.
RCS	[KPI milestone]	Cargo and documents received from shipper by GHA, 'Received cargo from Shipper' (message to forwarder).
DEP	[KPI milestone]	Departure - from GHA.
ARR	[KPI milestone]	Arrival at the hub.
RCF	[KPI milestone]	Cargo and air waybill have been received at final destination 'Received Cargo from Flight'.
DEP	[KPI milestone]	Departure - from hub.

These KPIs will be used to monitor the performance of the EGFL project. The performance milestones are generated on a daily, weekly and monthly basis. The customer cargo delivery performance is measured using the LAT. The GHA cargo handling performance by the RCS and the DEP. The trucker transit performance by the DEP and the ARR. Following the delivery quality of the cargo by the RCF (if the cargo is complete and correct) and the overall performance by the DEP from the hub. For this master thesis the main KPI will be improving is the RCF. If the RCF is increased, without compromising on other factors, the cargo value chain performance will be increased and the project is successful. The RCF indicates that the cargo and air waybill have been successfully received at the hub in Amsterdam. Following it is the hubs responsibility to ensure that the cargo makes the connecting flight, but this is outside the scope of this research. It was explained in Chapter 2 that the hub is considered as a black box.

6.2 KPI Offset Times

In this section the KPI offset times are discussed. The offset time is the time at which a milestone must have been completed for it to be successful. For example the truck must depart from the GHA before the DEP milestone for the milestone to be registered as successful. If the truck departs after the time prescribed by the DEP milestone, the milestone will be registered as failed. A milestone will only be registered as successful if all items from which the milestone is built of are correctly executed. The milestone often consists of multiple items such as messaging, routing, timing etc. The offset times as registered in the systems before the EGFL project and the changes made after the EGFL project will be discussed below.

6.2.1 Offset Times Before EGFL

In Figure 6.2 the time stamps required for a milestone to be successful, before the EGFL project, are displayed. The cargo has to be delivered at least [redacted] minutes ([redacted] hours) before the DEP, also called the Latest Acceptance Time (LAT) as shown in yellow. The RCS has to be given [redacted] minutes ([redacted] hours) before DEP, as shown in green. This gives the GHA only [redacted] minutes to perform all checks on the cargo if the cargo is delivered last minute. The departure of the truck (DEP) is indicated in red.

figures/OffsetpriorEGFL.png

Figure 6.2: Prior-EGFL LAT and RCS offset for Billund and Copenhagen

6.2.2 Offset Times After EGFL

Several bottlenecks are identified for the current offset. The offset requires the customers to deliver the cargo [redacted] hours in advance but gives the GHA only [redacted] minutes to perform all checks achieve a positive RCS milestone. In the remainder of the [redacted] hours, no other actions are required to be performed by the GHA, besides the built op of the cargo. The offset times for the cargo has been changed, to provide the GHA with more time to complete all checks required to give RCS to a shipment. As shown in green in Figure 6.3 the RCS is changed to [redacted] minutes ([redacted] hour) before the DEP. The RCS is set at the same time that the cargo is required to be ready for loading, in case of only ULDs.

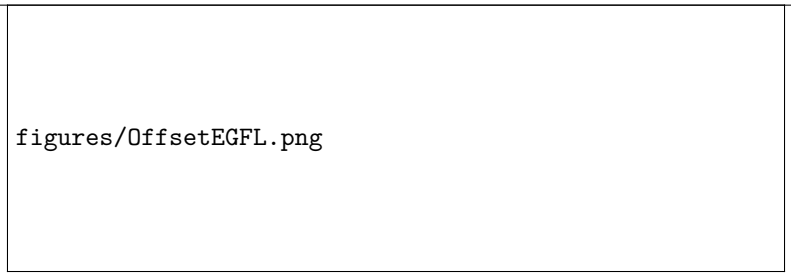

Figure 6.3: EGFL LAT and RCS offset for Billund and Copenhagen

With the new acceptance requirements for the EGFL project, such as checking if the cargo and documents are complete and correct and if necessary reparation, the GHA requests more time. Therefore in consultation with the GHA and the market manager in the Nordics it is decided that the LAT will be increased to 4 hours before DEP, as indicated in yellow in Figure 6.3.

7 General Information Cargo Value Chain

In this chapter the general information for the cargo value chain Denmark - Amsterdam is presented. The sub-research question answered in this chapter is:

3. Which stakeholders are involved in the process and which are most critical?

The stakeholder analysis that is performed in the first section will answer this question. Secondly the outline how the current state and future state will be analyzed is explained. Finally the general information about the GHA, trucking company and arrival in Amsterdam is presented as background knowledge for the analysis of the current state in Chapter 8 and future state in Chapter 9.

7.1 Stakeholder Analysis

In this section a short summary of the stakeholder analysis is presented. A detailed analysis can be found in Appendix C. The stakeholder analysis is performed before the execution of the EGFL project, to ensure that all stakeholders are identified and a plan can be designed to involve all stakeholders in the project. The relations between the stakeholders are identified as well as their interests, objectives and problem perceptions.

Stakeholders are "Those parties that have a certain interest in the system and / or that have some ability to influence that system, either directly or indirectly" [Enserink et al., 2010] p.80. For the stakeholder analysis, an inventory is made of the internal and external stakeholders including a summary of their main tasks. The relations between the stakeholders are mapped with the most important relations described in detail. Finally the interests, objectives and problem perceptions of each of the stakeholders are identified and their inter-dependencies are mapped. The relations between each of the external stakeholders is shown in Figure 7.3 and the internal stakeholders in Figure 7.2. In Figure 7.1 the most important stakeholders to keep satisfied are identified, thus answering the sub-research question:

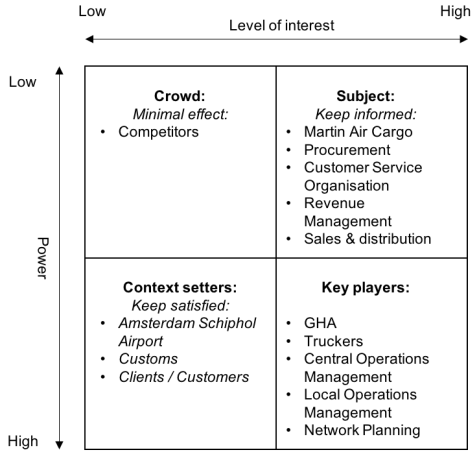

Figure 7.1: Power interest matrix of the stakeholders

3. Which stakeholders are involved in the process and which are most critical?
The internal formal chart and the external formal chart give an overview of the involved stakeholders and how they are related. In Table C.1 and Table C.2 a complete list of all the internal and external stakeholders is provided. The stakeholders that are most critical are presented in Figure 7.1, these are the key players; the GHA, trucking company, central operations management, local operations management and network planning.

The formal relations between actors are mapped using a formal chart. The formal chart describes the formal tasks, authorities and relations of actors and the current legislation. The analysis begins with mapping out the formal positions and relations. The formal chart will be limited to the actors identified in Section C.2. The informal relations are not taken into account in this formal chart although they often do exist and do have an influence on the relation. In addition not all the existing formal relations are displayed but only those deemed most important for the problem analysis. KLM Cargo is the problem owner and therefore will be displayed in the center of the formal chart for the external stakeholders. For the internal formal chart, the different departments of KLM Cargo involved are represented by the white boxes. The blue boxes are external stakeholders. The relations between the other actors are displayed by arrows. A single-sided arrow indicates a hierarchical relationship and a two-sided arrow indicates

formal representation relationship / membership. The formal charts are verified with KLM employees. The relations between stakeholders that are most affected by the EGFL project are further elaborated in Appendix C.

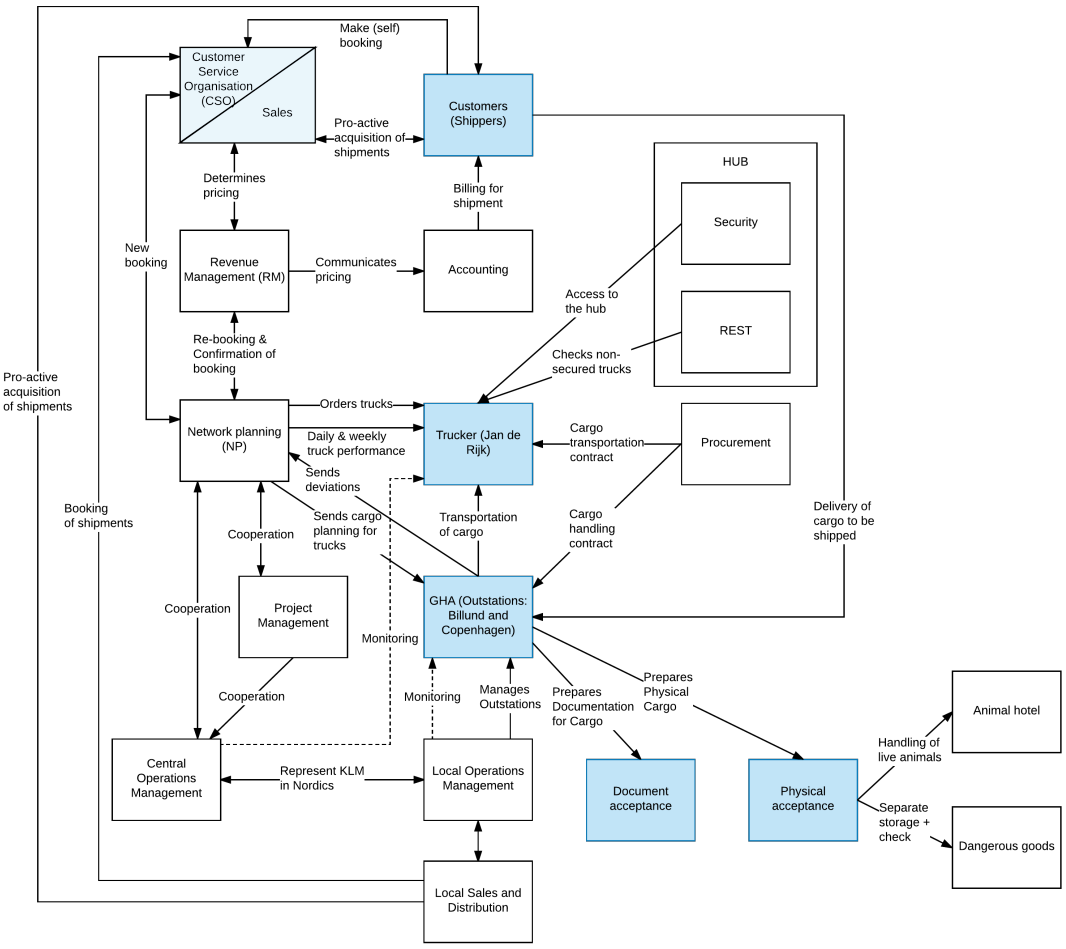

Figure 7.2: Formal chart showing the relations between the internal stakeholders for KLM Cargo

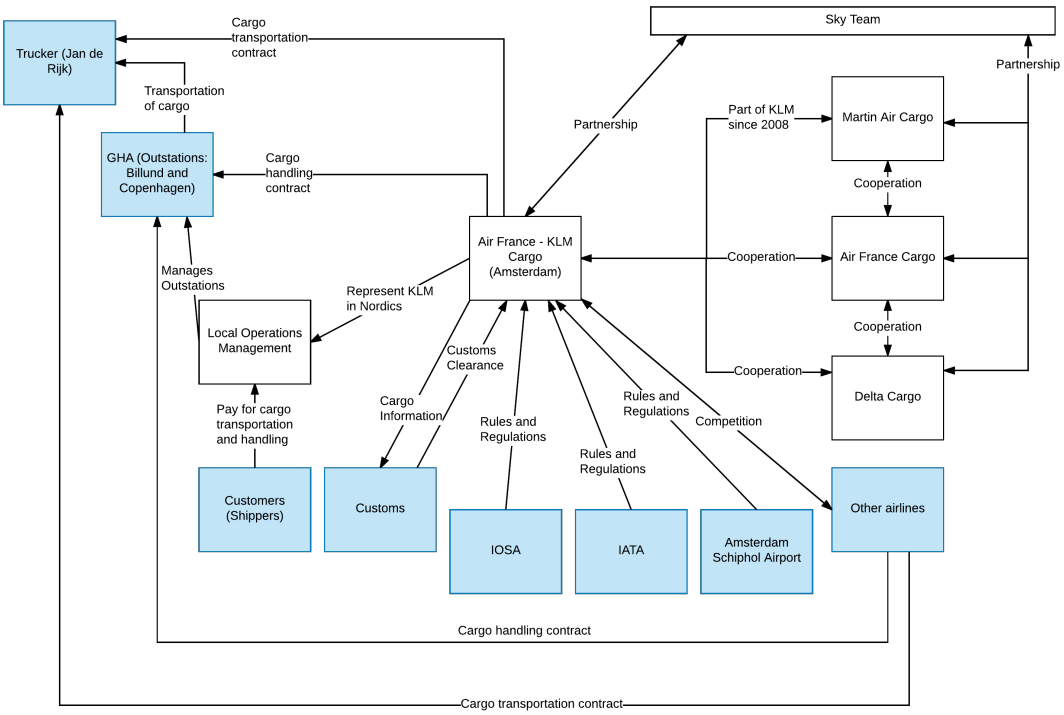

Figure 7.3: Formal chart showing the relations between the external stakeholders for KLM Cargo

7.2 Outline Current State and Future State

The situation before the implementation of the EGFL project will be analyzed in Chapter 8, called the current state, and the situation after the implementation, will be discussed in Chapter 9, called the future state. The current state is discussed on the basis of the 3 pillars identified in Chapter 2. The cargo acceptance, transportation and data communication all contribute to the quality and timeliness of the arrival of the cargo at the hub in Amsterdam. Together with a stakeholder analysis the current state is described. The go-live date of the EGFL project for Billund and Copenhagen is set to be on the 16th of May. The 16th of May is selected as the go-live date as this is a Tuesday, when a relatively small amount of cargo is expected to be transported to Amsterdam, allowing for an easy start to get used to the new EGFL procedure for the GHA personnel. The future state is measured based on data manually collected during the measurement period of the 16th of May till the 16th of June. The future state, after the EGFL project has been implemented will be described based on the same 3 pillars during this measurement period.

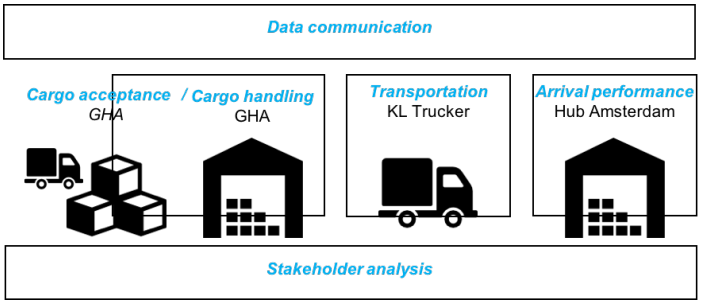

Figure 7.4: Process outline

In Figure 7.4 the 3 pillars on which the current state and future state are analyzed are shown. Within the system boundaries as indicated in Figure 2.3 the actors and 3 pillars are indicated in Figure 7.4. Based on the cargo acceptance, transportation and data communication the arrival performance will be increased by taking all stakeholders into account.

7.3 General Information Outstations

In this section general information regarding the cargo value chain from Denmark - Amsterdam is presented and the context is described for the current and future situation. Starting at the beginning of the cargo value chain, according to the system boundaries, from the GHA until the hub in Amsterdam. First general information about the GHA in Billund and Copenhagen will be presented, including the performance in 2016 and the future state context. Next, the contracted trucking time and the trucking costs are stated followed by the handling time required by the hub in Amsterdam.

7.3.1 GHA Billund

In this section the general information about Billund is presented especially with regard to the first actor in the supply chain the GHA. First the opening hours will be presented, following general information regarding Billund such as the number of AWBs, volume and weight transported in the current state and the performance in terms of the KPIs is presented. Finally the context regarding the number of AWBs, volume and weight transported during the measurement period is presented.

Billund Opening Hours
The opening hours of the documentation department and the warehouse are of importance for the design of the EGFL project for Billund and Copenhagen as during these times the truck can be (un-)loaded. In Table 7.2 the opening hours for Cargo Center Billund (CCB), the GHA in Billunds' documentation department can be found and in Table 7.1 the opening hours for CCB warehouse can be found. These opening hours also have to be entered correctly in the system, as the milestones will be measured against these opening hours.

Table 7.1: Opening hours warehouse Billund

Opening hours warehouse		
Mon - Fri	00:00	23:59
Sat	00:00	23:00
Sun	09:00	23:59

Table 7.2: Opening hours documentation Billund

Opening hours documentation		
Mon - Fri	06:00	04:00
Sat	05:00	00:00
Sun	08:00	21:00

General Information Billund Current State
In this section the general information about Cargo Center Billund (CCB), the GHA in Billund is provided. In Table 7.3 general information such as the contracted GHA, contracted trucking company and statistics about the cargo for the trade lane Billund - Amsterdam handled in 2016 can be found.

Table 7.3: General information about the performance in Billund [2016]

Billund [2016]	
Country	Denmark
Market	Nordics
GHA	Cargo Center Billund
Key Supplier?	
Trucker	Jan de Rijk
Number of FFMs	
# AWB [KL]	
Volume KL [m^2]	
Weight KL [kg]	

Billund [2016]	
LAT score	
RCS score	
DEP score	
FAP score	
DAP score	
# docs loose	10
# docs roller bed	2
# LTL trucks	
# FTL trucks	

The DEP score in Table 7.3 is not only the physical departure measured but also includes the messaging errors. The FOH milestone was only introduced in 2016 and therefore is not very reliable yet. The GHA is not yet asked to measure the FOH and RCS milestones separately. Therefore the RCS offsets have been wrong for most of 2016.

Billund General Information Future State
The general information during the research period from the 16th of May till the 16th of June can be found in Table 7.4.

Table 7.4: General information Billund [EGFL]

Billund [Future]	
# Trucks	[redacted]
# AWBs	[redacted]
Weight [kg]	[redacted] kg
Volume [m^3]	[redacted]

7.3.2 GHA Copenhagen

In this section the general information about Copenhagen is presented especially with regard to the GHA. First the opening hours will be presented, followed by the general information about cargo from Copenhagen such as the number of AWBs, volume and weight transported in the current state (2016) and the performance in terms of the KPIs is presented. Finally the context regarding the number of AWBs, volume and weight transported during the measurement period (16 May 2017 - 16 June 2017) is presented.

Copenhagen Opening Hours
The documentation department and the warehouse are both open 24 hours per week 365 days per year as shown in Table 7.5. The opening hours are of importance for the design of the new trucking schedule and the CargoIQ milestones.

Table 7.5: Opening hours warehouse and documentation in Copenhagen

Opening hours		
Mon - Fri	00:00	23:59
Sat	00:00	23:59
Sun	00:00	23:59

Copenhagen Current State General Information
In this section the general information about Copenhagen is presented. Including the GHA, Worldwide Flight Services (WFS), the trucking company JdR and their performance during 2016. It can already be identified that the RCS score for Copenhagen is very high, on average [redacted] and that the overall performance is acceptable. As explained in Chapter 2, on request of the market manager of the Nordics, Copenhagen is also included in the first roll out, so that Denmark with many similar customers for both Billund and Copenhagen would be informed in one wave about the new acceptance procedure.

Table 7.6: General information about the performance in Copenhagen [2016]

Copenhagen [2016]	
Country	Denmark
Market	Nordics / France
GHA	Worldwide Flight Services
Preferred Supplier?	[redacted]
Trucker	Jan de Rijk
Number of FFMs	[redacted]
# AWB [KL]	[redacted]
Volume KL [m^2]	[redacted]
Weight KL [kg]	[redacted]

Copenhagen [2016]	
LAT score	[redacted]
RCS score	[redacted]
DEP score	[redacted]
FAP score	[redacted]
DAP score	[redacted]
# docs loose	14
# docs roller bed	2
LTL trucks	[redacted]
FTL trucks	[redacted]

Copenhagen General Information Future State
The general information during the research period from the 16th of May till the 26th of June can be found in Table 7.7.

Table 7.7: General information Copenhagen [EGFL]

Copenhagen [Future]	
# Trucks	
# AWBs	
Weight	kg
Volume	m^3

7.3.3 General Information Trucking

In this section the general information regarding the trucking company is presented. The trucking company is the second actor in the supply chain as indicated in Figure 7.4. The trucking company contracted by KLM Cargo for the trade lanes Billund - Amsterdam and Copenhagen - Amsterdam is Jan de Rijk (JdR). KLM has contracts with a total of 11 trucking companies but only JdR is inside the scope of this research. In this subsection, first the trucking times will be presented followed by the trucking costs.

Contracted Trucking Times
In Table 7.8 the different trucking times for different types of trucks can be found. A distinction can be made between an Full Trucking Load (FTL) and a Less than Trucking Load (LTL). A single (normal) truck can transport four full ULDs. If the cargo to be transported to Amsterdam is limited, e.g. only 1 ULD has to be transported a LTL truck can be ordered instead of a FTL truck to reduce the costs of the truck as explained in Section 7.3.3. 1 ULD is equivalent to 10 - 18 m^3. To take into account the needs of the trucking company a LTL truck must be given additional time to make an intermediate stop at another (out)station to fill the empty space in the truck with cargo from another outstation. Therefore the nominal time of a FTL for Billund is 13 hours and a LTL truck gets 4 extra hours resulting in 17 hours trucking time as shown in Table 7.8. Critically analyzing this policy, shows that it is not very logical to first load KL trucks, add 4 hours to fill up but request to unload KL first as well. The KL cargo will be stored in the back of the truck, needing to unload the entire truck to unload the KL cargo.

Both cargo for KLM (KL) and Martinair (MP) is transported from the GHA to Amsterdam. The cargo can be transported in separate KL and MP trucks but for a small station it is often not financially achievable to use 2 individual half empty trucks. Therefore there is a possibility to co-load the trucks, which means that only 1 truck will be driving which administratively has both a KL and a MP truck number. If cargo is available for both a KL flight and a MartinAir connection but both do not have sufficient cargo for a Full Truck Load (FTL) the KL and MP can co-load depending on the connection times in AMS. NP can decide how to co-load, co-load with either short connection times or long connection times. A co-load means that both the cargo of KLM and MartinAir is loaded in the same truck resulting in that the truck will have 2 truck numbers, but physically is the same truck. To achieve this the MP trucks must depart at the same time as the KL truck. The truck will first deliver the cargo to KLM, having a trucking time of e.g. Billund of 13 hours and will get an additional 3 hours to unload at KLM and travel to the MartinAir warehouse operated by Menzies, also located at Schiphol in Amsterdam, where it should arrive after a maximum of 16 hours.

Table 7.8: Contracted transit times for different types of export trucks

Parameter	**Duration**	
Location	**Billund**	**Copenhagen**
LTL truck KL / MP	hours	hours
FTL truck KL / MP	hours	hours
LTL truck co-load	hours	hours
FTL truck co-load	hours	hours
MP handling time AMS	hours	
KL handling time AMS	hours	
LAT before DEP	hours	
Transport time KL to MP	hours	

Trucking Costs
In Table 7.9 the costs for the transportation from Billund to Amsterdam and Copenhagen to Amsterdam and return can be found. From these costs the imbalance between import and export for the trucking companies is shown. The higher the possibility to fill up the truck, the higher the rate. More trucking capacity, also by other industries is traveling from the Netherlands towards the Nordics for example truckloads of vegetables and flowers. As more capacity is moved towards the Nordics, to avoid having to drive back empty a lower rate is offered by the trucking companies to transport the cargo back towards Amsterdam. Therefore the costs for transportation to Amsterdam are lower than towards Billund or Copenhagen. If 1 ULD is to be transported, it is cheaper to order an LTL truck than a FTL truck. A LTL truck will only be ordered with a FTL transit time if the cargo on board has a short connection time to the connecting flight at the hub in Amsterdam, increasing the rate per kg (€/ kg).

Table 7.9: Cost for different types of trucks

Air-line	Route	FTL	Selected LTL Tariff 3 ULD	2 ULD	1 ULD	Kgs Min.	Rate	Transit Time Leg 1	Extra hrs. for LTL
KL	CPH AMS	€[redacted]	€[redacted]	€[redacted]	€[redacted]	€[redacted]	€[redacted]	[redacted]	[redacted]
KL	AMS CPH	€[redacted]	€[redacted]	€[redacted]	€[redacted]	€[redacted]	€[redacted]	[redacted]	[redacted]
KL	BLL AMS	€[redacted]	€[redacted]	€[redacted]	€[redacted]	€[redacted]	€[redacted]	[redacted]	[redacted]
KL	AMS BLL	€[redacted]	€[redacted]	€[redacted]	€[redacted]	€[redacted]	€[redacted]	[redacted]	[redacted]

7.3.4 General Information Hub Amsterdam

In this section the general information regarding the hub in Amsterdam is presented. The hub in Amsterdam is the 3rd actor in the cargo value chain as shown in Figure 7.4. The cargo has at this point been accepted at the GHA at the outstation and transported by the trucking company to Amsterdam.

Handling Times Hub Amsterdam
The handling times for MP and KL are different as they follow different procedures at the hub in Amsterdam. The KLM cargo has a requirement that the cargo should have arrived in Amsterdam at least 5 hour before the departure of the connecting flight. MartinAir requires the freight to be on the warehouse floor at least 11 hours before departure of the flight and the freight must have been unloaded at this point, thus a time of 11 hours is taken for the calculations. Difference in required handling time between KLM and Martinair lies in the fact that cargo is loose loaded for Menzies (where the Martinair cargo is delivered) and built up on aircraft ULDs for KLM which takes less time to unload. The hub gets 2.5 hours to unload the truck, break down the cargo on mixed ULDs and build up a new ULD. The cargo must be ready for flight 2.5 hours before departure of the flight. The handling times are presented in Table 7.8.

7.4 Synthesis

In this section, the sub-research question of this chapter is answered and an overview of the observations made in this chapter are presented. The sub-research question answered in this chapter is:
3. Which stakeholders are involved in the process and which are most critical?

In this chapter an overview of the internal- and external stakeholders was given and their relation to each other. In addition the most critical actors were identified with the use of a power-interest matrix. The most critical actors (also known as key players) are: Ground Handling Agent, truckers / trucking company, central operations management, local operations management and network planning.

In addition this chapter has presented general information about the outstations in Billund and Copenhagen, constructing the basics for the current state analysis and future state analysis in the next chapters. A short list of observations discussed: opening hours, performance over 2016, context setting for future state measurements, contracted trucking times, trucking costs, handling time at the hub in Amsterdam.

8 Current State

In this chapter the current state for the cargo value chain Denmark - Amsterdam is presented. The current state is measured over the period of time before the implementation of the EGFL project, in this thesis the time period is 2016.

The sub-research questions answered in this chapter are:
4. How is the current export cargo arrival process organized?
5. What is the performance of the current cargo arrival process?
6. What is the relation between delay in cargo arrival and the acceptance procedure, trucking schedule and data communication?

These research questions will be answered by discussing the cargo value chain in chronological order, based on the 3 pillars, using the in-depth case study methodology for Billund and Copenhagen. First the acceptance process at the GHA is discussed followed by the trucking schedule and performance. Next the arrival performance in Amsterdam is presented and followed by data communication. Finally, this chapter concludes with a synthesis in which a short overview of the observations made in this chapter are presented and the sub-research questions are answered.

8.1 Acceptance Process at the GHA

This section describes the acceptance process at the GHA. This is the first step in the cargo value chain as shown in Figure 7.4. First the acceptance process for Billund will be described followed by the acceptance process in Copenhagen. Finally the observations made will be summarized. The acceptance process is analyzed by performing field research at the GHAs in Billund and Copenhagen, gathering data from systems and performing interviews as explained in Chapter 3.

8.1.1 Billund

This section describes the performance of the current acceptance procedure in Billund. The total cargo handling procedure is described including illustrations in Appendix A. Only specific observations that are for a large extend influenced by the EGFL project will be discussed in this section. First the cargo delivery is discussed followed by the performance of the current acceptance procedure in terms of the KPIs identified in Chapter 6.

Billund Cargo Delivery
The cargo is delivered by the customers / forwarders to the warehouse of the GHA. These customers have to be taken into account when implementing the EGFL program. As identified in the stakeholder analysis in Appendix C the customers must be kept satisfied. In Appendix D the booking behaviour in terms of volume of the different customers for Billund can be found. For Billund the biggest customers are based on the number of AWBs in May 2017:

1. [redacted]
2. [redacted]
3. [redacted]
4. [redacted]
5. [redacted]
6. [redacted]
7. [redacted]
8. [redacted]
9. [redacted]
10. [redacted]

The peak hours for the delivery of cargo to the GHA warehouse is between 17:00 - 21:00 [Hansen, 2017b]. The larger customers deliver freight not only for KL trucks but also for 1 of the other 200 airlines that are handled by CCB. Besides the booked cargo, cargo is also delivered ad hoc. In general it can be stated that the bigger the customers the later that they deliver their shipments [Hansen, 2017b].

Performance Acceptance Procedure in terms of KPIs Billund
When the cargo is delivered at the warehouse, the cargo is scanned and it goes through the x-ray machine to check for explosives if requested by forwarder, as explained in Section C.2.1. When the cargo is scanned, both the Freight On Hand (FOH) and the Received Cargo from Shipper (RCS) milestones are triggered. The RCS has to be triggered 30 minutes after LAT to make the cargo IQ milestone, as explained in Section 6.2.2. Often FOH and RCS have already been given before it is delivered to CCB. This is done by CCBs internal outsourcing department where they also do the warehouse handling for larger customers. The outsourcing department ensures that the packaging, AWB printing and consolidation is performed for these customers [Hansen, 2017b]. In the current state the FOH and RCS of the cargo are given in any random order. If the cargo arrives later than the LAT, CCB would contact the customer and inquire what actions to perform. If the cargo and the required documents are delayed, CCB would delay the departure of the truck until these (large) shipments have arrived [Hansen, 2017b].

Figure 8.1: Cargo IQ milestones LAT, RCS and DEP for Billund [2016] [Cargo Performance Management, 2017]

In Figure 8.1 the KPI milestones for the current state in Billund are presented. In this figure the LAT, RCS and DEP Cargo IQ milestones for Billund can be found. The average LAT performance is [redacted]. This can mean that on average only half of the cargo is delivered on time by the customers, message is not received, message is received late, cargo is re-booked to operational truck, different number of pieces, all of these deviations leads to a failure of the milestones. The difference in performance between the LAT and RCS shows that the remainder of the cargo is delivered late or not at all. The current RCS milestone has to be given 30 minutes after the LAT as shown in Figure 6.2. The average of the RCS is [redacted] showing that within 30 minutes more cargo has arrived which has met the RCS milestone, but not the LAT milestone. When the RCS status is given to the cargo the contract with the customer is signed, a promise to the customer is made and the baseline is created in Cargo IQ. From this moment onward KLM Cargo is responsible for the cargo and has to ensure that the cargo is flown as booked in baseline. In the current state it is not possible to keep this promise as the booking truck is the first truck to leave and the operational trucks all depart later, the concept of the booking truck will be explained in Section 8.2. If the cargo is incorrectly labelled, packaged or if the cargo has no booking, it is now the problem of KLM Cargo, they have to repair the package, as they have accepted the cargo.

Complete and Correct
Currently the GHA is not checking the shipment for booking, documentation, weight etc. completeness and / or correctness. There is a possibility for weighing and volume checking however in the current state this is not used for KL shipments. It might occur that a shipment is not complete, e.g. some pieces are missing and this is not notified to KLM. The cargo, especially Dangerous Goods (DG) might have incorrect or incomplete labelling or packaging. The documents are not checked for correctness and completeness. All cargo is accepted and transported to Amsterdam. In addition the cargo is randomly built on a ULD not taking into account the connection time of the shipments to the connecting flight in Amsterdam. All cargo is built, as long as it fits on the ULD. One problem that often occurs in Billund is that there are not enough ULDs. This forces the warehouse to send the cargo as bulk (loose cargo) to the hub in Amsterdam, resulting in more unloading time.

8.1.2 Copenhagen

This section describes the performance of the current acceptance procedure in Copenhagen. The total cargo handling procedure is described including illustrations in Appendix B. Only specific observations that are influenced by the EGFL project will be discussed. First the cargo delivery is discussed followed by the performance of the current acceptance procedure in terms of the KPIs identified in Chapter 6.

Copenhagen Cargo Delivery
Below the main customers delivering cargo in Copenhagen are discussed. This is the delivery performance of the cargo at the warehouse. These customers have to be taken into account when implementing the EGFL project. As identified in the stakeholder analysis in Appendix C the customers must be kept satisfied. For Copenhagen the biggest customers are based on the number of AWBs in May 2017 can be found below. In Appendix D the booking behaviour of the customers in terms of volume of shipments can be found.

1. [redacted]
2. [redacted]
3. [redacted]
4. [redacted]
5. [redacted]
6. [redacted]
7. [redacted]
8. [redacted]
9. [redacted]
10. [redacted]

Performance Acceptance Procedure in terms of KPIs Copenhagen
During the field research in Copenhagen it was discovered that the RCS is given to all shipments that arrive at the warehouse. There is no possibility to separately give FOH and RCS. As soon as the shipment is entered into the system either by X-ray scan, performed by an external party, or by the documentation staff the shipment will receive RCS. This RCS is given while no checks have been performed yet on the completeness or correctness of the shipment / documentation. This can be seen in Figure 8.2 where the RCS has an average performance of [redacted]. The other [redacted] is often due to the fact that always some cargo that is booked will not be delivered by the customer (no-show).

The small difference between the LAT and the RCS might be caused by the fact that the information is entered on a different time in the system. However this deviation is so small that it can be neglected. An interesting pattern in Figure 8.2 is that the departure drops extremely compared to the RCS. This means that of the cargo is not ready for carriage, so the warehouse can not send it to Amsterdam or that the departure of the shipment is delayed for some reason. When the RCS is given a contract with the customer is made that the shipment will be transported by KLM Cargo. However the shipment already fails on the first milestone the departure, meaning that KLM Cargo can not keep the promise that it made to the customer about the routing of the shipment. Therefore it is of utmost importance that the FOH and RCS can be separated. The FOH to inform the customer that the shipment has successfully arrived at the warehouse, but no contract (RCS), until WFS on behalf of KLM Cargo is sure that the shipment is correct and complete and thus ready for shipment.

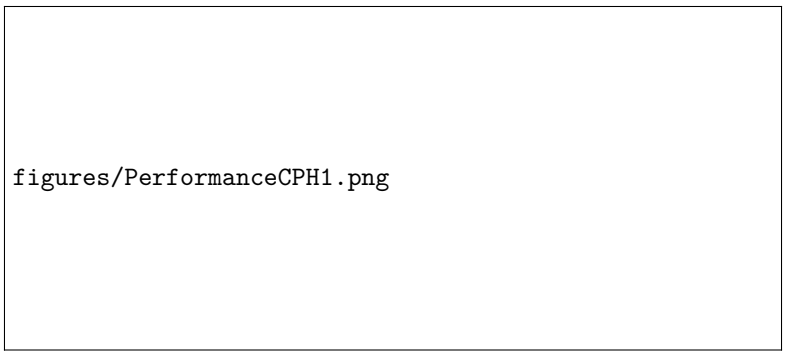

Figure 8.2: Cargo IQ milestones LAT, RCS and DEP for Copenhagen [2016] [Cargo Performance Management, 2017]

Currently all shipments are transported to Amsterdam without a thorough check of completeness and correctness causing the Amsterdam hub having to repair all deviations. Currently there is no available equipment for weighing or for determining the volume of the shipments in Copenhagen. In addition during the built up there is no difference between cargo with a short and long connection. Therefore in Amsterdam all ULDs have to be broken down to find the correct shipments resulting in extra work.

8.2 Trucking Schedule and Performance

In this section the trucking schedule is introduced and the performance of the trucking company. On the routes Billund - Amsterdam and Copenhagen - Amsterdam Jan de Rijk (JdR) is the only trucking company contracted. The trucking schedule and performance will be discussed for the two case studies Billund and Copenhagen. The current trucking schedule is first discussed, followed by the number of trucks, data availability and reporting- and departure performance from the GHA.

8.2.1 Billund

In this section the trucking departure performance is analyzed. First the bottlenecks with the current KL and MP trucking schedule are identified. Secondly, the number of trucks that departed from Billund in 2016 is analyzed on a daily, weekly and monthly basis. Finally the bottlenecks with the reporting data availability performance and the departure data availability performance are discussed.

Schedule Billund Current State

Table 8.1: Current departure schedule for KL trucks from Billund

Truck Number	**Departure Time** [Hours]	**Arrival Time** [Hours]	**Travel Time** [Hours]	**Day of the week**						
				1	2	3	4	5	6	7
KL8480	**18:00**	**07:00**	**13**						**X**	
KL8482	09:00	22:00	13			X		X	X	
KL8482	16:00	05:00	13							X
KL8484	10:00	00:00	14			X		X	X	
KL8484	15:00	04:00	13							X
KL8486	11:00	00:00	13			X				
KL8486	12:00	01:00	13						X	
KL8486	17:00	06:00	13							X
KL8488	11:00	07:00	20						X	
KL8490	**18:00**	**07:00**	**13**		**X**			X		
KL8490	**15:00**	**04:00**	**13**							**X**
KL8492	19:00	08:00	13		X					
KL8492	17:30	06:30	13						X	
KL8492	16:00	05:00	13							X
KL8494	17:30	06:30	13						X	X
KL8496	18:00	07:00	13						X	
KL8498	17:00	06:00	13	X	X	X	X	X		
KL8980	**23:05**	**12:05**	**13**	**X**	**X**	**X**	**X**	**X**		
KL8982	23:05	12:05	13	X	X	X	X	X		
KL8984	01:00	14:00	13	X	X	X	X	X		
KL8986	01:00	14:00	13	X	X	X	X			
KL8986	03:00	16:00	13						X	
KL8994	01:00	14:00	13	X	X	X	X	X		

The current trucking schedule for the KL trucks from Billund can be found in Table 8.1. This trucking schedule is taken from the data given in Cargoal. From this table it can be seen that there are many different truck numbers with different departure times, arrival times and transit times, departing on various days of the week without a repeating pattern. First of all, the travel time varies between 13, 14 and 20 hours, as shown in the fourth column in Table 8.1. Secondly several of the trucks arrive between

01:00 and 04:00 at the hub arriving in the peak hours in Amsterdam as shown in the third column in Table 8.1. Billund is a smaller station in terms of cargo volume transported per year, with only a maximum of 5 trucks departing on 1 day. Therefore the trucking schedule from Billund can be adapted to arrive outside of the peak hours in Amsterdam opposed to for example a Frankfurt station where 14 trucks can depart on one day. Therefore a larger spread of departure times can be realized based on the connection times booked, shipments already delivered to the station and transit time. However the trucking schedule for Billund still has to take into account other factors such as flight connections have to be secured, delivery patterns of customers must be honoured, opening hours must be taken into account, the transit time of FTL and LTL trucks etc. Thirdly a similar truck KL8980 departing at 23:05 on days 1-5 also has truck number KL8982, making the schedule confusing for the operational team. The booking truck is used to book the shipments and has unlimited capacity. When (almost) all cargo to be shipped is known, depending on the amount of volume the cargo is re-booked to operational trucks, which will drive to Amsterdam. Finally the KL8486 departs at 11:00 / 12:00 and 17:00 on different days of the week. The booking truck is indicated in bold in Table 8.1.

Table 8.2: Current departure schedule for MP trucks from Billund

Truck Number	**Departure Time** [Hours]	**Arrival Time** [Hours]	**Travel Time** [Hours]	**Day of the week**						
				1	2	3	4	5	6	7
MP4938	17:00	06:00	13	X	X	X	X	X		
MP4940	00:05	13:05	13	X	X	X	X	X		
MP4942	01:00	14:00	13	X	X	X	X	X		X
MP4946	18:00	07:00	13		X			X		
MP4948	18:00	07:00	13						X	

The current trucking schedule for the MP trucks departing from Billund can be found in Table 8.2. The trucking schedule is based on data provided in Cargoal. The MP trucks can either depart as separate MP trucks to Menzies or co-load with a KL truck. If cargo is available for both a KL flight and a MartinAir connection but both do not have sufficient cargo for a Full Truck Load (FTL) the KL and MP can co-load depending on the connection times in AMS. NP can decide how to co-load, co-load with either short connection times or long connection times. A co-load means that both the cargo of KLM and MartinAir is loaded in the same truck resulting in that the truck will have 2 truck numbers, but physically is the same truck. To achieve this the MP trucks must depart at the same time as the KL truck. In the MP trucking schedule it can be seen that this is not always the case. Resulting in if a co-load is requested Network Planning (NP) must manually adjust the time settings for these trucks, resulting in more manual labour. In addition all the manual labour required creates room for errors, such as forgetting the 3 hour transit time from KL to MP.

Number of Truck Departures from Billund [2016]

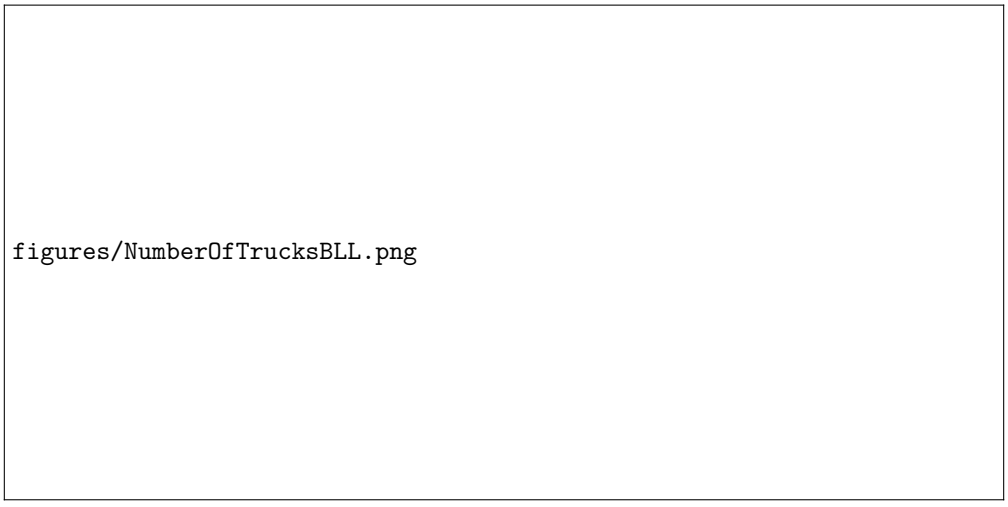

Figure 8.3: The departure of trucks from Billund to Amsterdam per day per month [2016]

The departing performance from Billund has been analyzed over 2016. In Figure 8.4 the number of trucks that have departed on a certain day in Billund can be found. Interesting to see from this pie chart is that on Sundays no trucks depart from Billund. The peak days are Tuesday and Saturday. From Figure 8.5 the total number of trucks that on average depart each month in 2016, can be found. From this graph it can be seen that July and August are the peak months for Billund in terms of truck departures. This is verified by Figure 8.3 where the number of trucks per day of the week and per month are shown. On Tuesdays and Saturdays the most number of trucks depart with a peak in July and August.

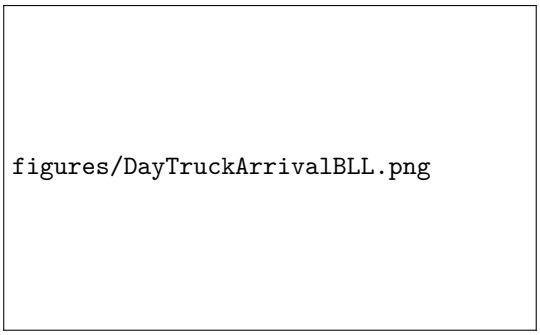

Figure 8.4: Number of truck departures per day from Billund [2016]

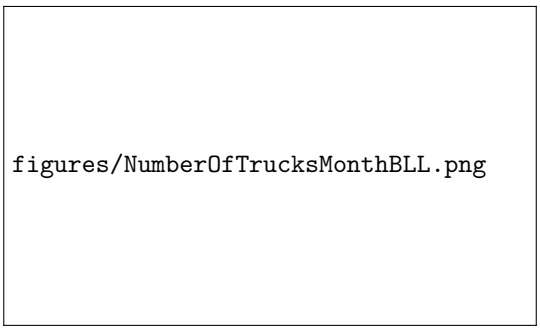

Figure 8.5: Number of truck departures per month from Billund [2016]

Reporting Data Availability and Performance

The availability of the reporting data is of importance as it provides the input information for the visibility of the KPIs. The reporting data availability by the GHA in 2016 is below average and the reporting performance of the trucker medium. For the GHA out of the [redacted] entries, only [redacted] reporting times were registered in the system (equivalent to [redacted]) and for the trucker [redacted] entries (equivalent to [redacted]). The reporting performance is of importance as the trucker has to report to the GHA 1 hour before Scheduled Time of Departure (STD) in case of ULD cargo loading and 2 hours before STD in case of loose loading (bulk cargo). If the trucker reports later the GHA may not have enough time to load the truck to allow the trucker to depart on time. To allow KLM Cargo to determine the bottlenecks in the supply chain the data gathering needs to be improved. The reporting time is important to determine the causing party in case of late arrival. For example late reporting of the truck often results in late departure of the truck and in late arrival in Amsterdam, thus the causing party is the trucker. On time reporting, late departure and therefore late arrival in Amsterdam the causing party is the GHA. On time reporting, on time departure but late arrival in Amsterdam the causing party is the trucker. As shown in Figure 8.6 the available data of the trucking performance shows that they report [redacted] of the time early, [redacted] on time, [redacted] too late and [redacted] no data.

Figure 8.6: Trucking reporting data availability based on KLM data for Billund [2016]

Figure 8.7: Trucking departure data availability based on KLM data for Billund [2016]

Departure Data Availability and Performance

The availability of the departure data is of importance as it provides the input information for the visibility of the KPIs. The departure data availability of the trucks departing from the GHA in 2016 is [redacted] entries equivalent to [redacted]. The departure performance of the trucks is [redacted] entries equivalent to [redacted]. In Figure 8.7 it can be seen that the trucks departs [redacted] of the time early, [redacted] on time, [redacted] too late and [redacted] no data. There is a correlation between the late reporting and the late departure. Often when the trucker reports late the slot time at the GHA will be gone and the trucker needs to wait for a new slot time, thus will depart later than planned.

In Figure 8.1 the DEP performance based on the Cargo IQ milestones can be found, on average the on-time departure performance of Billund is [redacted] as was also seen in the statistics above. So both the data on truck-level and on shipment level indicate that there is an improvement to be gained in the departure at Billund. The main reason why the departure from Billund is so low is due to the fact that no data automatically means a failed milestone. Another reason is that the DEP performance from Billund is measured on the booking truck. In the current schedule the booking truck is only there for the booking of the cargo and therefore has unlimited capacity. The cargo is re-booked by NP to the operational trucks always departing at the same time or later than the booking truck. Therefore even if the truck departs according to schedule it is measured as late because the booking truck has the earliest departure. The booking truck is indicated in bold in Table 8.1.

8.2.2 Copenhagen

In this section the trucking departure performance is analyzed. First the bottlenecks in the current KL and MP schedule are identified. Secondly the number of trucks that departed from Copenhagen in 2016 are analyzed on a daily, weekly and monthly basis. Finally the bottlenecks with the reporting data availability, performance and the departure data availability performance are discussed.

Current Trucking Schedule in Copenhagen

The current trucking schedule for the KL trucks from Copenhagen can be found in Table 8.3. The trucking schedule is based on data provided in Cargoal. From the table it can be seen that there are 2 booking trucks, the KL8470 departing on days 1-5 with a different departure time on day 5 and the KL8460 departing on day 6. Several operational trucks are connected to each booking truck (connected to the KL8470: KL8472, KL8474, KL8476 and KL8478 and connected to the KL8460: KL8462, KL8464 and KL8468). However each of the operational trucks departs later than the booking truck, therefore by default failing the departure milestone. This could be one of the reasons why the departure milestone is so low in Figure 8.2. In addition the schedule is unclear as the KL8468 truck can depart on all days 1-7, however the booking truck is only available on day 6. This means that only bookings can be made for day 6, why have an operational truck on the other days? Also, the KL8468 truck can depart on Sundays, when there are no truck departures from Copenhagen as determined in Figure 8.9. The operational trucks related to the KL8470 can depart on day 6, while the booking trucks are only for day 1-5. Finally, different truck numbers are departing at the same time, can lead to confusion with the operational staff.

Table 8.3: Current departure schedule for KL trucks from Copenhagen

Truck Number	**Departure Time** [Hours]	**Arrival Time** [Hours]	**Travel Time** [Hours]	**Day of the week**						
				1	2	3	4	5	6	7
KL8460	**15:00**	**06:00**	**15**						**X**	
KL8462	15:00	06:00	15						X	
KL8464	16:00	07:00	15						X	
KL8468	17:00	08:00	15	X	X	X	X	X	X	X
KL8470	**23:00**	**14:00**	**15**	**X**	**X**	**X**	**X**			
KL8470	**00:00**	**15:00**	**15**					**X**		
KL8472	23:00	14:00	15	X	X	X	X	X	X	
KL8474	01:00	16:00	15	X	X	X	X	X		
KL8476	01:00	16:00	15	X	X	X	X	X	X	
KL8478	02:00	17:00	15	X	X	X	X	X	X	

The current trucking schedule for the MP trucks departing from Copenhagen can be found in Table 8.4. The trucking schedule is based on data provided in Cargoal. The MP trucks can either depart as individual MP trucks or as a co-load with a KL-truck. If cargo is available for both KL and MP, but neither is sufficient to fill a total truck, a co-load is possible to save on costs. Both the KL and MP cargo will be loaded on the same truck, but the truck will have 2 truck numbers. The MP truck must depart at the same time as the KL truck in this case. Manually adjusting the truck STD and Scheduled Time of Arrival (STA) is extra work for NP and prone to human error. Arriving in Amsterdam, the truck will first unload the KL cargo. Next the truck will drive to Menzies and unload the MartinAir cargo. The trucker will get 3 hours extra time to perform this extra detour and for unloading.

Table 8.4: Current departure schedule for MP trucks from Copenhagen

Truck Number	**Departure Time** [Hours]	**Arrival Time** [Hours]	**Travel Time** [Hours]	**Day of the week**						
				1	2	3	4	5	6	7
MP4950	21:00	13:00	16	X	X	X	X	X	X	
MP4952	00:00	15:00	15	X	X	X	X	X		
MP4954	00:30	16:30	16	X	X	X	X	X	X	X
MP4958	15:00	06:00	15						X	

Number of Truck Departures from Copenhagen in 2016

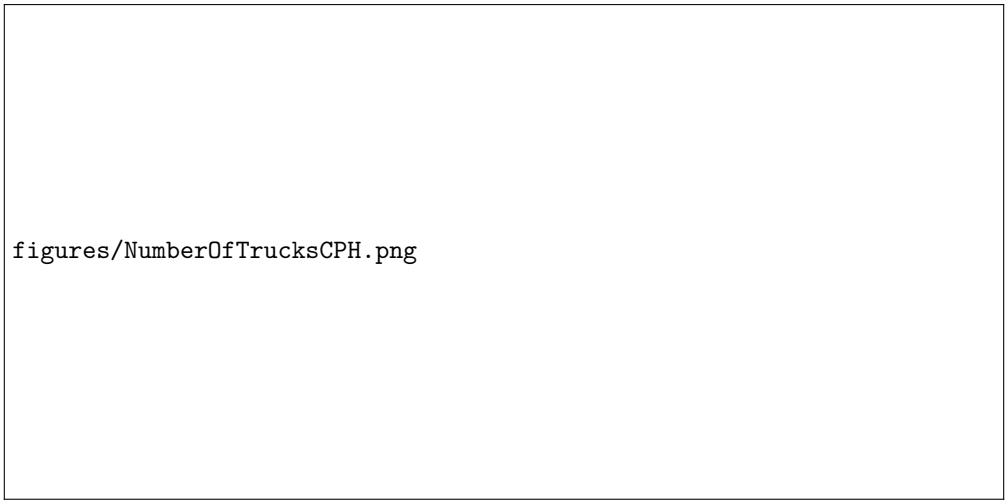

Figure 8.8: The departure of trucks from Copenhagen to Amsterdam per day per month [2016]

The departing trucks from Copenhagen have been analyzed over 2016. In Figure 8.9 the number of trucks that have departed on a certain day of the week from Copenhagen can be found. Based on these figures it can be concluded that Saturday is the peak day for Copenhagen and on Sunday no trucks depart. In Figure 8.10 the total number of trucks departed in each month can be found. From this graph it can be concluded that July and October are the peak month for Copenhagen followed by November and December. This is verified by Figure 8.8 where the total overview of truck departures per day per month is shown. The green high bars indicate the peak departure on Saturdays and the peak months are October and November.

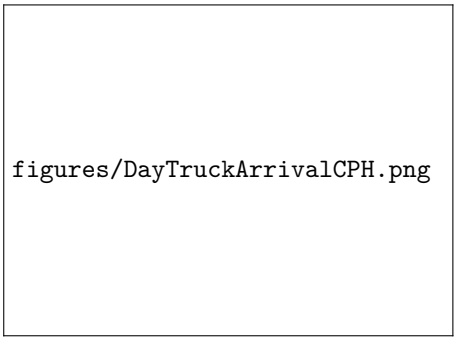

Figure 8.9: Number of truck departures per day from Copenhagen [2016]

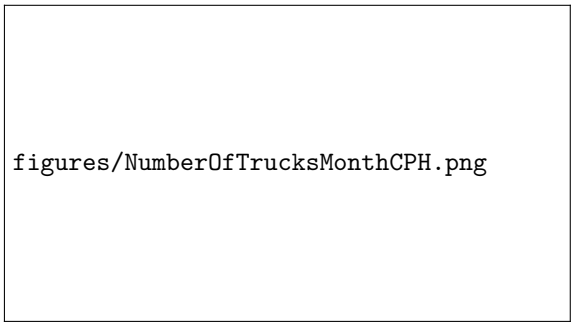

Figure 8.10: Number of trucks departures per month from Copenhagen [2016]

Reporting Data Availability and Performance

The availability of the reporting data is of importance as it provides the input information for the visibility of the KPIs. The reporting data availability describes how often the reporting data is correctly and completely communicated by the GHA. The trucker has to report at the GHA at least 1 hour in advance for ULD loading and 2 hours in advance for bulk cargo loading. It is of significant importance that this data is communicated to evaluate the performance of JdR and of the GHA. If a truck departs late it has to be evaluated who was the causing party to allow room for discussion with this stakeholder. If structural bottlenecks occur this should be visible in the data to discuss with the stakeholder which structural changes can be made to improve the supply chain. The reporting time is both reported by the GHA and the trucker. In 2016 the GHA entered the reporting time [redacted] out of the total [redacted] trucks, equivalent to [redacted]. The problem with [redacted] no available data is that no structural issues can be determined. It is not possible to determine if there are structural issues or just bad performance. In Figure 8.11 it can be seen that the trucker reported [redacted] early, [redacted] on time and [redacted] late.

Figure 8.11: Trucking reporting data availability based on KLM data for Copenhagen [2016]

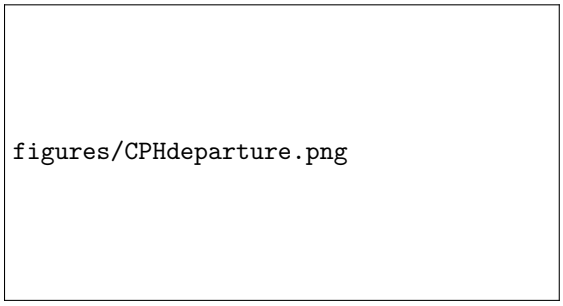

Figure 8.12: Trucking reporting data availability based on KLM data for Copenhagen [2016]

Departure Data Availability and Performance

The availability of the departure data is of importance as it provides the input information for the visibility of the KPIs. The departure data availability performance describes how often the departure data is correctly and completely communicated by the GHA. On time departure is important if the shipments loaded on the truck have short connection times to the connecting flight in Amsterdam. The departure performance is determined based on the scheduled time of departure (STD) opposed to the actual time of departure (ATD). The GHA has reported [redacted] out of the [redacted] trucks equivalent to [redacted]. In Figure 8.12 it can be seen that the truck departs on average [redacted] early, [redacted] on time, [redacted] late and [redacted] unknown. With the available data a correlation can be found between late reporting and late departure.

8.3 Arrival at the Amsterdam Hub

The arrival performance at the Amsterdam hub is discussed in this section. Including the arrival times of the trucks from Billund and Copenhagen and the percentage of trucks that arrive on time according to the Cargo IQ milestones. In addition the performance of trucking company JdR is discussed. On the routes Billund and Copenhagen JdR is the only trucking company contracted. JdR has a contracted transit time with KLM Cargo in which they have to transport the cargo from Billund and Copenhagen to Amsterdam. The agreed arrival performance with JdR is [redacted] of the trucks to arrive before or on the scheduled time of arrival in Amsterdam. Their arrival time at the hub is of importance to ensure that the hub has enough time to process the delivered cargo to make it's scheduled connecting flight on time.

8.3.1 Acceptance Procedure Amsterdam

The acceptance procedure at the hub in Amsterdam is outside the scope of this master thesis as indicated in Figure 2.3. However the requirements of the hub must be taken into account. The hub requires 5 hours to handle the cargo that is delivered by the trucks as shown in Table 7.8. 3 Types of cargo can be delivered to the hub; loose (bulk) cargo, mix ULD or T-ULD. Bulk cargo requires the most work as bulk cargo must be unloaded item by item out of the truck to the storage location and be build up on a ULD. If a mixed ULD is delivered the hub, the ULD can be retrieved at once from the truck, be broken down, the individual shipments stored at the correct location and a new ULD has to be build up with all shipments for the same destination. If a T-ULD is delivered at the hub the ULD can directly go to the storage location on the roof of the hub and is collected when needed for aircraft loading. Therefore the hub prefers T-ULDs and otherwise mix ULDs to minimize the time at the (un-)loading docks. As stated in Figure 8.13 the hub can handle on average 6 export trucks per hour, taking into account the other trucks, only if ULDs are used. Unloading bulk cargo takes much longer.

The hub has 5 hours to accept, break down and build up the ULDs to make the scheduled connecting flights. Current problems that are encountered are that shipments with a short connection time are not build up on 1 mixed ULD, but are spread over several ULDs. The hub must therefore break down all ULD to retrieve the shipments with short connection times also labelled as 'hot' shipments. If all 'hot' shipments would be located on the same ULD and the shipments with longer connections on the same ULD called 'cold' shipments this would release the hub of additional work as only the 'hot' ULD has to be broken down and the 'cold' ULD can be broken down at a later, more convenient time.

The trucks are serviced based on their arrival. The current handling process is First In First Out (FIFO). This handling process does not take into account the STA of the truck. If a truck would arrive too late but still before the truck that arrives on time, the late truck would first be serviced before the on time truck. As the late truck takes the slot of the on time truck, the on time truck becomes a late truck (creating the possibility of the shipments to miss their connecting flight).

Another problem that is encountered at the hub is that cargo without a booking is send to Amsterdam from the GHAs. Cargo without a booking is not known in the systems of KLM and the hub does not know what to do with the shipment. Currently all shipments are accepted at the GHA, if the packaging or documentation is incorrect, the hub will repair the shipments resulting in more repair work, which is not billed to the customer and might cause that the shipment might miss the flight.

8.3.2 Scheduled Truck Arrival Trends

The actual overall spread of the scheduled arrivals and the spread of the actual arrivals of all trucks arriving at Amsterdam can be found in Figure 8.13. The green line represents the spread of the actual arrivals. These figures show that the peak of the arrivals in Amsterdam is between 02:00 - 04:00 am. The hub can handle 6 trucks per hour, due to unloading equipment availability, as is indicated by the red line. In an ideal situation the arrival would be spread equally over the day with 6 trucks per hour. As described in Chapter 4 the customers and delivering trucks often arrive close to the departure time of the flight [Ou et al., 2010]. Creating congestion at the hub for unloading trucks. This can also lead to more efficient man power planning. The cargo can also miss the flight. Therefore it is of utmost importance that the arrival time of the trucks from outstations in Europe is spread evenly over the day.

The truck arrivals, measured on truck level, from Billund and Copenhagen are tracked in the systems of KLM Cargo. KLM Cargo currently works with a system named smartloxs which allows the driver to scan his card, at which time a time stamp will be given of his arrival. The smartloxs time stamp so far is only implemented in Amsterdam and still manually needs to be connected to the corresponding truck number. The time stamp of smartloxs is coupled to the KL number and afterwards the Actual Time of Arrival (ATA) is entered in cargoal. This way the hub measures the arrival of the trucks. The trucking companies, in this case JdR have their own measurement system. The truck driver will enter the arrival time in the board computer. In addition GPS data is used to pinpoint truck locations. Based on these systems the arrival performance at Amsterdam can be determined.

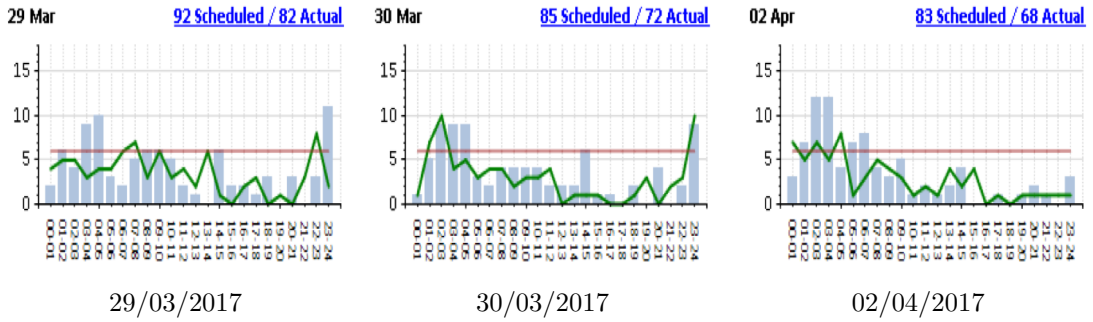

Figure 8.13: Scheduled vs. actual truck arrival trend in Amsterdam displayed for various days

Below for 2016 the data has been analyzed regarding the arrival performance from Billund and Copenhagen. The raw data obtained from the KLM system first must be edited. Some of the arrival data is not registered and therefore the data has to be filtered on the available data. The next step to improve the data is to filter out co-loads. Co-loads are trucks that are combined KLM (KL) and MartinAir (MP) cargo in 1 truck as explained in Chapter 7. Therefore two truck numbers are used and registered in the KLM system, while it is only one physical truck resulting in the double entries having to be filtered from the data. Finally the Direct Pick Up (DPU) trucks, trucks that directly collect cargo from customers with large volumes in cargo, have to be removed from the data. The cargo from DPUs is not consolidated at a GHA. DPU cargo is entering the KL network as export in Amsterdam instead of in Billund or Copenhagen. Due to the fact that the GHA at origin is eliminated from the value chain for the DPU cargo, all the cargo checks have to be performed in Amsterdam. This saves handling costs per kg at the origin but the DPU cargo is delivered loose, which is not a preferred way of delivery to Amsterdam.

8.3.3 Billund

In this section the performance of trucks originating from Billund is presented. First the arrival spread of the trucks in Amsterdam is shown, secondly the availability of arrival data and performance is presented. Next, the arrival performance in terms of the KPIs is presented. Finally the connecting flights for cargo originating from Billund are identified.

Arrival spread

Figure 8.14 shows at which times the trucks originating from Billund arrived at Amsterdam during 2016. A high peak can be seen around 12:00 pm, starting around 10:00 am and ending at 14:00 pm. The average arrival time as measured by KLM Cargo is 11:39 am and as measured by JdR 11:06 am. Of the [redacted] trucks KLM Cargo reported [redacted] ATAs [redacted] and JdR reported [redacted] ATAs [redacted]. Comparing Figure 8.13 with Figure 8.14 it can be concluded that the trucks from Billund arrive outside the peak hours in Amsterdam (identified in Section 8.3 to be between 02:00 am - 04:00 am), thus contributing to the spread of scheduled truck arrivals.

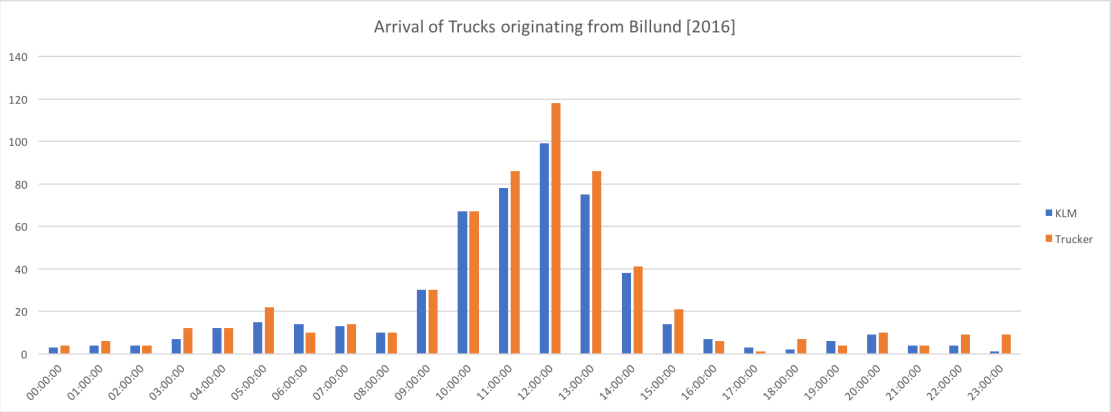

Figure 8.14: The actual time of arrival of trucks from Billund in Amsterdam [2016]

Data Availability and Performance

The arrival performance on truck level from Billund in Amsterdam is shown in Figures 8.15 and 8.16. In Figure 8.15 the ATA versus the Scheduled Time of Arrival (STA) in Amsterdam is shown. Due to uncontrollable circumstances such as traffic jams, bridges, ferries etc. the trucking time often varies. The ordered transit time by KLM Cargo, depending on the type of truck are explained in Table 7.8. It can be concluded that almost [redacted] of the trucks arrives earlier than STA and [redacted] arrives too late. The contracted arrival performance with JdR of [redacted], is not achieved. In Figure 8.17 the arrival performance on shipment level was [redacted]. Suggesting that not all trucks are filled with an equal amount of AWBs.

In Figure 8.16 the arrival performance can be divided into early (more than 15 minutes earlier than STA), on time (between 15 minutes too early and 15 minutes too late) and late (15 minutes or more than STA). The arrival performance of JdR is approximately [redacted] of the time early, [redacted] on time and [redacted] too late. The performance (consisting of early and on time arrival) is [redacted] and the unknown arrivals (unregistered arrivals) account for [redacted]. The arrivals are unknown due to the fact that the arrival time stamps are not assigned to a truck or wrongly assigned (driver did not have a smartloxs card, system didn't work, time stamp was not correctly registered etc.). The required contracted arrival performance of JdR is [redacted] and this is not achieved. If the cargo arrives early in Amsterdam the hub has more time to process the cargo as the connection time (CT) of the cargo (the time until the flight departs) is longer. If the cargo arrives too early the priority is lower and it might be forgotten. If the cargo arrives too late at the hub does not have enough time to process the cargo and the connecting flight can't be made. From these statistics it can be concluded that the reliability of the arrival of cargo should be improved to reduce costs as discussed in literature by [Savelberg and Bakker, 2010] in Chapter 4.

figures/BLLATAvsSTA.png

Figure 8.15: Billund - actual time of arrival vs. scheduled time of arrival [2016]

figures/BLLArrivalAMS.png

Figure 8.16: Billund - arrival performance in Amsterdam [2016]

Arrival Performance in terms of KPIs

Cargo IQ is developed by IATA (the International Air Transport Association) as a system for the planning of cargo shipments and the performance monitoring of these shipments based on common business process and milestone definitions [International Air Transport Association, 2017b]. The Cargo IQ measurements are based on shipment level. These milestones are measured against the baseline of the booking truck. The baseline is created at the moment 'Received Cargo from Shipper' (RCS) is given on a shipment. If a truck arrives later than the baseline arrival time in Amsterdam, the truck will be recorded as late as well as all shipments on the truck. The Cargo IQ milestones for Billund, on a monthly basis are shown in Figure 8.17.

Figure 8.17: Performance of CargoIQ milestones ARR, RCF and DEP milestones for Billund [2016] [Cargo Performance Management, 2017]

The milestones in Figure 8.17 show the average arrival performance of the trucks from Billund for each month from March 2016 - March 2017 based on shipment level. From the statistics it can be seen that the Arrival (ARR) in Amsterdam is on average [redacted]. Equivalent to stating that 1 in 2 trucks arrives later than planned on the hub in Amsterdam. This can also be seen in the left statistics (ARR) in Figure 8.17. This figure shows for the equivalent months the number of AWBs that arrived late in Amsterdam, almost half of the AWBs is received late. The main reason why the arrival in Amsterdam from Billund fails [redacted] of the time is due to the fact that the performance is measured compared to the booking truck, the baseline is based on the booking truck. In the current schedule the booking truck is only there for the booking of the cargo and therefore has unlimited capacity. The cargo is re-booked by NP to the operational trucks, which always depart at the same time or later than the booking truck, as can be seen in the trucking schedule presented in Table 8.1. Therefore by default the 2nd truck fails even if all goes as ordered by NP. All changes to the schedule made by NP by default will fail on baseline. For example, if the schedule was FTL and by ordering an LTL by default the arrival will fail, as LTL has 4 more hours for STA as presented in Table 7.8.

The second performance milestone that can be seen in Figure 8.17 is the RCF. When the RCF is given it means that the cargo has arrived in the cargo bay at the final destination of trucking, so RCF is given at the hub meaning that the air way bill (AWB) and the cargo are both administratively received in the system. The RCF has almost equivalently low performance as the ARR.

An interesting turn of events is the performance milestones of the departure (DEP) from Amsterdam (by flight) showing a sudden increase in the statistics. The third statistics in Figure 8.17 shows an average of [redacted]. The reason behind this increase is that the sales department in the Nordics adds an extra [redacted] hours on each booking to ensure that the cargo can make it's connecting flight. In their experience, the performance of the GHA, trucker and / or the hub is not reliable and to ensure that they can sell a presentable reliability statistics to the customers they add an extra [redacted] hours to each of the bookings. Within [redacted] hours the delayed cargo will arrive at the hub and therefore [redacted] of the cargo will depart as scheduled. The need of the sales department illustrates the need for an improved arrival performance at the hub. By structurally improving the arrival performance and quality of completeness and correctness of the cargo, the minimum of 5 hours connection time can be made and it is no longer need to add an extra [redacted] hours to each booking, but CSO can offer customers actual reliability statistics.

Connecting Flights

The connecting flights are the flights that the shipments are booked on, to continue their journey. Each segment of the shipment journey is called a 'leg', so the next leg. For both Billund and Copenhagen an overview is made of the top 10 destinations including flight number, the destination, the weight that have been transported over a week and the departure time of the flight. In Table 8.5 the top 10 destinations for Billund can be found. The connecting flights will be used in Chapter 9 to design the new trucking schedule for Billund.

Table 8.5: Top 10 connecting flights for cargo from Billund

Billund				
Top 10 destinations	**Flight numbers**	**Destinations**	**Weight [kg]**	**DEP time flight**
1	[redacted]	[redacted]	[redacted]	17:20
2	[redacted]	[redacted]	[redacted]	15:20
3	[redacted]	[redacted]	[redacted]	21:30
4	[redacted]	[redacted]	[redacted]	10:00
5	[redacted]	[redacted]	[redacted]	10:00
6	[redacted]	[redacted]	[redacted]	10:25
7	[redacted]	[redacted]	[redacted]	10:35
8	[redacted]	[redacted]	[redacted]	10:00
9	[redacted]	[redacted]	[redacted]	17:30
10	[redacted]	[redacted]	[redacted]	21:05

8.3.4 Copenhagen

In this section the performance of trucks from Copenhagen is presented. First the arrival spread of the trucks in Amsterdam is shown, secondly the availability of arrival data and performance is presented. Finally, the arrival performance in terms of the KPIs determined and finally the connecting flights are identified.

Arrival Spread

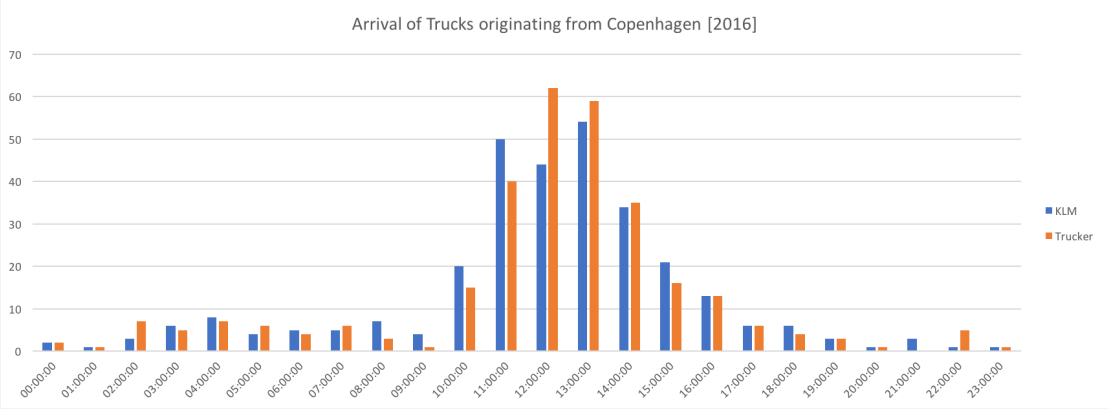

Figure 8.18: The actual time of arrival of trucks from Copenhagen in Amsterdam [2016]

Figure 8.18 shows at which times the trucks originating from Copenhagen arrived in Amsterdam during 2016. The peak is around 12:00 pm, starting around 11:00 am and ending around 14:00 pm. The average arrival time as measured by KLM Cargo is 12:27 pm and measured by JdR 12:26 pm. Of the 525 trucks KLM Cargo registered 417 ATAs [redacted] and JdR reported 488 ATAs [redacted]. Comparing Figure 8.13 with Figure 8.18 it can be concluded that the trucks from Copenhagen arrive outside the peak hours in Amsterdam (identified in Section 8.3 to be between 02:00 am and 04:00 am), thus contributing to the spread of scheduled truck arrivals.

Data Availability and Performance

The arrival performance of the trucks from Copenhagen in Amsterdam is shown in Figures 8.19 and 8.20. In Figure 8.19 the exact amount of early or late arrival of the trucks can be found, also known as the ATA vs. STA. From Figure 8.20 it can be seen that about [redacted] of the trucks arrive early, [redacted] on time, [redacted] too late and [redacted] is unknown. Concluding, [redacted] of the trucks arrive according to the STA, therefore it can be stated that the arrival performance of JdR does not meet the contracted STA of [redacted].

Figure 8.19: Copenhagen - actual time of arrival vs. scheduled time of arrival [2016]

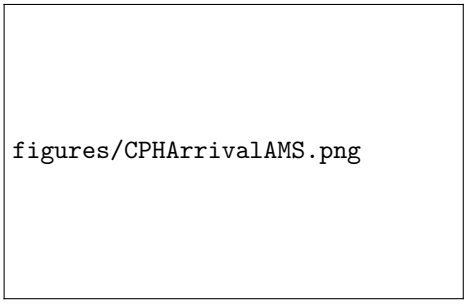

Figure 8.20: Copenhagen - arrival performance in Amsterdam [2016]

Arrival Performance in terms of KPIs

The statistics in Figure 8.21 show the ARR (arrival), RCF (received cargo from flight) and DEP (departure) performance of cargo from Copenhagen for the period of March 2016 - March 2017. The performance of the arrival of cargo from Copenhagen is better than the performance of Billund, on average around [redacted]. The RCF is a few percentages higher but almost equivalent and again the DEP increases significantly compared to the ARR to an average of [redacted]. The possibility to increase the DEP compared to the ARR again is due to the fact that the sales department, which is the same for Billund and Copenhagen adds [redacted] hours to each booking to ensure that the cargo can make the connection the the flight that it is booked on.

Figure 8.21: Performance of CargoIQ milestones ARR, RCF and DEP milestones for Copenhagen [2016] [Cargo Performance Management, 2017]

Table 8.6: Top 10 connecting flights for cargo from Copenhagen

Copenhagen				
Top 10 destinations	**Flight numbers**	**Destinations**	**Weight [kg]**	**DEP time flight**
1	[redacted]	[redacted]	[redacted]	15:25
2	[redacted]	[redacted]	[redacted]	09:50
3	[redacted]	[redacted]	[redacted]	09:40
4	[redacted]	[redacted]	[redacted]	11:20
5	[redacted]	[redacted]	[redacted]	17:20
6	[redacted]	[redacted]	[redacted]	13:20
7	[redacted]	[redacted]	[redacted]	12:35
8	[redacted]	[redacted]	[redacted]	14:40
9	[redacted]	[redacted]	[redacted]	12:25
10	[redacted]	[redacted]	[redacted]	12:50

In Table 8.6 the top 10 destinations for Copenhagen can be found. The connecting flights will be used in Chapter 9 to design the new trucking schedule for Copenhagen. Currently the trucking schedule for Copenhagen is not based on the connecting flights.

8.4 Data Communication

In this section the data communication in Amsterdam, Billund and Copenhagen is discussed. The data communication is one of the 3 pillars on which the EGFL project is evaluated. The data communication is discussed based on communication between data systems but also the interaction between actors and parties.

8.4.1 Amsterdam

The truck arrives at the hub and the trucker will scan his identify card at the smartloxs station. It seems like an automated process however the truck number must still manually be connected to the smartloxs system and is therefore vulnerable for human error (e.g. wrong truck number, wrong date, system not operational) [Asselman, 2017b]. Following if it is a secured truck a time and an unloading dock will be assigned. If it is an unsecured truck, the truck has to wait at the Remote Explosive Scent Tracking (REST) department for an air sample to be taken to ensure that no explosives are present in the truck.

According to [de Nooijer, 2017] [redacted] of the air waybills (AWBs) need to be re-entered and corrected at the hub. This is a tremendous inefficiency which needs to be solved at the root cause. If information is incorrect or incomplete on the AWB, customs in the country of destination might reject the shipment, fine the carrier and a new AWB has to be generated before the shipment can continue on the journey, creating tremendous delay for the shipments. Deviations in the weight, volume, labelling, temperature, packaging are all communication problems which are now seen at the hub. If there is a larger weight or volume, this might have a significant effect on the load and balance of the aircraft, however this is not known in advance and the symptoms have to be solved on the spot. In addition the customers are not charged for the extra weight and volume that they are transporting. The deviations are not communicated in advance by the GHA, as they do not have the opportunity to send an updated FWB, called an FWB'.

Currently only limited communication takes place between the different actors in the cargo value chain. First of all, the customer is not involved in the process. The delivery of the cargo and documents too late, incomplete or incorrect is troublesome for the rest of the supply chain. However this is not communicated to the customer and therefore they are not aware that they cause problems further on in the chain. As the incomplete and incorrectness of shipments needs to be repaired the carrier is unable in the limited time to ensure that the shipment makes the connecting flight resulting in low reliability statistics. The customer will complain that KLM Cargo is unable to deliver what is promised. However if KLM would communicate with the customers what is expected of them and that they are causing the problems in

the chain themselves a joint solution can be generated. The second party in the chain, the GHA is only limited involved in the communication along the supply chain. The GHA's customer is KLM cargo and therefore their aim is to handle the shipments as fast as possible, to ensure that the shipments make their flight. However by not ensuring that the shipment is correct and complete they move the problem to the Amsterdam hub, whereas their aim was to 'help' the hub by sending the shipment as fast as possible. Another example is that the GHA delays the trucks to ensure that a customer can make the truck and that the cargo is still transported to Amsterdam. However by delaying the truck they don't know that all the other shipments on the truck that were on time will miss their flight as well. Finally the trucking company is also not involved in the communication. The trucking schedule is not based on the connecting flights, not based on the import trucks, it is based on what was convenient for everyone at that time [Camoenie, 2017]. The trucks often depart late as the truck is not finished with the import transportation or a delay on the way has taken place. The truckers are unaware that it is important that they report at the required time and place as a loading slot is reserved for them at the GHA. Concluding it could be stated that there is no systematic feedback loop in the cargo value chain. This is not always possible as (correct) data is not collected by KLM Cargo.

8.4.2 Billund

Cargo Center Billund experiences several problems with regard to data communication [Hansen, 2017b]. The communication with NP is limited. As FBLs are not sent frequently enough the GHA just accepts all cargo without checking if a booking is present. They will enter the AWBs in their own system and send an FOH and RCS to the customer. The departure of KLM trucks is in their peak hours so they do not have enough time to perform all required (extra) checks for KLM. Often then the truck details such as height and license number are unknown to the GHA, as they are not correctly communicated by NP. Therefore the GHA does not know which truck is correct for KLM and the height that they can built the ULD. This results that the ULD sometimes has to be broken down last minute and that the remaining cargo is loaded as bulk in the truck.

CCB works with Elwis, a Lufthansa system, which not always allows for all functionalities that KLM Cargo requires. CCB will send a FWB' is they encounter information that had to be adjusted regarding the shipment. However KLM pays for the FWB' but does not allow the KLM systems to be updated with this information, therefore this information is lost, while it costs KLM extra. There is no clear communication with the GHA which party is responsible for which action. Therefore the GHA attempts to solve all problems encountered to their best knowledge. Deviation reports are send to NP in their own format, only stating the AWB number, truck number, date and a small description of the discrepancy.

CCB has limited manpower. As employees are very expensive in Denmark they have limited and very expensive employees. Not all employees know how to handle the KLM systems. All airlines work with a different system and each airline might have multiple systems, KLM already has 7. Therefore many systems have to be learned by the employees, resulting in complications. In addition all entries must be done manually in the system. Therefore the data is prone to human error, such as incorrect date, time etc. Also entries might be forgotten, see as an example the reporting performance in Figure 8.6.

Finally there is no clear overview on the actual information of the GHAs. In the systems there is still old data, such as the opening hours and old trucks. Faulty opening hours result in the system of KLM, that the CargoIQ milestones will fail by default as the warehouse is closed. Concluding it could be stated that there is no structural feedback to the GHA only occasionally when something is encountered by accident.

8.4.3 Copenhagen

Worldwide Flight Services, the GHA in Copenhagen, experiences many problems with regard to data communication as well [Hansen, 2017a]. The first and foremost major problem at WFS is that they have one way of operating and this is standardized for all airlines. They have been operating this way for 11 years and no structural exceptions will be made. The FOH and RCS in their system is systematically given at the same time and can not be given separately as they do not have scanners available in the warehouse to perform this action. In combination with their data communication this provides a major problem. As shipments with RCS can not be re-booked by CSO the shipments must be re-booked by NP. However it is unclear for WFS who is the correct department to communicate to, when a rebooking is needed.

Other communication problems that are encountered is that information is unknown, such as the height of the truck, truck license number. If a truck will arrive late, this is not communicated to WFS, they have to wait until the truck arrives, making their internal planning complicated. The FBLs providing information on shipments are not send frequently enough, which results in that last minute bookings often miss the truck or flight as they were not stated on the previous FBL and no deviation report is generated for this missed shipment, resulting in lost shipments. The deviation reports have to be filled in manually and are sent in the standard format of WFS, deviating from the standard format requested by KLM. Therefore often information on the deviation report is missing resulting in extra work at the hub. Information that is updated by WFS is sent to the hub, but is rejected as the KLM system will not accept the updates from an unauthorized station. Valuable information is therefore lost.

WFS occasionally enters the EHCs in the system allowing the entire value chain to be able to find the deviations of that shipment. WFS is one of the few stations already performing this service. However the EHCs as well as the reporting time and departing time have to be manually inserted in the system allowing human error to occur.

8.5 Synthesis

In this section, the sub-research questions of this chapter are answered and an overview of the observations made in this chapter are presented. The sub-research questions answered in this chapter are:

The sub-research questions answered in this chapter are:
4. How is the current export cargo arrival process organized?
Within the system boundaries of this project the current export cargo arrival process in Amsterdam is organized as follows: first the GHA accepts the cargo, followed by JdR transporting the cargo to Amsterdam where the cargo has a certain arrival performance depending on the performance of the cargo value chain activities previously executed.

5. What is the performance of the current cargo arrival process?
The contracted cargo arrival performance with JdR is [redacted]. However for Billund this performance over 2016 is [redacted] on time or early, [redacted] too late and [redacted] of the data is unknown. For Copenhagen the performance for 2016 is [redacted] on time or early, [redacted] too late and [redacted] of the data is unknown. The performance is not even close to the contracted arrival performance of [redacted], resulting in shipments missing their scheduled connecting flights.

6. What is the relation between delay in cargo arrival and the acceptance procedure, trucking schedule and data communication?
The acceptance procedure, trucking schedule and data communication are the 3 pillars on which the EGFL project is analyzed and these all contribute to the quality of the arrival performance. They take place earlier in the cargo value chain and therefore their performance influences the arrival performance. For the acceptance procedure, the on time delivery of cargo, ensuring that the cargo and documents are complete and correct and accepting the cargo are important checks. Following the reporting and departure time of the trucking company is vital to the trucking performance. In addition the data communication is needed to inform all the different parties in the supply chain with information and data needs to be entered in the systems to identify structural issues. Currently many of above named issues are not executed correctly and therefore the EGFL project is designed.

Next the different bottlenecks / improvements identified for Amsterdam, Billund and Copenhagen are listed. These bottlenecks have to be taken into account when implementing the EGFL project.

8.5.1 Amsterdam

As described in Chapter 4 one of the scientific gaps identified by [Feng et al., 2015] was that almost no research has been performed on the 'air cargo supply chain coordination'. In this chapter the general current state was discussed, providing an example to the literature how the current supply chain is organized and the bottlenecks involved. The current state is analyzed for Billund and Copenhagen using an in-depth case study. The findings for the arrival in Amsterdam are:

1. **Trucking Schedule** The trucks do not arrive in the peak hours at Amsterdam.
2. **Trucking Schedule** Only [redacted] of the trucks arrive on time from Billund and [redacted] from Copenhagen opposed to the contracted arrival performance of [redacted] with JdR.
3. **Performance**: CargoIQ milestones for both Billund and Copenhagen are lower than is demanded by the customers. To remain competitive the quality of transportation and therefore the performance has to increase.
4. **Acceptance Procedure**: The hub promises 5 hours of handling time but due to the repair procedures that have to be performed on the shipments 5 hours is often not achieved.
5. **Acceptance Procedure**: Due to the late arrival of trucks and repair processes at the hub cargo often misses the flight. To keep customers satisfied CSO in Copenhagen adds [redacted] hours of booking to each of the shipments, resulting in very long connection times from Billund and Copenhagen.
6. **Acceptance Procedure**: Bulk cargo is extra work for the hub, therefore the aim is to deliver more T-ULDs and Mix-ULDs.
7. **Acceptance Procedure**: ULDs are not build up 'hot' and 'cold' connection times combined on 1 ULD, resulting in more break down work at the hub.
8. **Acceptance Procedure**: First In, First Out (FIFO) servicing of the trucks at the hub, resulting in on time trucks to be delayed.
9. **Acceptance Procedure**: Cargo is received incomplete, incorrect and without a booking, delaying the handling procedure at the hub.
10. **Data Communication**: Smartloxs not working optimally and still needs to be manually coupled, risking human errors.
11. **Data Communication**: [redacted] of AWBs have to be re-entered and corrected.
12. **Data Communication**: No communication takes place between the different actors in the chain, no systematic feedback system.
13. **Data Communication**: All stakeholders in the chain do their best to provide the best service according to their best knowledge, however this might not always synchronize with the other players. In additions the different parties in the supply chain are unaware of their responsibilities.

8.5.2 Billund and Copenhagen

Overall Cargo Center Billund in Billund and Worldwide Flight Services in Copenhagen experiences many problems and uncertainties which they aim to repair however due to minimal communication with NP, instead of repairing the problem channels further down the supply chain. Therefore below a list has been made of all points subject to improvement for Billund and Copenhagen based on observations, interviews and data analysis.

- **Acceptance Procedure**
  - Cargo is delivered late by customers.
  - Cargo does not have the correct packaging / labeling / documents / no booking.
  - Cargo is given RCS without a check if everything is correct and complete.
  - Not enough ULDs available at location resulting in bulk loading.
  - No weighing / volume check.
  - No built up according to connection times of shipments at the hub.
- **Trucking**
  - The truck schedule is unclear and no repeating patter, resulting in confusion for the operational staff.
  - Many Cargo IQ milestones fail due to the baseline being set by the booking truck.
  - Loading KL cargo first and adding 4 hours to fill up the truck, but requirement to unload KL cargo first as well is a non-logical construction.
  - Booking truck is not operational, therefore failing the CargoIQ milestones.
  - If cargo is already available it waits in the GHA warehouse, could also already be transported to Amsterdam, where it has more time to be handled.
  - Trucker often reports late.

- Trucker departs late.
- Late arrival of trucker in Amsterdam - cargo can not make the connecting flight.

- **Data Communication**
  - FBLs are not frequently send.
  - Pre-advice is not send frequently enough.
  - Final planning is sent very late - required to start building ULDs.
  - Often truck license plate is unknown.
  - Often truck height is unknown - difficult for build up of mix ULDs (2.45m or 3.00m high).
  - Work with their own systems - Billund with a Lufthansa system which sometimes has problems in communicating with the KLM systems.
  - Have to call NP for everything they want to know and is unclear.
  - No communication when the truck is late, they just have to wait and see.
  - Deviation reports are in the outstations' own format and not standardized.
  - Occasionally EHCs are placed in the system.
  - System entries done manually - prone to human error.
  - Unclear responsibilities of customer, GHA, KLM Cargo, Trucker.
  - Too many systems.
  - FWBs sent by the GHA are not accepted by KLM Cargo, resulting in loss of information and double work.
  - Incorrect data in system (trucks, opening hours).
  - **No structural feedback from KLM Cargo**.

9 Future State

In this chapter the future state is discussed. This performance of the implementation of the EGFL project is monitored and described. The changes that are implemented with the EGFL project can be found in Chapter 5. EGFL is a pioneering project in which for the first time ever, structural issues in the air cargo supply chain and air cargo supply chain coordination are addressed instead of symptom addressing. The sub-research questions answered in this chapter are:

7. What does the EGFL project change in Billund and Copenhagen to increase the arrival performance of the cargo in Amsterdam?
8. What impact do the EGFL changes have on the KPIs identified for the EGFL project?

The sub-research questions will be answered using the 3 pillars on which the research is based. First the effect of the EGFL project on the acceptance process at the GHA will discussed, followed by the trucking schedule and performance. Next the effect of the EGFL project on the arrival at the Amsterdam hub and the data communication is discussed. Finally in the synthesis a recap of the chapter is presented.

9.1 Acceptance Process at the GHA

In this section the changes that apply for both Billund and Copenhagen after the EGFL implementation are described in the general section, followed by the changes that are specific for Billund and specific for Copenhagen are highlighted.

9.1.1 General

Acceptance rules
The acceptance rules have been changed to allow for standardization and clear KLM rules and regulations for the transportation of cargo. As described in Chapter 5 the new acceptance processes are late-show, no-show, high-show (higher weight and / or volume) and go-show (cargo without a booking). For each of these processes a flow chart has been designed.

It is clearly communicated to customers what is expected of them and if they don't comply with the rules the cargo will not be transported on the booked truck and / or flight. The cargo has to be delivered complete (e.g. booking has to be present, number of pieces correct, all needed documents available) and correct (e.g. all information on the documents is present, weight and volume are as stated on the documents, packaging and labeling is correct). The result of the EGFL project can be seen in the fact that cargo is rejected if not correct and / or complete.

FOH vs. RCS milestone
One of the requirements for the EGFL project is that the FOH and RCS milestone can be triggered separately. The FOH milestone is sent to the customer to indicate that the freight has been delivered at the GHA. The RCS milestone indicates that the cargo is checked and accepted for transportation. One of the goals of the EGFL project is to ensure that all cargo is correctly accepted and / or prepared by the GHA so that the hub in Amsterdam only acts as a transit station instead of having to repair the shipments. The RCS that is given at the GHA must adhere to the RFC requirements as described below. According to the Cargo Handling Manual (CHM) [AFKL Cargo, 2016] (in line with the IATA cargo handling manual) the RFC requirements are:

2.3.1. Ready for carriage (RFC) [AFKL Cargo, 2016]
When a consignment is delivered for export acceptance it must be Ready-for-Carriage (RFC). A consignment is 'Ready for Carriage' if the:

- Shipment is booked and delivered as booked
- Shipment is delivered before the agreed close out time / latest acceptance time
- Shipment is complete together with the AWB and other relevant documentation
- Weight, number of pieces, volume, contents, service type are correct on the AWB and in accordance with the actual shipment and booking

- Shipment is customs cleared
- Pieces are correctly labelled
- Condition of the packages is suitable for air transport
- IATA regulations, such as DGR and LAR, are correctly observed
- MAWB (FWB) and HAWB (FHL) is correctly received.
- Security regulations are complied with
- Customs regulations are complied with
- Any other regulation that is applicable is complied with

If a consignment is not Ready for Carriage the local AF-KL representative must be contacted for instructions. The RCS may not be triggered for a shipment until the RFC check is successful.

Weighing
For both Billund and Copenhagen, one of the EGFL requirements is [redacted] weighing the cargo, with [redacted] deviation. Discrepancies between booked and delivered cargo is often found. Currently, this is a problem due to the fact that the shipment will have to be weighed in Amsterdam again as it is of great importance that the total weight of the cargo is known for the weight and balance of the aircraft. If the actual weight of the shipment does not correspond with the weight on the documents, the shipment is stopped at the customs department in the country of destination. New documentation must be provided before the shipment is allowed to continue the journey, resulting in delays. In addition the customer should be invoiced correctly according to the weight and / or volume that is shipped. For both Billund and Copenhagen the weighing procedure has not been set in place yet during the measurement period, due to lack of the availability of weighing equipment that can produce a weight slip as proof to the customer. The decision making procedure for ordering scales is in an advanced phase and in the near future it should be possible to determine the weight and possibly volume of the individual shipments as requested by KLM cargo.

9.1.2 Billund

This section discusses the changes in the acceptance process due to the EGFL project specifically for Billund. First the offset times are discussed followed by the performance in terms of KPIs.

Offset times
The latest time that cargo will still be accepted by the GHA is changed. The truck used to depart at 00:00, with a 3 hour LAT as is described in Section 6.2.2, resulting in a LAT at 21:00. The truck departure has changed to 06:00 in the morning, with a 4 hour LAT, resulting in the latest acceptance time at 02:00. The result of this change is that customers have more time to deliver their cargo and on the deviation reports sent daily to NP it can be observed that there is hardly ever a late-show. Most deviations are no-shows.

Performance in terms of KPIs Billund

figures/PerformanceBLLFuture1.png

Figure 9.1: Cargo IQ milestones LAT, RCS and DEP for Billund [EGFL] [Cargo Performance Management, 2017]

The KPIs for Billund during the measurement time frame of EGFL are shown in Figure 9.1. From week 20 till week 24 measurements have been taken to measure the influence of the EGFL project on these milestones. In Figure 9.1 it can be observed that the LAT has remained roughly the same. The RCS seems to have slightly decreased and the DEP seems to have increased quite substantially.

9.1.3 Copenhagen

This section discusses the changes in the acceptance process due to the EGFL project specifically for Copenhagen. First the offset times are discussed followed by the performance in terms of KPIs.

Offset times
The latest time that cargo will still be accepted by the GHA is changed. The truck used to depart at 23:00, with a 3 hour LAT as is described in Section 6.2.2, resulting in a LAT at 20:00. The truck departure has changed to 02:00 in the morning, with a 4 hour LAT, resulting in the latest acceptance time at 22:00. The result of this change is that customers have more time to deliver their cargo and on the deviation reports sent daily to NP it can be observed that there is hardly ever a late-show. Most deviations are no-shows.

Performance in terms of KPIs Copenhagen
The KPIs for Copenhagen during the measurement time frame of EGFL are shown in Figure 9.2. From week 20 till week 24 measurements have been taken to measure the influence of the EGFL project on these milestones. In Figure 9.2 it can be observed that the LAT has remained roughly the same. Both the RCS and the DEP seems to have slightly increased.

Figure 9.2: Cargo IQ milestones LAT, RCS and DEP for Copenhagen [EGFL] [Cargo Performance Management, 2017]

Scanners
As KLM requires WFS to give the FOH and RCS separately the higher management of WFS have promised to install scanners which will make it possible to give FOH and RCS separately. However the time span of tendering scanners, delivery time, testing and implementing at the GHA might take some time and this effect of EGFL can therefore not be measured during the measuring period. The scanners are expected to be operational by the 1st of September 2017.

9.2 Trucking Schedule and Performance

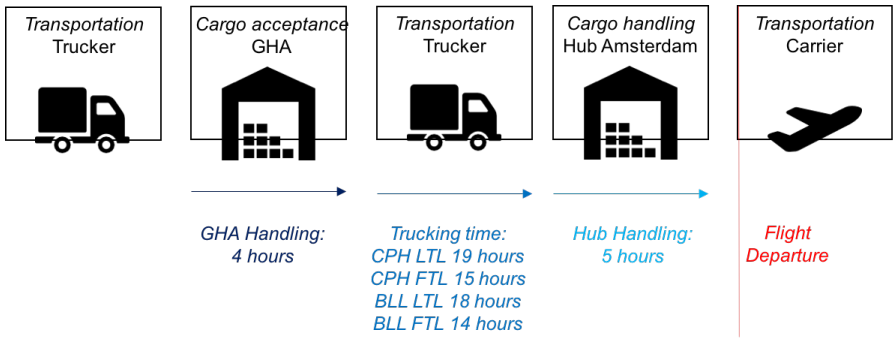

Figure 9.3: The required handling times for actors in the cargo value chain

For the re-design of the trucking schedule several parameters were taken into account, as shown below:

1. Connections with the flights as shown in Table 8.5 for Billund and Table 8.6 for Copenhagen.
2. Opening hours of the warehouse and documentation department. For Billund the opening hours for documentation are shown in Table 7.2 and for the warehouse in Table 7.1. For Copenhagen the opening hours for both the warehouse and documentation are shown in Table 7.5.
3. Avoid the peak hours at Amsterdam as shown in Figure 8.13.
4. Consider the number of LTLs and FTLs as stated in Table 7.3 for Billund and Table 7.6 for Copenhagen.
5. Consider the number of trucks per day in each month as shown in Figure 8.8, Figure 8.9 and Figure 8.10 for Copenhagen. Figure 8.3, Figure 8.4 and Figure 8.5 for Billund.
6. The cargo must be re-booked to earlier operational trucks so that booking truck will always depart latest resulting in a better performance of the DEP milestone.

The newly designed trucking schedules are presented in Table 9.2 for Billund and Table 9.6 for Copenhagen.

9.2.1 Billund

In this section the trucking schedule and performance specifically for Billund is discussed. First the number of truck departures from Billund is presented followed by the new trucking schedule, transported cargo and data availability and performance.

Number of Truck Departures from Billund

Based on the data from Figure 8.3, Figure 8.4 and Figure 8.5 the number of trucks departing on average on a certain day in a certain month are calculated. The data in Figure 8.3 can be misleading as there many be 4 / 5 re-occuring days in a month depending on the number days in that month. Therefore an average of trucks departing on a certain day of the month has been calculated based on the number of days in that specific month in 2016. This table can be found in Table 9.1. From this table it can be concluded that the peak is in August on Tuesdays (4 trucks departing) and Fridays (5 trucks departing). The colours indicate the number of trucks required. Dark red indicates that 5 trucks are required on that day. Orange represents 4 trucks per day, yellow indicates 3 trucks per day and green 2 trucks per day are departing. The others remain white. The new trucking schedule designed for Billund is based on the highest number of trucks required in that day of the week.

Table 9.1: Average number of trucks departing per day per month from Billund [EGFL]

2016	Mon	Tue	Wed	Thu	Fri	Sat	Sun
January	1,75	2	1,25	1	1	2	0
Febuary	1,2	2,25	1,5	1	2	2,5	0
March	0,75	2	1,8	1,4	1,75	3	0
April	1	3	3,25	1,75	1,8	3	0
May	0,8	2,4	2,75	1,25	1,25	3	0
June	1	2,25	1,8	1,2	1,25	2,5	0
July	1,75	3,5	2,5	1,75	2	3,8	0
August	2	4	2,6	1,5	1,25	5	0
September	1	3,25	2,25	1,4	1,2	4,25	0
October	1	3	1,75	1,25	1	3,2	0
November	1,25	3	2	1	2,25	2,5	0
December	0,75	3,25	1,75	1,8	1,2	3	0

Based on the statistics in Table 9.1 it can be concluded that the highest expected number of trucks departing on a day is 5 trucks. It is chosen to operate with 2 booking trucks are each is given 4 operational trucks, resulting in a total 5 trucks per booking truck, anticipating for future growth in cargo volumes from Billund. Together with the opening hours of CCB presented in Table 7.1 and Table 7.2, the delivery times of customers determined by the interviews with [Hansen, 2017b], [Nielsen, 2017] and [Brandt Nielsen, 2017] and the connecting flights presented in Table 8.5, the trucking schedule is designed. The peak for cargo delivery is until 21:00 with exceptions to 22:00. Below a summary of influences taken into account when designing the new trucking schedule. In Table 9.2 the final trucking schedule for Billund is presented.

- Peak at Amsterdam between 02:00 - 04:00
- Peak at CCB between 16:00 - 21:00
- Customer delivery pattern
- Expected number of truck departures
- Opening hours of CCB
- Connecting flights for cargo from Billund
- Import trucking schedule from JdR
- Requirements by JdR

New Trucking Schedule Billund

In Table 9.2 the new trucking schedule for Billund can be found. The bold trucks KL8980 and KL8480 are the booking trucks. This means that all bookings are made on this truck (in the systems this truck has unlimited capacity) and that the customer will see all connecting flights that can be made by this truck when booking the shipment. Depending on the total amount of cargo booked on the booking truck, if it does not fit in the physical volume available in the booking truck, the cargo is re-booked to earlier operational trucks. For the KL8980 this can be the KL8982, KL8984, KL8986 or the KL8978. These trucks will always depart earlier than the booking truck so that all connections promised to the customer can be made. For the KL8480 booking truck the operational trucks are KL8482, KL8484, KL8486 and KL8488. The trucking schedule is set to a LTL schedule, having 18 hours of trucking time as indicated in Table 7.8. The LTL schedule is selected because often the volume of the cargo to be transported is not enough to fill a FTL. From a cost perspective as presented in Table 7.9 with partly empty truck is is cheaper to drive with an LTL than with a FTL, which increases the cost/kg. If a full truck is needed it can still drive on the LTL schedule. The trucks related to the KL8980 booking truck will depart on all days except Monday. The trucks related to the KL8480 booking truck will depart on all days except Sunday. On Sundays most companies in Denmark are closed and no cargo will be delivered to the warehouse. The cargo will either be delivered on Saturday or will have a very long connection time to the connecting flight in Amsterdam, thus can be taken on the Monday truck. The KL8980 booking truck will depart at 06:00 in the morning, outside the peak hours of CCB and the KL8480 booking truck will depart at 18:00 just before the peak hours of CCB. The scheduled arrival time of the trucks are <23:59 for the KL8980 trucks and <12:00 for the KL8480 trucks, thus outside the peak in Amsterdam, contributing to a spread arrival of trucks in Amsterdam.

Table 9.2: New trucking schedule for Billund

Type	Kind	#	Is co-load	LAT	DEP	ARR	Conx interval		Remarks	1	2	3	4	5	6	7
MP only	LTL	MP4948			04:00	22:00					X	X	X	X	X	X
Co-load	LTL	MP4946	KL8982		05:00	02:00			11h CT		X	X	X	X	X	X
MP only	LTL	MP4944		02:00	06:00	23:59	11:00	23:00			X	X	X	X	X	X
KL only	LTL	KL8978			02:00	20:00					X	X	X	X	X	X
KL only	LTL	KL8986			03:00	21:00					X	X	X	X	X	X
KL only	LTL	KL8984			04:00	22:00			5h CT		X	X	X	X	X	X
Co-load	LTL	KL8982	MP4946		05:00	23:00					X	X	X	X	X	X
KL only	**LTL**	**KL8980**		**02:00**	**06:00**	**23:59**	**05:00**	**17:00**			**X**	**X**	**X**	**X**	**X**	**X**
MP only	LTL	MP4942			16:00	10:00				X	X	X	X	X	X	
Co-load	LTL	MP4940	KL8482		17:00	14:00			11h CT	X	X	X	X	X	X	
MP only	LTL	MP4938		14:00	18:00	12:00	23:00	11:00		X	X	X	X	X	X	
KL only	LTL	KL8488			14:00	08:00				X	X	X	X	X	X	
KL only	LTL	KL8486			15:00	09:00				X	X	X	X	X	X	
KL only	LTL	KL8484			16:00	10:00			5h CT	X	X	X	X	X	X	
Co-load	LTL	KL8482			17:00	11:00				X	X	X	X	X	X	
KL only	**LTL**	**KL8480**		**14:00**	**18:00**	**12:00**	**17:00**	**23:59**		**X**	**X**	**X**	**X**	**X**	**X**	

If MartinAir cargo is also available, there is a possibility to co-load with the KL truck. Truck KL8982 and MP4946 depart at the same time and therefore these two numbers can co-load on one truck. The first operational truck is selected as the co-load truck, so that the cargo does not have to be delivered earlier for the co-load truck and the NP department does not manually have to change the times. The 11h handling time of Menzies in Amsterdam is also taken into account with the departure of the freighters.

Transported Cargo During Research Timeframe

In Figure 9.4 the number of trucks departing on a certain day of the week during the measurement period can be found. It can be seen that the peak days are Tuesday, Wednesday and Saturday. In Table 9.3 the spread of the 64 trucks from Table 7.4 over the days can be found. Based on the number of each day of the week (e.g. number of Mondays) an average of the trucks per day is calculated as shown in Table 9.3. Comparing this average with the average determined in Table 9.1 it can be seen that the future average is higher. The number of AWBs in the same period in 2016 was [redacted] with a total weight of [redacted] kg and a volume of [redacted] m^3. The number of AWBs in the measurement period is [redacted] with a weight of [redacted] kg and a volume of [redacted] m^3. Based on these statistics it can be stated that there is more cargo transported during the current measurement period than the same measurement period in 2016.

figures/BLLNumbertruckFuture.png

Figure 9.4: Number of truck departures per day from Billund [EGFL]

Table 9.3: Average number of truck departures per day from Billund [EGFL]

Day	Total	Average
Monday	[redacted]	[redacted]
Tuesday	[redacted]	[redacted]
Wednesday	[redacted]	[redacted]
Thursday	[redacted]	[redacted]
Friday	[redacted]	[redacted]
Saturday	[redacted]	[redacted]
Sunday	[redacted]	[redacted]

Data Availability and Performance

The data communication e.g. reporting and departure registration for Billund in the current state was presented in Figure 8.6 and Figure 8.7. In these figures it can be seen that for the reporting [redacted] of the reporting data was not registered and for the departure performance almost [redacted] of the trucks departed late. In Figure 9.5 the reporting performance and in Figure 9.6 the departing performance can be found. This future state was measured from the 16th of May till the 16th of June. Over this period of time it can be seen that the non-reporting has decreased significantly to only [redacted] entries missing, equivalent to [redacted], opposed to [redacted] previously. The departure performance of JdR from Billund has also increased, with now only [redacted] of the trucks is departing late, opposed to [redacted] previously.

figures/BLLreportingfuture.png

Figure 9.5: Trucking reporting data availability based on KLM data for Billund [EGFL]

figures/BLLdeparturefuture.png

Figure 9.6: Trucking departure data availability based on KLM data for Billund [EGFL]

If the truck is only loaded with ULDs the driver has to report 'ready for loading' 1 hour before the departure. If the truck is a co-load with a MP truck, often both bulk cargo and ULDs are involved and therefore the driver has to report ready for loading 2 hours before the departure time. The system automatically generates a scheduled time of reporting depending on ULD or bulk cargo. The KLM reporting and departure system is able to identify a co-load but the scheduled reporting time for co-load is falsely generated for 1 hour. Resulting in false dashboards, the GHA receives a non performance while this should actually be given to the trucker. The 2 hour before departure reporting is required for bulk cargo as this is loaded manually, piece by piece with forklifts, requiring more time.

9.2.2 Copenhagen

In this section the trucking schedule and performance specifically for Copenhagen is discussed. First the number of truck departures from Copenhagen is presented, followed by the new trucking schedule, transported cargo and data availability and performance.

Number of Truck Departures from Copenhagen

Based on the number of truck departures per year, month and day as presented in Figure 8.8, Figure 8.9 and Figure 8.10 the number of trucks departing on average on a certain day in a certain month are calculated. In Table 9.4 the average number of trucks departing are presented. The yellow colour indicates that 3 trucks are required and the green colour that 2 trucks are needed. When only 1 or 0 trucks are predicted no colour is given.

Table 9.4: Average number of trucks departing per day per month from Copenhagen [EGFL]

2016	Mon	Tue	Wed	Thu	Fri	Sat	Sun
January	1	1	1	1.25	1.2	2	0
February	1	1	1	1	1.25	1.5	0
March	0.75	1.4	1.4	1.2	1	2.25	0
April	1.25	1.5	1.25	1.25	1.6	1.4	0
May	0.8	1	1.5	1.25	1.25	1.25	0
June	1	1	1.6	1.2	1	2	0
July	1	1	1	1	1.2	2.8	0
August	1.2	1	1.2	1.75	1.25	1.25	0
September	1	2	1.75	1.6	1	1.75	0
October	1	1.75	1.25	1.5	1.5	2.2	0
November	1	1.6	1.2	1.25	1.5	1.25	0
December	1	1	1.25	1	1	2.4	0

Based on the statistics in Table 9.4 it can be concluded that the highest expected number of trucks departing on a single day is 3 trucks. To anticipate on future growth in the cargo volume it 5 trucks in total are selected, as only 1 booking truck is selected to be open for bookings. Together with the opening hours of WFS in Copenhagen presented in Table 7.5, the delivery pattern of customers determined by the interviews with [Thunbo, 2017] and [Hansen, 2017b] and the connecting flights presented in Table 8.6 the trucking schedule is designed. The peak for cargo delivery is until 21:00 with late cargo being delivered until 22:00. Below a list of aspects taken into account is presented. In Table 9.6 the final trucking schedule for Copenhagen is presented.

1. Peak at Amsterdam between 02:00 - 04:00
2. Peak at WFS between 17:00 - 21:00
3. Customer delivery pattern
4. Expected number of truck departures
5. Opening hours of WFS
6. Connecting flights for cargo from Copenhagen
7. Import trucking schedule from JdR
8. Requirements by JdR

New Trucking Schedule Copenhagen

In Table 9.6 the new trucking schedule for Copenhagen can be found. The bold truck KL8470 is the booking truck. This means that all booking are made on this truck and the customer will only see all connecting flights that can be made by this truck. Depending on the amount of cargo, if it does not fit in the single booking truck the cargo is re-booked to an earlier truck, either KL8472, KL8474, KL8476 or KL8478 (operational trucks). The trucks will always depart earlier than the booking truck so that all connections promised to the customer to be made. The trucking time is set to an LTL schedule, having 19 hours of trucking time as indicated by Table 7.8. The trucks will depart on all days except Monday. The truck will depart at 02:00, thus outside the peak hours of WFS and will arrive at 21:00 in Amsterdam, thus outside the peak hours of the hub.

If Martinair cargo is also available there is a possibility to co-load. Truck KL8472 and MP4952 depart on the same time therefore these two numbers can co-load on one physical truck. As Martinair has 11h connection time at the Menzies GHA in Amsterdam this is also taken into account with the departure of the MP freighters.

Transported Cargo During Research Time Frame

In Figure 9.7 the number of trucks departing on a certain day during the measurement period can be found. It can be seen that the peak days are Tuesday, Wednesday and Saturday. In Table 9.5 the spread of the 35 trucks as determined in Table 7.7 over the days can be found. Based on the number of each day of the week (e.g. number of Mondays) an average of the trucks per day is determined as shown in Table 9.5. Comparing this average with the average determined in Table 9.4 it can be seen that the average is lower. The number of AWBs in 2016 was [redacted] with a total weight of [redacted] kg and a volume of [redacted] m^3. The number of AWBs in the measurement period is [redacted] with a weight of [redacted] kg and volume of [redacted] m^3. Based on these statistics it can be stated that there is less cargo is transported from Copenhagen during the current measurement period than the same measurement period in 2016.

figures/CPHNumbertruckFuture.png

Figure 9.7: Number of truck departures per day from Copenhagen [EGFL]

Table 9.5: Average number of truck departures per day from Copenhagen [EGFL]

Day	Total	Average
Monday	[redacted]	[redacted]
Tuesday	[redacted]	[redacted]
Wednesday	[redacted]	[redacted]
Thursday	[redacted]	[redacted]
Friday	[redacted]	[redacted]
Saturday	[redacted]	[redacted]
Sunday	[redacted]	[redacted]

Data Availability and Performance

The data communication e.g. reporting and departure registration for Copenhagen in the current state was presented in Figure 8.11 and Figure 8.12. In these figures it can be seen that for the reporting almost [redacted] of the reporting data was not registered and for the departure performance almost [redacted] of the truck departed late. In Figure 9.8 the reporting performance and in Figure 9.9 the new departing performance can be found. This future state was measured from the 16th of May till the 16th of June. Over this period of time it can be seen that the non-reporting has decreased significantly to only [redacted] missing, equivalent to [redacted] opposed to [redacted] in the current state. The departure performance of JdR from Copenhagen has also increased, with now only [redacted] departing late, opposed to [redacted] departing late.

Table 9.6: New trucking schedule for Copenhagen

Type	Kind	#	Is co-load	LAT	DEP	ARR	Conx interval		Remarks	1	2	3	4	5	6	7
Co-load	LTL	MP4952	KL8472		01:00	23:00			11h CT		X	X	X	X	X	X
MP only	LTL	MP4950		22:00	02:00	21:00	08:00	23:00			X	X	X	X	X	X
KL only	LTL	KL8478			22:00	17:00					X	X	X	X	X	X
KL only	LTL	KL8476			23:00	18:00					X	X	X	X	X	X
KL only	LTL	KL8474			00:00	19:00			5h CT		X	X	X	X	X	X
Co-load	LTL	KL8472	MP4950		01:00	20:00					X	X	X	X	X	X
KL only	**LTL**	**KL8470**		**22:00**	**02:00**	**21:00**	**02:00**	**23:00**			**X**	**X**	**X**	**X**	**X**	**X**

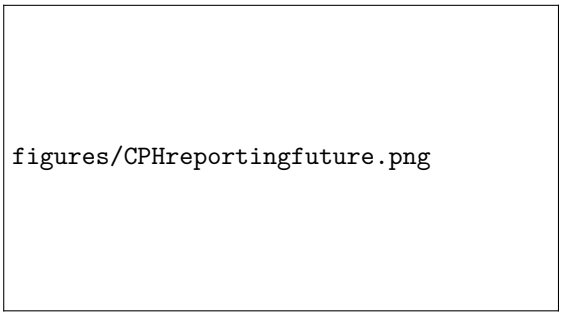

Figure 9.8: Trucking reporting data availability based on KLM data for Copenhagen [EGFL]

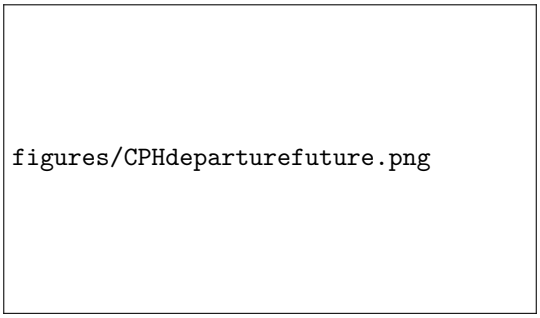

Figure 9.9: Trucking departure data availability based on KLM data for Copenhagen [EGFL]

9.3 Arrival at the Amsterdam hub

The contracted trucking- handling times and trucking costs in Amsterdam have remained the same except for the handling time of MartinAir. The handling time has increased from 8 hours to 11 hours, this due to changed settings in the new booking system AFLS. The settings in this system prevent customer service from booking shorter connections than 11 hours.

ULDs
With the EGFL project the focus has been on the built up of the ULDs. The aim is to build up all cargo on ULDs to ease the unloading process at the hub and that no cargo is arriving as bulk anymore. In reality this is more complicated, as there is a shortage of ULDs. In the process more ULDs have been ordered. In addition the aim is to build the ULDs according to the connection time of the shipments to the connecting flights in Amsterdam. T-ULDs are most favored, but if multiple mix-ULDs can be build, they are build according to connection time. This results in a mix-ULD with 'hot' and 'cold' freight, allowing the hub to only break down the 'hot' ULD and the 'cold' ULD can be handled after the peak hours.

9.3.1 Billund

In Figure 8.16 the arrival performance in Amsterdam in the current state is shown. In Figure 9.10 the arrival performance after the new trucking schedule is implemented measured during the period of 16th of May till the 16th of June. It can be seen that there is a significant increase in the ATA reporting performance. In addition it can be seen that the number of trucks arriving early has increased significantly. In Figure 9.11 the CargoIQ milestones for the ARR, RCF and DEP are shown. In these milestones an increase for the arrival in Amsterdam from the go-live week onward (grey bar) can be seen. This increase in percentages can also be observed for the RCF milestone, showing that more cargo is delivered correct and complete to Amsterdam. The departure from Amsterdam has remained roughly the same. As the hub is regarded as a black box, the reason why the DEP does not increase in correlation with the ARR and RCF is not inside the scope of this research project.

Figure 9.10: Billund - arrival performance in Amsterdam [EGFL]

Figure 9.11: Performance of CargoIQ milestones ARR, RCF and DEP milestones for Billund [EGFL] [Cargo Performance Management, 2017]

In Figure 9.12 the ATA of the trucks from Billund can be found. The KL8480 and the KL8980 are separated. The median arrival time for the KL8480 truck was 07:40 am and the median arrival time for the KL8980 truck was 16:03 pm. Both trucks arrive outside the peak and much earlier than the STA. Only a trucks with a large delay arrived in the peak. Therefore it is of importance that the departure of the truck from Billund is no later than the STD.

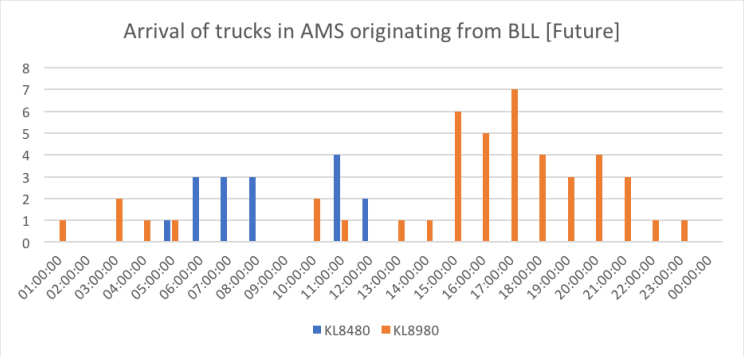

Figure 9.12: The actual time of arrival of trucks from Billund in Amsterdam [EGFL]

9.3.2 Copenhagen

In Figure 8.20 the arrival performance in Amsterdam in the current state is shown. In Figure 9.13 the arrival performance after the new trucking schedule is implemented measured during the period of 16th of May till the 16th of June. It can be seen that there is a significant increase in the arrival reporting performance from [redacted] to [redacted]. In addition it can be seen that the early arrival has increased significantly.

In Figure 9.14 the CargoIQ milestones for the ARR, RCF and DEP are shown. In these milestones it can be seen that the arrival shows an increase in the percentages for the arrival in Amsterdam from the go-live week onward (grey bar). This increase in percentages can also be observed for the RCF milestone, showing that more cargo is delivered correct and complete to Amsterdam. There is no significant improvement in the milestones of the departure from Amsterdam. However as the hub is regarded as a black box, the reason why the DEP does not increase in correlation with the ARR and RCF is not inside the scope of this research project.

figures/CPHArrivalAMSFuture.png

Figure 9.13: Copenhagen - arrival performance in Amsterdam [EGFL]

figures/PerformanceCPHFuture2.png

Figure 9.14: Performance of CargoIQ milestones ARR, RCF and DEP milestones for Copenhagen [EGFL] [Cargo Performance Management, 2017]

In Figure 9.15 the ATA of the truck from Copenhagen can be found. The median arrival time for the KL8470 truck was 15:09 pm. The truck arrives outside the peak hours in Amsterdam and much earlier than the STA. Only a single truck with a large delay arrived just before the peak. Therefore it is of importance that the departure from Copenhagen of the truck is no later than the STD.

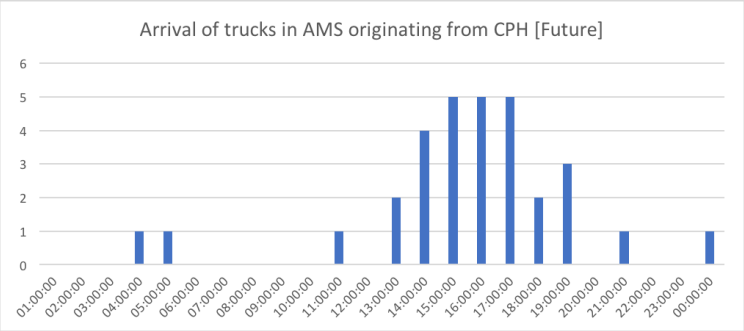

Figure 9.15: The actual time of arrival of trucks from Copenhagen in Amsterdam [EGFL]

9.4 Data Communication

In this section the effect that the EGFL project has had on the data communication pillar is discussed. The changes that apply for both Billund and Copenhagen after the EGFL implementation, regarding the data communication are described. First the compliance checker is introduced, followed by the number of FBLs, deviations report, reporting and departure registration performance.

Customer
In Chapter 8 the major customers have been identified. These customers must be kept satisfied as is determined by the stakeholder analysis performed in Appendix C. To keep the customers satisfied, individual meetings have taken place with the customers, to inform them about the EGFL project and the impact this will have on them. The customers will have to deliver the cargo earlier, namely 4 hours before the departure of the truck instead of 3 hours. In addition the cargo has to be delivered complete and correct, otherwise the cargo will not be accepted and will not receive RCS. The trucks will no longer be delayed when the customer delivers the cargo later than the LAT. The cargo will be re-booked on the next available truck. These meetings will be organized by the Nordics Sales Manager: Soeren Roerstroem. In Table 9.7 the dates and place at which the meetings with the major customers have taken place can be found.

Table 9.7: Meetings with the largest customers in Denmark

Date	Customer	Location
04-05-2017	[redacted]	[redacted]
08-05-2017	[redacted]	[redacted]
09-05-2017	[redacted]	[redacted]
10-05-2017	[redacted]	[redacted]
11-05-2017	[redacted]	[redacted]

In addition the customers will be updated with newsletters regarding the progress and expectations. The offset times will be changed as explained in section 6.2.2 and the larger customers will have to agree before the offset times are accepted in the system. During the execution of roll-out for Billund and Copenhagen it was discovered that [redacted], a major customer in multiple outstations in Europe was not involved in the update. Measures had to be taken to update [redacted].

Compliance Checker
Another project at KLM Cargo, running parallel to the EGFL project is the compliance checker. The compliance checker is an online tool developed by Cargonaut, to reduce the workload at the documentation department in Amsterdam. Reduction of the workload is achieved by eliminating repair actions concerning the AWB. The compliance checker will be used by the GHA to ensure that the documentation will be sent correct and complete to Amsterdam, with regards to FWB, FHL, FFM, description, destination, product, embargoes etc.

Number of FBLs
During the field research in Billund and Copenhagen problems were observed that have not been identified yet in the Frankfurt Pilot. The GHA needs a Flight Booking List (FBL) to synchronize the booking information from the KLM Cargo systems to their own systems. Only if information is synchronized with their system they can check if a shipment that has been delivered to their warehouse also has a booking in the KLM system. The number of FBLs sent was increased as the GHA should only give RCS when a booking is present. For the trucks the number of FBLs have increased starting from 3 days until 4 hours before the departure. At the same time, the truck is closed for booking after the LAT so no extra bookings can be made by the customer or CSO.

Deviations Report
For deviations such as late show, no show or shipments that are incorrect or incomplete, RCS should not be triggered by the GHA. For late-show and no show, a deviation report has to be sent to NP and / or CSO, within 60 minutes after departure of the truck to allow for canceling the booked segments or re-booking. For go-show a new booking has to be made by CSO and for high-show the information on the AWB has to be updated. For the different procedures regarding deviations of the shipment see Figure 5.4 for no-show, Figure 5.5 for go-show, Figure 5.6 for high show and Figure 5.7 for late show.

With the pilot in Frankfurt (a Swissport station) an excel sheet with the various deviations could be generated automatically from their system including information such as origin, AWB nr., date, booked pieces, actual pieces, booked weight, actual weight, actual volume, booked volume, BUP, final status, re-booked on flight, agent, reason for offload and other remarks. In Appendix I.4 an example of a Swissport deviation report is shown. The deviation report generated by the Swissport stations can not be automatically generated by CCB in Billund and WFS in Copenhagen as they operate using a different system. Due to the fact that they are already short on manpower and that manual labor is expensive in Denmark it is not affordable and sustainable to require the GHA to fill in the deviation sheet manually every day. Instead an automatic deviation report is sent after departure of the trucks by the GHA, however only the AWB nr. of the shipment with a deviation is presented in this report. NP in Amsterdam needs to look up the AWB number manually to retrieve extra information about the shipments.

Billund System
CCB in Billund works with Elwis, a Lufthansa system. There are several limitations by using a system from a competitor. Challenges were identified in the communication with the KLM systems. Also making structural changes in this system will cost money as KLM is currently the only carrier implementing the new acceptance procedure, requiring FOH and RCS given separately according to the EGFL requirements.

Copenhagen System
WFS in Copenhagen works with a limited version of Cargospot. As this version is limited it has a limitation on the number of actions that can be performed. This has to be taken into account when requesting the GHA to perform certain tasks.

Data communication reporting, departure and arrival registration
The data availability of the reporting, departure and arrival of the trucks has increased significantly. With only occasionally data missing structural issues can be identified. One of the main issues is that JdR often reports late, due to unforeseen circumstances. For future improvements JdR could make their trucking reporting more reliable. In addition the communication between JdR and NP has improved. JdR is earlier informed if a truck needs 1 hour or 2 hours reporting time before the DEP. Also if a truck is canceled this is communicated earlier. For the GHA the trucking schedule has improved as there is a standardized format and they know at what time they can expect the truck and which truck number it has, as it is the same every day.

Exception Handling Codes
Copenhagen has a pioneering approach in working with the exception handling codes. When a shipment had departed late or pieces are missing a deviation can be coupled to the AWB number, thus making the deviation available to all parties in the supply chain. Copenhagen is one of the few stations that already enters all EHCs. Billund does not yet enter the EHCs.

9.5 Synthesis

In this section, the sub-research questions of this chapter are answered. The sub-research questions answered in this chapter are:

7. What does the EGFL project change in Billund and Copenhagen to increase the arrival performance of the cargo in Amsterdam?
The acceptance rules late-, no-, high- (cargo with higher weight or volume than booked) and go-show (cargo with no booking) procedures are implemented. These procedures allow different procedures for deviating cargo to ensure that the truck can still depart on time to arrive on time in Amsterdam. In addition this allows for correct data reporting regarding re-booking and weighing. In addition two milestones are requested at cargo acceptance, namely the FOH and the RCS milestone. The FOH milestone to inform the customers that the cargo has arrived at the warehouse and the RCS milestone after all 'ready for carriage' checks have been performed and the cargo is ready for shipping. Also, all cargo [redacted] for the EGFL project will be weighed, so that the actual weight corresponds with the weight on the documents reducing the number of shipments stopped at customs in the country of destination and allowing KLM Cargo to invoice the correct weight and volume shipped to the customer. Next to that the offset-times are changed allowing both the customer and the GHA more time for delivery and handling of the cargo.

The trucking schedule for both Billund and Copenhagen is redesigned taking into account the delivery pattern of customers, opening hours and peak hours of the GHA, possibility of combined loading, contracted transit times and actual transit times of the trucker, peak hours at the hub in Amsterdam, minimal handling times at the warehouse in Amsterdam and the connecting flights on the most booked destinations. In addition all operational trucks depart before the booking truck, thus all performance milestones for the shipments can be made. The on-time departure of trucks allows for on-time arrival in Amsterdam, increasing the arrival performance. With regard to the data communication, insight is provided in the responsibilities and tasks of each actor. Possibilities for entering the data correctly in the systems are provided.

8. What impact do the EGFL changes have on the KPIs identified for the EGFL project?
For both Billund and Copenhagen the LAT and RCS KPI have remained roughly the same. This is due to the fact that offset times are not yet accepted by all the customers and opening hours are not correctly entered in the systems. It is expected that in the future the KPI will increase significantly when these changes are implemented. Currently, the FOH and RCS milestone are not given separately yet as scanners are still not implemented in all stations. Therefore the FOH and RCS are roughly the same. In the future it is expected that these will show different performances. The departure KPI for both Billund and Copenhagen have increased significant. This is due to the fact that all trucks with actual shipments depart before the booking truck and therefore the milestone is achieved. For the arrival performance also an increase can be observed. Due to the fact that the trucks depart on time, they more likely to also arrive on time at the hub in Amsterdam. The RCF depends on the unloading time in Amsterdam and increases slightly as the correctness and completeness of the cargo is increased. The DEP from the hub is not considered within the scope of the research thesis as the hub is regarded as a black box.

The KPIs currently reflect the performance for trucks, flights and direct pick-ups. In the future it is recommended that the KPIs are divided in individual graphs for the trucks, flights and direct pick-ups to directly monitor the performance of each transportation mode. In addition, the effect of the EGFL project, which only considers trucks can be directly measured.

10 Discussion of Results

In this chapter the results presented in the future state in Chapter 9 are discussed. This discussion takes place based on the 3 pillars of this research thesis, the trucking performance, acceptance procedure and data communication.

10.1 Trucking Performance

In the new trucking schedule, no distinction has been made between an LTL schedule and an FTL schedule. The performance of JdR has proven to be unsatisfactory and although measures have been taken to improve the performance, the results do not reflect the improvement. Therefore all trucks have been set on an LTL schedule, providing JdR with 4 more hours of trucking time. Based on Figure 9.10 and Figure 9.13 it can still be observed that trucks report late at the GHA or no data is entered in the system. In due time, when the reliability and performance of JdR will improve the FTL schedule may be re-introduced.

The results measured for the future state will differ from the results measured by the KLM Cargo systems for example on the reporting performance of JdR. As the KLM Cargo systems are unable to identify the difference between 2 hours before DEP reporting for bulk cargo and 1 hour before DEP reporting for ULD cargo, the performance of JdR is 'good' in the KLM Cargo systems while in practice it is not that perfect.

10.2 Data Communication

In this section the data communication results are discussed including the findings for the deviation reports, changes in the trucking schedule and faulty data communication in the CargoIQ milestones.

Deviation Reports
It can't be required of the GHA to manually fill in the deviation reports due to expensive man hours in Denmark. The deviation reports can either be used as they are received now of generated from KLM Cargo's own systems. The aim of KLM Cargo is to standardize the deviation reports all stations. A future solution could be the use of Exception Handling Codes (EHCs). EHCs indicate the deviation with an AWB. Currently there are over [redacted] EHCs which can be used to express deviations such as: 'Driver Reported too Late' or 'Delayed Documentation Handling'. Currently the Nordics is the only region in which EHCs are placed in case of a deviation. This EHC can be used to indicate if there is a difference in weight, volume etc. This would be a standardized and IATA certified procedure instead of a Swissport procedure.

Changes in Trucking Schedule
In some rare occasions it is required that the trucking schedule is adjusted to an ad-hoc shipment. Currently NP can adjust the trucking schedules according to their best view. The communication with JdR has to be increased to ensure that the required trucking schedule is also possible with the resting hours of the trucker, reporting and departure time of the truck and the schedule of the import truck. In addition if the departure time in the schedule is adjusted the corresponding arrival time must also be adjusted to ensure that still an LTL schedule is required by JdR and the arrival performance will be correctly registered in Amsterdam.

CargoIQ Milestones
In Figure 9.14 the ARR in Amsterdam does not reflect the same increase in performance as the field research data reflects. Over the measured period of 1 month the KLM KPIs indicate an average arrival performance of [redacted]. The data in Figure 9.13 the arrival performance is around [redacted]. A discrepancy can be explained by the fact that Figure 9.13 is on truck level and Figure 9.14 is on shipment level. To analyze this in more detail the arrival performance data of KLM for 1 week is studied in detail. Week 22 from the 28th of May till the 4th of June indicated by the light green bar in Figure 9.14 is selected.

Comparing Figure 9.14 with the data of KLM of the arrival performance of the trucks shown in the figures below shows a large discrepancy. Based on the number of trucks shown in Figure 10.2 only the trucks from the warehouse are taken into account and the DPU trucks are neglected. Figure 10.1 and Figure 10.3 show that all trucks arrived on time in Amsterdam. However the statistics in Figure 9.14 shows that the arrival performance in Amsterdam is only [redacted].

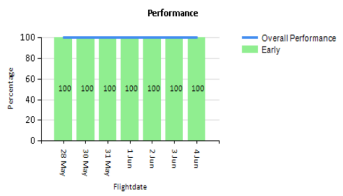

Figure 10.1: Overall performance of trucks from Copenhagen in week 22 [Asselman, 2017a]

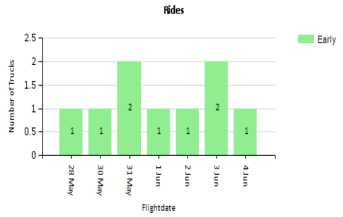

Figure 10.2: Number of trucks from Copenhagen in week 22 [Asselman, 2017a]

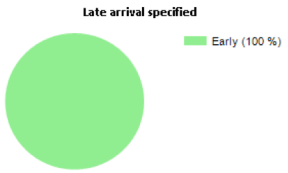

Figure 10.3: Arrival performance of trucks from Copenhagen in percentages in week 22 [Asselman, 2017a]

In depth research has indicated that the arrival is not only dependent on the trucks also the flights are taken into account. The flight arrival performance is outside the scope of the EGFL project and therefore should not be taken into account in these statistics. In addition the ARR performance of a shipment is dependent on if the ARR message is received in Traxon, the correct arrival time is placed in the ARR message, if the correct ARR is placed as a baseline, all information with regard to the planning must be the same for the shipment; number of pieces and route etc., the difference between the actual time of arrival and the scheduled time of arrival [Snel, 2016]. For the milestone ARR to be correct several items have to be successfully performed. At the moment the Cargo IQ ARR data is not reliable enough to reflect the performance of the EGFL project.

Researching the remainder of the milestones, it was concluded that the milestones take into account all AWBs from Copenhagen, also the AWBs that are transported per aircraft. In Figure 10.5 the AWBs transported per aircraft on the 22nd of June are shown, in total [redacted] AWBs. In Figure 10.4 the AWBs transported on the [redacted] of June by truck are shown, in total 6 AWBs. This indicates that there are [redacted] times as many AWBs transported by flight than by truck. This makes sense as the GHA is located at the airport and also services the cargo for the flights. In Table 10.2 an overview of the flights per day from Copenhagen is shown.

Table 10.1: Scheduled flights from Copenhagen

Flight Number	DEP
KL1124	06:00
KL1126	Closed for cargo
KL1128	11:50
KL1130	14:40
KL1132	16:25
KL1134	19:10

Table 10.2: Scheduled flights from Billund

Flight Number	DEP
KL1340	06:00 (closed for cargo D1/7)
KL1342	10:05 (closed for cargo D1/7)
KL1344	11:20 (closed for cargo D7)
KL1346	14:40 (closed for cargo D1/6/7)
KL1348	18:35

The acceptance for flights is also done according to the new EGFL rules. However the departure from Copenhagen, arrival in AMS, RCF in AMS and DEP in AMS do not accurately represent the performance of the trucks and no conclusion can be drawn from these statistics as they also represent the flights. If the truck departs on time from Copenhagen or arrives on time in AMS is not represented in the CargoIQ milestones. This problem was not encountered in the blue print of Frankfurt as in Frankfurt the number of flights vs. truck departures is lower. Significantly more trucks depart from Frankfurt compared to flights and therefore the truck performance dominates the CargoIQ milestones. For the measurement period of 16th of May until the 16th of June, for Billund there were [redacted] truck AWBs and [redacted] flight AWBs. Therefore the cargoIQ milestones reflect slightly better the truck performance than for Copenhagen. For Copenhagen the total ratio for the measurement period was [redacted] truck AWBs and [redacted] flight AWBs. Thus almost [redacted] of the data is incorrectly representing the EGFL project milestones.

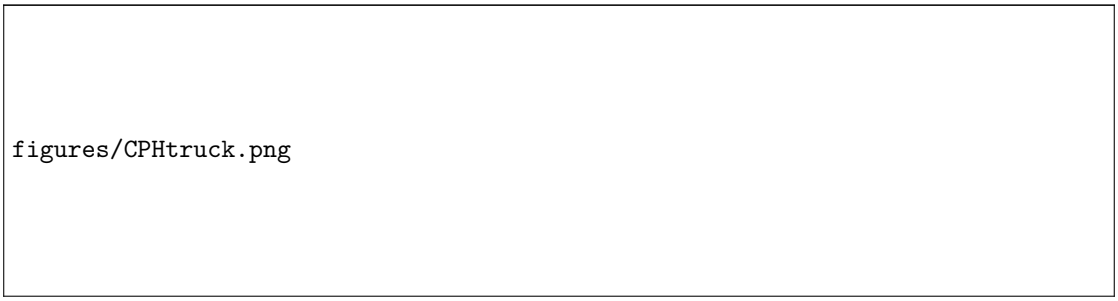

Figure 10.4: AWBs transported by truck from Copenhagen on the 22nd of June [Todtenhaupt, 2017]

Figure 10.5: AWBs transported by flight from Copenhagen on the 22nd of June [Todtenhaupt, 2017]

10.3 Arrival Performance Amsterdam

The truck schedule has been adapted based on the current peak in Amsterdam between 02:00 - 04:00. However 10 stations are rolled-out at the same time. The arrival times of these 10 stations are not related to each other. All the connecting flights from Amsterdam will start departing around 07:00 and will continue until 23:00. As the hub needs at least 5 hours to handle the cargo all trucks want to arrive around 02:00. In addition the departure of the flights might change in the future and this is not anticipated in the design.

11 Roadmap for Future Stations

The current roadmap that is designed for the roll-out of the EGFL stations is presented in Figure 11.1. First 4 weeks of preparation are scheduled followed by 8 weeks of roll-out. Important dates with regard to the EGFL project implementation are:

Table 11.1: Schedule for EGFL roll-out for Billund and Copenhagen

Event	Date
Start preparations	04-04-2017
Start roll-out	02-05-2017
Go-live	16-05-2017
End roll-out	27-06-2017

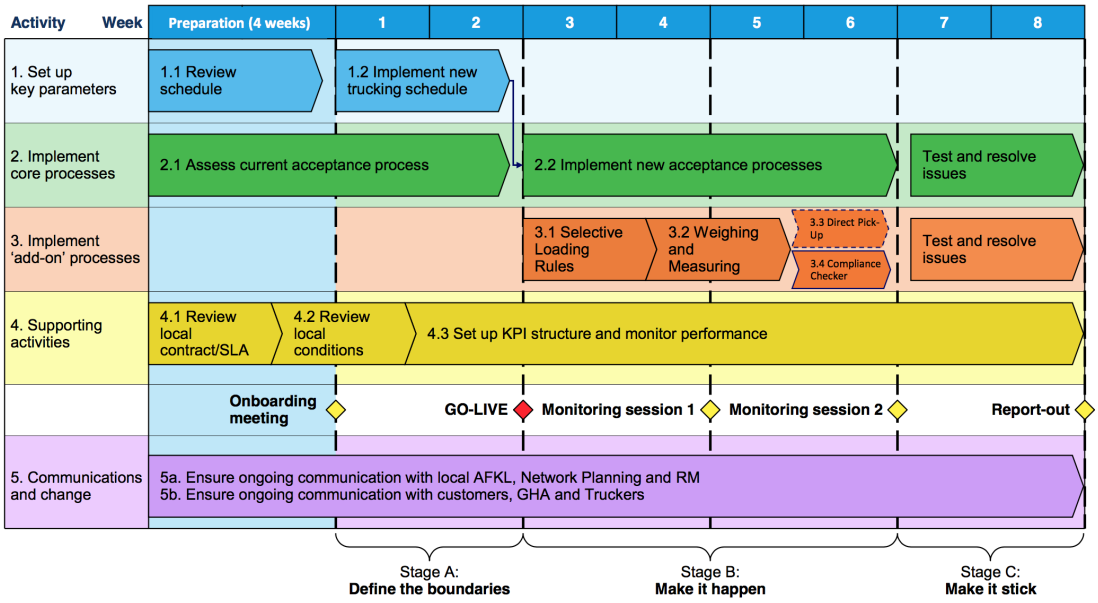

Figure 11.1: Initial roll-out plan for the EGFL project [de Wolf, 2017]

The activities have been divided into 5 themes, as illustrated on the left side of Figure 11.1. Each theme will be described below:

Preparation:

- **Set up key parameters**: the trucking schedule is designed, reviewed and finalized. The trucking schedule has to be loaded in the NP and GHA systems and ready to go-live.
- **Implement core processes**: perform an assessment of the day-to-day operations at the GHA in the current situation to assess the change impact to come.
- **Supporting activities**: review contracts with GHA, local conditions, truckers. Adapt these documents so that they are compatible with the EGFL requirements.

Roll-out:

- **Implement core processes**: the new core acceptance processes related to EGFL should be carried out by the GHA as specified. Monitor the performance.
- **Implement add-on processes**: selective loading rules, weighing, measuring, direct-pick up and compliance checker. Should be done gradually during the weeks after.
- **Supporting activities**: performance improvements of the operational truck schedule and acceptance process should be measured. If the performance falls behind expectations corrective actions should be taken.

The detailed roll-out plan can be found in Appendix K. Based on the experience and research performed at Billund and Copenhagen the following improvements for the roll-out can be formulated:

1. **Acceptance Process**:
   (a) 4 weeks for preparation is too short in some cases - first time Billund and Copenhagen were visited was 3 weeks before the go-live date. The stations in some cases need more time to adjust their systems and procedures to the new EGFL program.
   (b) Generate own checklist of items KLM wants to have checked for the GHA to use. The cargo handling manual is a manual for cargo acceptance and handling with a detailed description of how each check should be performed. However, this is not user friendly and no overall clear checklist is available.
   (c) Customers should be fined for nonperformance in cargo delivery (correct, complete and on time).
   (d) Scanners and scales should be pre-planned. Notify the GHA months in advance to execute preparations for the ordering and implementation of scanners and scales. Also motivate higher management to already prepare other stations, not in the current roll out wave of the EGFL project. In the next roll-out wave these stations are ready to implement the project.
2. **Trucking Schedule**:
   (a) Trucking schedule had to be implemented at least 11 days before the go-live date as customers will be able to place a booking from 11 days in advance.
   (b) Trucks in cargoal have to be cleaned - trucks that are no longer used need to me omitted from the list. In addition clear information has to be presented in the system, so other users can be informed of the purpose of the different truck numbers.
   (c) Trucks need to have the correct arrival time - this has to be checked in cargoal, administratively entering date changing trucks (e.g. depart on day 1, arrive on day 2) can cause problems.
   (d) The trucking schedule should be designed taking into account the current delivery pattern of customers. The customers have their entire production process scheduled based on the current LAT times. The customers will not change their process for KLM, if inconvenient they will select another competitor.
   (e) The trucking schedule should be implemented once. No adjustments made in the future. This is confusing for the NP, GHA and customers. Therefore the preparation period should be increased, therefore this part can not be performed in accordance with the Agile method.
   (f) Co-loading with other GHAs should be researched. For smaller stations not being able to fill an entire truck, co-loading with other stations might be financially favorable.
   (g) The reporting and departure performance of JdR at the GHA has to increase. This could be done by introducing a penalty for JdR for nonperformance.
   (h) JdR should be fined if the truck is not on time. This is measurement is mentioned in the contract but not enforced.
   (i) Reporting measurement of 1 hour before departure for ULD cargo and 2 hours for bulk can be measured in the system. However for a co-load there are 2 truck numbers. On 1 the ULD cargo (KL cargo) is booked, thus 1 hour before departure and on the other the bulk cargo (MP cargo) is booked, thus reporting 2 hours before departure. Currently the milestone for the truck is green if the truck reports 1 hour before departure as the KL truck requires 1 hour, but the problem is that it actually fails the milestone because the MP truck requests 2 hours.
3. **Arrival in Amsterdam**:
   (a) A truck model should be made. Currently there are no guidelines when the trucks are allowed to arrive at the hub. Only not in the peak, resulting that all trucks will arrive just before the peak and therefore a new peak is created and the outstations that are rolled out last do not have any flexibility of arriving.
   (b) ULDs should be readily available. Currently there is a shortage at the GHAs for ULDs. This will result in bulk cargo going to the hub in Amsterdam. Not helping with the clean through put.
   (c) Inform MP about the new trucking schedule. Co-load also has an affect on the time that the trucks arrive at Menzies. Do not want to increase their peak.

(d) Is 5 hours connection time at the hub feasible? First need to gather actual performance data before trying to reduce the connection time. Currently 97% is longer than 7 hours at the hub and the current performance is not 100%.

(e) CSO can eliminate the 24 hours extra connection time for each shipment when the arrival performance in Amsterdam becomes reliable. When CSO received proof of increased departure performance of the shipments they are willing to do this.

4. **Data Communication**:

(a) Visit GHA before go-live date to assess the current problems, also issues not related to EGFL. It is suggested that more days of performing field research are scheduled before the go-live date.

(b) All customers need to accept the new offset times, make sure that this is discussed way in advance of the go-live date and it may take time to inform all customers.

(c) Make sure all customers are informed, not only by newsletter but the large customers are personally visited.

(d) Monitoring data should be correct and complete. No flights, no DPU. It should be clear which things the GHA should change to achieve the desired affect.

(e) Research the possibility of placing EHCs instead of manually filling in deviation reports

(f) The communication plan should be ready before the go-live of the EGFL project. In this specific case the first few weeks the GHA did not have a clue who to contact in case of a deviation. The flow charts of high-show, late-show, no- show, go-show have been designed by me.

(g) FBLs should be adjusted in advance of the go-live date of the station.

(h) Correct and complete information should be generated from KLM's own systems. Don't ask the GHA for information about customers. They are KLM's customers.

(i) Correct and complete information sent to the GHA. Including truck license number, truck height, built up plan on time, new scheduled time when schedule is adjusted.

(j) If last minute booking is made by CSO, contact GHA personally. Do not wait for them to discover. After final planning is sent by NP, latest 5 hours before departure, the truck should closed for additional bookings.

(k) Automatic system should be generated for reporting and departure of the trucker. Now all is entered manually risk for wrong date, time or no time / date.

(l) Opening hours in system should be adjusted such that no red milestones occur due to wrong information in system.

(m) Messages do not always synchronize in system such as special handling codes. In addition there queue in messaging acceptance. Therefore the message could be sent on time, however is received late and therefore fails the KPI.

(n) Enable GHA to enter FWB'. In the current state the FWB' is rejected by the KLM system.

The researcher following up on this research can use this road-map and the suggested improvements as a guide to obtain a basic understanding of the project. The suggestions for improvements can be used in the planning and execution in the stations rolled-out in wave 2. The in-depth case study has contributed as an example for the overall question regarding air cargo supply chain coordination. To obtain a holistic overview how to approach this problem, the EGFL method developed needs to be further developed. In addition to develop a holistic method more case studies need to be performed, not only on different stations but also on specific topics. The air cargo industry can greatly benefit from a generic model that can be implemented for all stations.

12 Conclusion

In this chapter the conclusion is provided. The first section presents the conclusion for the air cargo industry, which can be used to identify what impact and contribution this research has on the general industry. The second section concludes with a reflection on the research. The third section states the conclusion with regard to the in-depth case study, which can be used by KLM Cargo in the interest of the project.

This thesis researches the cargo value chain for export cargo from Denmark, for the outstations Billund and Copenhagen, towards the hub in Amsterdam. As part of the European Green Fast Lane (EGFL) project, KLM Cargo aims to improve all export trade lanes in Europe. This improvement is necessary as the current poor performance of the arrival of cargo induces extra costs and reputation damage. One of the main goals of the EGFL project is to improve the arrival performance with regard to the overall quality of cargo delivered (such as complete and correct documentation, packaging, labeling, all required checks performed) and improve the timeliness to an agreed service level of [redacted] resulting in an overall reduction in costs and increase in reputation. The current achieved service level for Billund and Copenhagen is both [redacted], thus requiring structural improvements to increase the performance. The in-depth case study for Billund and Copenhagen is performed according to the blue print that has been designed for the pioneering EGFL outstation Frankfurt. To make a holistic blue print other stations must be studied as well and the lessons learned added to the existing blue print. The main research question of this master thesis is:

How can the cargo value chain be improved with regard to the acceptance process, trucking schedule and data communication for cargo originating from Billund and Copenhagen, in order to increase the arrival performance at the hub in Amsterdam?

12.1 Conclusion Air Cargo Industry

This conclusion discusses the contribution of this research to the general air cargo industry. First the limitations in the scientific research and the general problems encountered in the air cargo industry are presented. Next the research executed in this thesis is discussed, followed by how this research contributes to the air cargo industry.

Scientific Research Gaps

The literature study, presented in Chapter 4, discusses the state-of-the-art knowledge about the air cargo transportation industry. Among which, the most resent research performed by [Feng et al., 2015] in the form of an extensive literature review on scientific sources available on the performance on air cargo processes. Based on this literature study, two scientific gaps are identified, which account for the entire air cargo industry.

The first scientific gap identified is that in the air cargo transportation field, much research has been performed but not on the specific topic of 'air cargo supply chain coordination'. How the different parties in the supply chain can collaborate to achieve the optimal performance is still to be researched. The individual tasks and processes of each party in the supply chain are analyzed and optimized, but to the best of my knowledge, research regarding the entire supply chain coordination and integration is lacking. The second scientific gap identified is that scientific research on the air cargo supply chain is often theoretical. Most real-world air cargo supply chain coordination problems remain unsatisfactorily solved, due to the complexity of the air cargo operations, including the many systems and players.

A method to address the problem of the coordination in the air cargo supply chain is yet to be designed and therefore developed in this master thesis. This thesis presents an in-depth case study to provide insights with regard to a real-world air cargo supply chain coordination problem. The case study provides insights and lessons learned to further develop the coordination of air cargo supply chain method. This method is a pioneering approach, which if successfully implemented can be used throughout the air cargo industry to improve the air cargo supply chain performance, which is the purpose of the blue print.

Problems in the air cargo industry

The general problem that occurs in the air cargo industry is that the passenger business has always been regarded as the most profiting industry segment and therefore research and investments have been focused mostly on this area. In recent years, carriers have noticed that the cargo business is a profitable business on its own and therefore the amount of research has increased. However, with the economic crisis of 2008 the investments have been limited. Currently with the expected growth in the air cargo transportation and upcoming competitors from the middle east, the air cargo business is forced to innovate and improve their air cargo processes to remain competitive.

Currently, in the air cargo industry, almost all cargo is accepted before all ready for carriage checks are performed, resulting in non performance for the airline instead of non performance of the forwarder. This in turn results in monetary losses due to unnecessary rework and reputation damage. As [Savelberg and Bakker, 2010] have identified, early arrival at the hub induces costs, but late arrival induces even higher costs, therefore it is of utmost importance that the cargo arrives on time. In addition, fines are imposed on the carriers by the customs at destination if deviations exist on the shipments and documents. Structural problems such as these are deeply rooted in the air cargo industry, which are difficult to address due to the numerous parties involved.

Research performed

In this master thesis an in-depth case study is executed to further develop a method to address structural issues in the coordination of the air cargo supply chain. The in-depth case study is used as a method to provide insights in a real-world air cargo supply chain coordination problem.

The in-depth case study discusses the cargo acceptance process, trucking performance, data communication, arrival performance. The current state is analyzed and several suggestions for improvement are provided. The insights gained from this study are; firstly, if the different parties in the air cargo supply chain collaborate, integrate and share data, the coordination in the supply chain can be optimized. Secondly, the individual activities of each actor are optimized to achieve maximum performance in the entire supply chain instead of for each actor individually. Thirdly, in the current acceptance procedure all cargo is accepted without all ready for carriage checks being performed. Fourthly, the new International Air Transportation Association milestone 'Freight On Hand' is not implemented yet, resulting in rework and inevitable non performance for the airline instead of the forwarder. Fifthly, the trucking schedule is not optimized nor based on the connecting flights of the shipments and in combination with trucks arriving late at the hub, this results in missed connecting flights. In addition, data is often unavailable, unknown or incorrect, making it difficult to identify structural issues and measure the performance. Finally, no cooperation and communication between the different actors in the chain is present.

The method developed for the coordination of the entire supply chain, suggests improvements for the acceptance process, trucking schedule and data communication. For the acceptance procedure, cargo is no longer accepted if delivered late and quality checks of the cargo have to be performed before cargo is accepted. The trucking schedule is redesigned by taking into account the connecting flights, the optimization of the departure and arrival times, the peak hours and handling times of the various parties, the delivery patterns of customers and a realistic transit time. Data communication between the different parties in the supply chain is optimized by data sharing and insights in the supply chain.

Contribution to general cargo industry

[Flyvbjerg, 2016] has argued that one cannot generalize based on a single (in-depth) case study, but an in-depth case study can greatly contribute to the research methodology. The in-depth case study performed in this master thesis, contributes to scientific research as an example of a real-world air cargo supply chain coordination problem. The methodology developed is a pioneering approach, which can be used by the entire air cargo industry to improve the supply chain. This method allows for structural problem solving instead of addressing symptoms. The method requires rules and regulations to change and all parties in the supply chain willing to contribute to the collaboration. From the point of view of a consortium, taking into account all actors (the customers, ground handling agents, trucking companies and the hub), the supply chain can be improved for all parties, allowing for a win-win situation. By structurally improving the quality of cargo (such as complete and correct documentation, packaging, labeling, all required checks performed) and data at the beginning of the supply chain, this channels throughout the rest of the chain. Sharing data, allowing all parties to have insight in the supply chain and providing structural communication and feedback are part of the method proposed.

12.2 Reflection

The method developed in this master thesis is an innovative and structural solution for the air cargo industry supply chain problem. However, the air cargo industry could debate if the complexity existing in this industry is really necessary. Many ground handling agents (40) and trucking companies (11) are contracted (for KLM only), each of them operating with their own systems, rules and regulations. The question could be asked if it is necessary to contract so many small parties, whom are critical actors in the supply chain and on whom the carrier is dependent. Many carriers have grown extensively in the past and for every problem encountered a new solution was designed to address the symptoms. However, no research has been performed on the possibilities to structurally address these problems. The possibilities for structural innovation and improvement of the supply chain are currently limited, as the many different contracted parties in the chain work with old, proven to function, systems. The carrier can request high-tech solutions to be used but with the number of parties in the chain, the implementation of these high-tech systems is almost impossible. In the future, it should be researched how this method can be further developed and how the systems used by the different parties can be upgraded.

In the air cargo industry a technocratic culture exists, involving operating with many procedures and paperwork. It could be debated, if a new procedure would be effective to solve the structural problem or if a cultural shift is needed in the air cargo industry. Observations made during the in-depth case study, suggest that the performance is measured based on paperwork. If the paperwork is correct, the performance is high. However in reality it is also important that the physical shipment arrives on time and makes the scheduled connecting flight. The employees operating in this technocratic cultural environment ensure that on paper the performance is high. A cultural shift might be needed from a technocratic culture towards more time, more communication between actors and actual performance measurements. In the past if the performance was low, a new procedure was developed to address symptoms of the problem. After several years, new symptoms occurred and a new procedure was launched to address these new symptoms. The method developed in this master thesis is a start towards this cultural change of structurally addressing problems, instead of symptom addressing, however many improvements can still be gained in the future.

12.3 Conclusion In-Depth Case Study

To reach a design to improve the arrival performance in Amsterdam from [redacted] to the agreed service level of [redacted], first a thorough analysis of the current state of the supply chain from Billund and Copenhagen is performed. On the basis of this analysis the performance of the current situation is determined. The bottlenecks identified are: first, all cargo is accepted before the ready for carriage checks are performed, cargo is delivered late by customers and as a result the departure of the trucks is delayed, resulting in possible late arrival at the hub in Amsterdam. Second, the current trucking schedule is not based on the delivery pattern of customers, realistic transit times and / or realistic handling times for the different parties and connecting flights. Finally, information is not shared between the different parties, no communication is present and no structural feedback is provided. Possibilities for improvement are in the redesign of the acceptance process, trucking schedule and data communication. With the research up to this point KLM Cargo already gained an insight in the current performance of the export value chain from Denmark.

The implemented EGFL project for Billund and Copenhagen is analyzed during a measurement period of 1 month. Overall, the European Green Fast Lane (EGFL) project initiates significant improvements to the air cargo supply chain especially with regard to the acceptance procedure, where the late-show, no-show, high-show (deviation weight and / or volume) and go-show (cargo without a booking) acceptance procedures are designed. A new trucking schedule is designed taking into account the delivery pattern of customers, realistic transit times and / or realistic handling times of the different parties and connecting flights. Several improvements for the blue print of the EGFL project with regard to data communication are identified among which two major ones. Firstly, the data gathering performance must be improved to make an constructive judgment about the performance of the EGFL project. Currently too many data errors or unregistered data is dominating the system to identify structural problems. One of the main bottlenecks is that the majority of the data is entered manually in the systems, thus prone to human error. The second observation is that the available data is not accurately representing the EGFL project. Other factors such as flight and direct pick up data are also represented in the key performance indicators and therefore the performance of Billund and Copenhagen can not be measured on the current results.

To answer the main research question; the cargo value chain can be improved by adjusting the acceptance rules, implementing weighing possibilities and adapting the offset times. For the trucking schedule the connection times in Amsterdam, requirements for the trucking company and peak hours are taken into account. For data communication improvements are gained by specifying the tasks requested to be performed by the various parties in the chain, informing customers, updating the deviation reports and increasing the registration performance. The improvements result in spread delivery times in Amsterdam, cargo that has the correct packaging and all checks performed and correct / complete documentation to contribute to the improvement in quality. The goal of an agreed service level of [redacted] has not been achieved. However, the performance has increased significantly (in Billund from [redacted] to [redacted] and in Copenhagen from [redacted] to [redacted]) and future changes may allow for more increase. To achieve the last [redacted] increase, continuous improvement is required on all the elements.

Overall it can be concluded that the EGFL project is a pioneering project in the field of air cargo supply chain coordination. By structurally solving issues at the beginning of the supply chain such as the acceptance process, the remainder of the supply chain will also improve. The structural approach instead of symptom addressing can lead to a robust solution. However, it must be concluded that the EGFL project is currently not a holistic approach and improvements can still be made to the blue print to allow for a more complete and successful implementation.

13 Recommendation

In this chapter, first the recommendations for the air cargo industry in general are presented. The recommendations are made with regard to the scientific research gaps, contribution to the air cargo industry and the method developed (road-map). Second, the recommendations are made for the in-depth case study performed for Billund and Copenhagen are presented. The recommendations with regard to the general process, acceptance procedure, trucking schedule, arrival performance in Amsterdam and data communication. Also for the performed case-studies the limitations of the research are presented.

13.1 Recommendation Air Cargo Industry

Scientific Research Gaps

The scientific research performed on air cargo supply chain coordination is limited. A real-world air cargo supply chain coordination example has been added to scientific research in the form of this master thesis. However several more in-depth case studies have to be performed in this field to gain more insights in the bottlenecks currently present. It is recommended to perform at least 5 in-depth case studies, after which approximately 80% of the bottlenecks should be identified. Additional case studies can be performed to identify the remaining 20% of specific problems encountered with culture, language, station specifics. The recommendation is to perform the case studies on stations with a different set-up such as multiple contracted ground handling agents for 1 outstation, multiple contracted trucking companies, trucks co-loading with other stations. A general methodology connected to the theoretical framework is recommended to be developed. The European Green Fast Lane (EGFL) project is a innovative and pioneering approach towards this theoretical framework, however improvements can be made. The theoretical framework should be developed on the basis of real-world air cargo supply chain coordination examples.

Air Cargo Industry

For the air cargo industry in general it is recommended that the EGFL project approach is implemented for the industry as a whole. Addressing structural issues instead of addressing symptoms allows for a robust approach to be maintained in the future. However it is recommended to develop the methodology further, including studies for other carriers and different processes, to optimize and generalize the process before large scale implementation.

In both scientific literature and the in-depth case study costs reduction opportunities are identified when the cargo is delivered on time. It is recommended to perform additional research on the optimization of the arrival pattern at the hub. A suggestion for research would be to allow each truck to have an arrival slot of 30 minutes. If the truck arrives early, the truck has to wait in an allocated waiting area and if the truck arrives late a high penalty has to be paid and the truck is unloaded in a different area, not disrupting the normal arrival process.

In addition in scientific literature, the overall quality of the physical cargo and data available about the cargo is not discussed with regard to the entire supply chain. Reject and accept policies with regard to booking (e.g. price vs. availability) has been discussed by [Amaruchkul et al., 2007] and [Han et al., 2010], but no reject and accept policies with regard to cargo quality acceptance. The quality of the cargo (documentation check, dangerous goods check, customs check, packaging check etc.) has a great influence on the handling throughout the supply chain. It is therefore recommended that more research is performed on this aspect of cargo acceptance.

Road map

A road-map has been developed as a start of the methodology to address the air cargo supply chain coordination in Chapter 11. This road-map has been developed for the future implementation of the EGFL project in stations. The researcher following up on this research can use this road-map as a guide. It is recommended that the researcher reads this thesis to obtain a basic understanding of the contribution to scientific research and of the project itself. The next step is to perform more in-depth case studies not

only for different stations but also on specified topics. The air cargo industry could greatly benefit from a generic model that could be implemented for all stations and thereby making a step towards structurally solving the air cargo supply chain coordination dilemma. In addition the future researcher could study if a cultural change might be needed to structurally address the issue. This cultural change would involve changing from a technocratic approach to open and productive discussions / communication between all parties. Digitization in the air cargo industry can be researched as a possibility to improve the process and would already impose a cultural change. It is also recommended that the future researcher questions the complexity of the air cargo industry. A suggestion might be made that standardizing and contracting fewer parties in the supply chain might simplify the process.

13.2 Recommendation In-Depth Case Study

General

The analysis of the effect of the implementation of the EGFL project is researched for a limited time period of 1 month for this master thesis. To gain more insight into further external influences and the steady state performance of the ground handling agent, the data time span should be broadened to for instance a full year. The future state was monitored from the go-live date, the ground handling agent requires some implementing, start-up and adjusting time to the new EGFL procedure to structurally solve the small operational problems. Therefore it can be expected that in this start up time more errors occur than in a steady-state performance. Currently the start-up time is also included in the research results. To gain more steady results a measurement should be performed after the EGFL project has been operational for a certain time period.

No research has been performed on the delivery pattern of customers. When the ground handling agent will be able to give the 'Freight On Hand' milestone separate from the 'Received Cargo from Shipper' milestone, the delivery behavior of the freight forwarders or the customers can be analyzed. Based on the delivery pattern, the customers can be informed about structural issues that occur due to their delivery pattern. In addition shipments that are delivered at the ground handling agent days before the scheduled departure can be re-booked to earlier trucks to Amsterdam.

Acceptance Procedure

For the acceptance procedure further research could investigate a system which can keep track of the total number of shipments in the warehouse. Both for the ground handlers' warehouse and the warehouse at the hub, such a system would allow to identify which shipments have been stored longer than 24 hours and an automatic invoice can be send to the corresponding customer, so that the customers will not use the hub or ground handling agent as free storage space.

The performance of the ground handling agent should be stricter monitored. Currently all issues are identified by accident and no structural feedback is provided to the actors in the supply chain as no structural data is gathered. It is of great importance that this data is systematically collected so that structural issues can be identified and problems addressed. It should be possible to penalize the ground handling agent for nonperforming, by e.g. not entering information on time in the systems, which is required by KLM Cargo. Currently there is no incentive for the ground handling agent to perform as requested.

Trucking Schedule

Currently the trucking schedule is based on a slow schedule, giving the trucker more time to transport the cargo from Denmark to Amsterdam. If the performance of the trucking company increases, the possibility to adjust the schedule to an fast schedule can be researched. The recommendation with regard to the trucking company is that they are currently not performing as expected, even with the 4 hours extra trucking time of the slow schedule. The current arrival performance is still below the required contracted [redacted] on time arrival performance in Amsterdam. At the moment the trucking company is not adjusting their behavior and no fines are given. However the trucking company does place a penalty on KLM Cargo, if the trucker has to wait for longer than 2 hours to be unloaded. This is an unbalanced situation, especially if the truck missed their time slot for unloading in Amsterdam, due to delay on their behalf. The possibility of placing a penalty to the trucker should be enforced and also executed to force

the trucker to increase performance towards the contracted arrival performance of [redacted]. The reporting and departure performance should also be monitored. At the moment it is observed that trucking company reports and departs late, [redacted] of the time. There is no incentive for the trucking company to improve as no penalty is given for nonperformance. The entire cargo value chain must be improved and to achieve this all players must act as is requested and expected of them, including the trucking company.

In the future the direct pick-up from the Nordic countries can be researched. Direct pick-up trucks are customers which have large volumes of freight and therefore direct trucks are sent to their warehouse to directly collect the cargo instead of consolidation of the cargo at the ground handling agent first. For Denmark the 3 largest customers for direct pick up are: Schenker, DSV and Scan Global Logistics.

Arrival Performance Amsterdam

Further research can be performed regarding the monitoring of the front trucking area at the hub. Currently the trucks are serviced according to the First In First Out (FIFO) principle. However trucks that are late are serviced in this same order, causing trucks that are on time to be serviced later than planned, as their time slot is taken by the late truck. By directing which truck can unload first, more cargo will be arriving as scheduled. Research should be performed how this can be designed.

In this first roll-out wave of the EGFL project, for 10 stations a new trucking schedule is designed. The trucking arrival pattern of the 10 new schedules is adjusted such that they do not arrive in the peak hour at Amsterdam. However, no relation between the arrival of the trucks from different stations is designed. Currently the trucks are restricted to arrive between 02:00 - 04:00 at Amsterdam. All trucks are planned to arrive just before the peak, as this is most convenient with regard to the connecting flights. This will create a new peak, instead of structurally solving the issue, it is shifted to another hour. In addition, only 10 stations are roll-out in the first wave, allowing for complete freedom for the scheduled arrival time of the trucks. In wave 2, a new set of stations will be rolled-out, these stations have a limited time frame in which the trucks can arrive in Amsterdam, as the most favorable slots are already taken by the trucks from stations rolled out in the first wave. An overall model should be constructed to design the optimal arrival pattern at Amsterdam. This way the delivery spread of 6 trucks per hour can be realized.

This researched has only focused on the export cargo from Denmark to Amsterdam. To gain a full image of the effect of EGFL all stations in Europe should be rolled-out and the EGFL procedure implemented. Billund and Copenhagen only account for [redacted] of the total volume and therefore a significant difference in the reduction of total costs will be limited. It is recommended that in the overall business case the total cost reduction of all stations is calculated.

Data Communication

With regard to data communication, a recommendation is made that it is of utmost importance to identify the meaning and purpose behind the data. First it should be identified what should be improved and on which topics a decision is to be made. Following for this specific research data should be gathered, so data collection is performed with a purpose in mind, driven towards the research question. Currently, the key performance indicators are used by higher management to monitor the EGFL program. However for Billund and Copenhagen it was discovered that the data reflected by the key performance indicators also represents flights and direct pick ups, contaminating the trucking results and therefore an increase in the performance of the stations due to the EGFL program could not be identified.

Another recommendation is that the deviation reports should be automated. The ground handling agent will not fill in a sheet of paper manually, which is prone to human error and other errors. The deviation report with requested information such as number of pieces, actual weight and customer should be generated from KLMs' own systems, as all the information is already sent by the ground handling agent via an updated air waybill. Another alternative is to use the exception handling codes in the system. For each shipment the ground handling agent will directly fill in the exception handling codes, allowing the entire value chain to directly the deviations of a certain shipment in the system.

Further research could investigate the possibility of automation. One observation of the field research is that data communication is done manually and therefore subject to human error. Many aspects can be automated such as reporting and departure of the truck with an identity card. If the exception handling codes are placed for all shipments the deviation report can be sent automatically. The booking list should not be sent on time intervals but there could be a real-time data update from the KLM systems to the ground handlers' system to inform them of any new bookings.

Limitations of this research

The research performed in this thesis is specifically for the in-depth case study of Billund and Copenhagen. Even though the cargo value chain is rather uniform all over the world, hub and outstation processes are specific for each outstation, due to layout, equipment, rules and regulations. Therefore the above conclusions could not (all) directly be applied to every other outstation in Europe or cargo handling hub in the world. The conclusions of this research are based on a specific hub, namely Amsterdam Airport Schiphol KLM Cargo hub and the trade lane Denmark - Amsterdam. With some possible adjustments and using the lessons learned from this case study to improve the EGFL blue print, the EGFL solution can be implemented at other outstations, to make these trade lanes in Europe more efficient. As described above, Copenhagen has been one of the most challenging roll-out projects and therefore the some of the recommendations formulated might already be successfully operational in other stations.

In this study, some assumptions were made with regard to the design of the changes to the acceptance procedure, trucking schedule and data communication:

- Acceptance Procedure
  - The delivery pattern of the customers will adjust according to the KLM schedule. In practice this is not always the case, the customers have their own standardization and they are the customer, thus paying.
  - The acceptance procedure has been designed taking into account the trucks. Although the acceptance procedure is similar to flights, this has not been taken into account in the design.
- Trucking Schedule
  - The cargo delivery volume is based on the volume in 2016. In practice this is not always the same. Due to the emerging strength of the world economy after the crisis of 2008, the cargo volumes can grow in the future.
  - Flight departures are expected to stay the same. The schedule is based on the current flight departure, however this may be subject to changes.
  - The trucking schedule is based on the trade lane Billund / Copenhagen to Amsterdam. No research is performed regarding co-loading with other stations in the same region.
- Data Communication
  - The already available possibilities for data communication are taken into account. It was assumed that this is sufficient and no extra research has been performed on improvement of the systems.
  - The data collection was found to be insufficient. Suggestions have been made to improve the data, however this has not been executed.

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A Process Analysis of CCB in Billund

In this appendix the process analysis of Billund is explained. First the process locations will be presented in Section A.1 followed by the schematic process flows in Section A.2 and a pictorial tour of the cargo acceptance journey in Section A.3. A short explanation will be given with each picture. The process analysis at the ground handling agent (GHA); Cargo Centre Billund (CCB) in Billund is performed by field research by multiple visits to CCB in Billund. The visits have taken place on the 24th and 25th of April, 15th till 19th of May, 13th till 17th of June. In addition interviews / meetings have taken place with Tonny Hansen [Hansen, 2017b], Jorgen Hvenegaard Hansen, Agnessa Nielsen [Nielsen, 2017], Martin Brandt Nielsen [Brandt Nielsen, 2017] and Janne Juul Jensen [Cargo Centre Billund, 2017b].

A.1 Process Locations

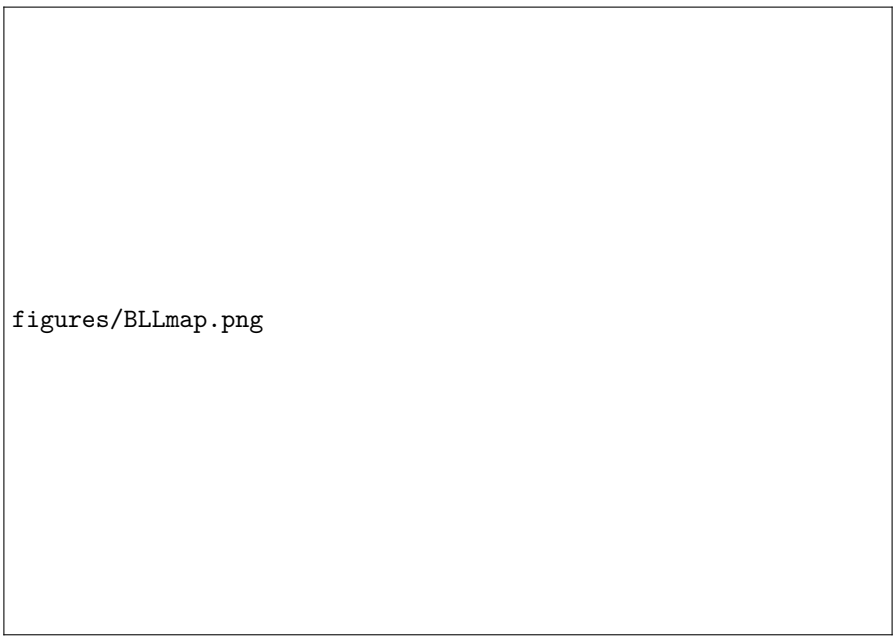


Figure A.1: [BLL] Map of Cargo Centre Billund [Cargo Centre Billund, 2017a]

In Figure A.1 a top view of CCB (GHA) in BLL can be found. CCB consists of the documentation building, terminal 1 and terminal 2. Terminal 1 is assigned to KLM Cargo. In Figure A.2 an top sight of the terminal 1 building where the AFKL cargo is located can be found. In the middle the KL bulk storage location can be identified (Number 074). 074 is the prefix of the KL/MP AWB numbers.

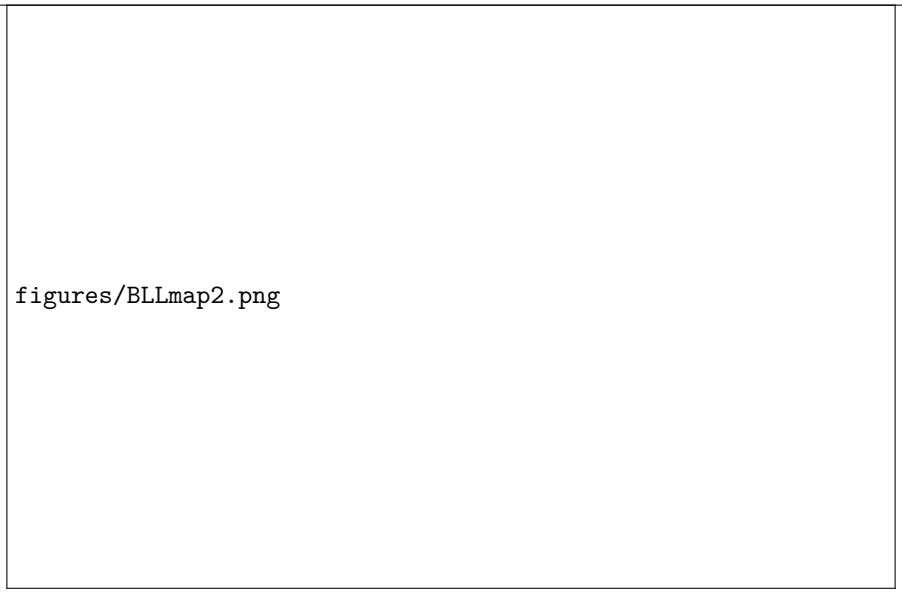


Figure A.2: [BLL] Map of the Cargo Centre Billund warehouse [Cargo Centre Billund, 2017a]

A.2 Process Flow

The process flows of the cargo delivery and cargo export are shown below. The process flows have been constructed based on interviews and meetings with Tonny Hansen (Manager) Jorgen Hvenegaard Hansen (documentation & quality), Agnessa Nielsen (office staff, DGR, warehouse), Martin Brandt Nielsen (office staff specialized in KLM trucks) and Janne Juul Jensen (senior office staff). In Figure A.3 and Figure A.4 the documentation flow of CCB is shown.

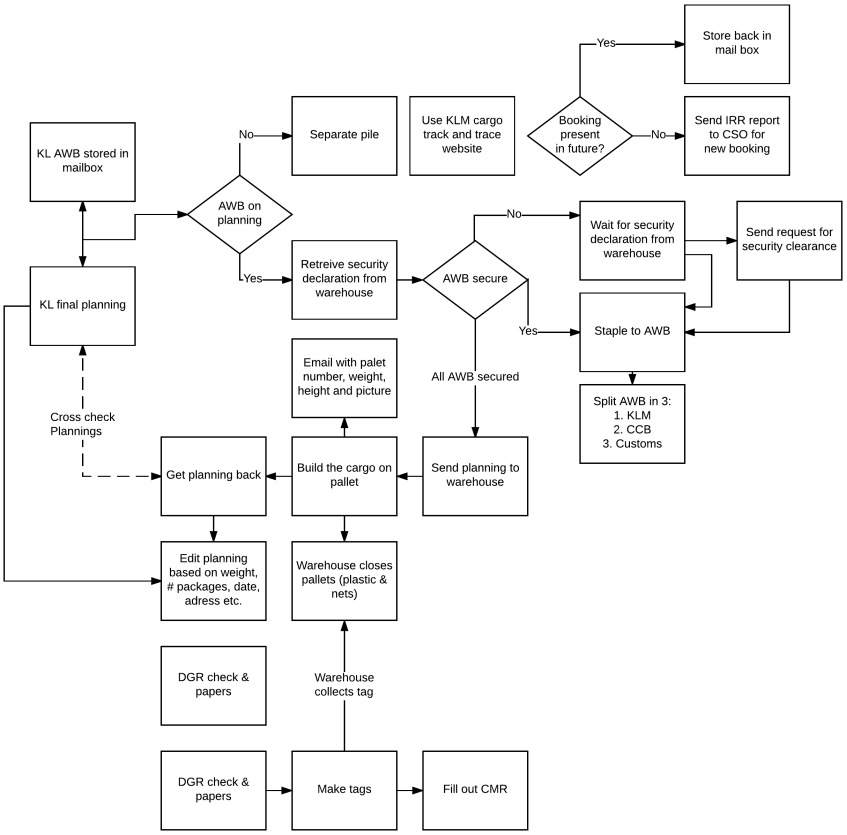


Figure A.3: [BLL] Documentation flow

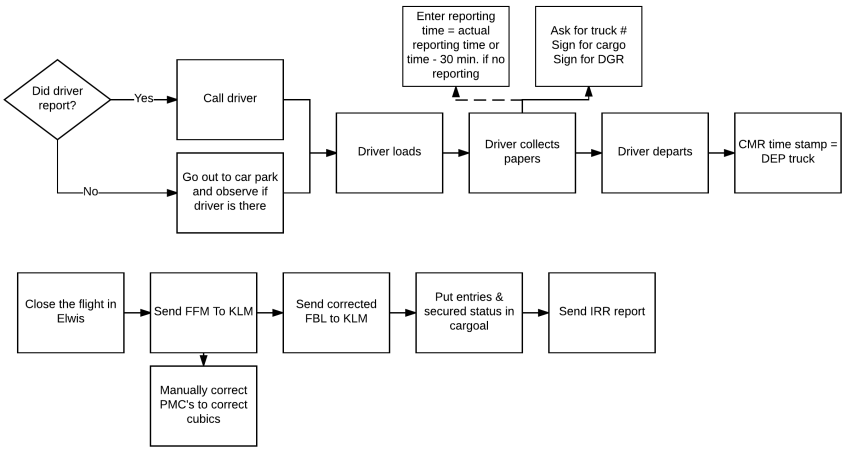


Figure A.4: [BLL] Documentation flow continued

A.3 Cargo Acceptance Journey

In this section the pictorial tour of the cargo acceptance journey is displayed. The different steps of the processes at the GHA are explained. Firstly the delivery of the cargo followed by the acceptance of the cargo, handling of cargo and finally the departure of the cargo.

A.3.1 Delivery of Cargo

The forwarder / customer will deliver the cargo to the CCB warehouse. The CCB office is shown in Figure A.5. The trucker will report at the front desk of CCB office and deliver the cargo documents. Following a ramp will be assigned and the truck will be unloaded by the warehouse staff as shown in Figure A.6. The peak hours for cargo delivery are until 21:00. The cargo will be unloaded at the unloading ramps as shown in the right side of the map in Figure A.2. Following the cargo will be stored in the buffer zones, indicated in Figure A.2 by the grey zones in Hall 4.

Figure A.5: [BLL] Cargo Centre Billund, Denmark

figures/BLLProcess7.JPG

Figure A.6: [BLL] Unloading the delivery trucks

A.3.2 Acceptance of Cargo

In the buffer zone the cargo will be scanned by the warehouse staff and crossed off the manifest that was delivered by the trucker, to check if all the cargo delivered on paper by the trucker is actually present in the truck. By scanning the cargo the status FOH (Freight on Hand) is given to the cargo, indicating that it is present in the warehouse. This process is illustrated in Figure A.7. If the cargo is from a known consignor/customer the cargo does not have to be scanned but can directly go into the warehouse. If the cargo is from an unknown consignor/customer it first has to be made secure by the x-ray. In Figure A.8 the large x-ray machines are shown. The x-rays are also shown in the map of terminal 1 in Hall 4 in Figure A.2, indicated by the grey areas with label: security. If the cargo shows deviations in the x-ray machine or if the cargo is too large to fit through the x-ray machine the cargo will be checked manually by trained warehouse personnel.

figures/BLLProcess8.JPG

Figure A.7: [BLL] Scanning of the cargo

figures/BLLProcess16.JPG

Figure A.8: [BLL] X-ray of the cargo

When the cargo is made secure the cargo will be transported to the designated area's for temporary storage. In Figure A.9 the storage location for dangerous goods is shown. The dangerous goods must first be checked by trained warehouse staff before it is allowed to be transported on a truck. At the bottom right the location for DGR can be found in Hall 1 on the terminal 1 map in Figure A.2. Other cargo is stored in the designated area's of the carrier. The storage area for KLM is shown in Figure A.10. The location for KLM cargo is indicated by 074 in Hall 3 on the terminal 1 map in Figure A.2.

Figure A.9: [BLL] Storage of dangerous goods cargo

Figure A.10: [BLL] Storage of the KLM cargo

A.3.3 Handling of Cargo

In Figure A.11 it is shown how the cargo is transported in the warehouse using trucks. The EGFL project requires in a future step that the every AWB the number of pieces are counted and that the cargo is weighed. CCB has the opportunity to weigh the cargo, simultaneously make a volume scan of the package, count the number of pieces and take a picture of the weight slip and of the cargo itself. This machine is shown in Figure A.12. The weighing machine is located in Hall 6 and is indicated by W/W in Figure A.2.

Figure A.11: [BLL] Transporting the cargo

Figure A.12: [BLL] Possibility of weighing the cargo

If all the checks are performed on the cargo and the build up list is send from SPL to BLL the warehouse will start with building the ULDs according to scheme. The build up of the ULDs will take place in accordance to the build up lists. The build up locations for KLM are shown in Figure A.2 by the grey areas in Hall 3. The building of the cargo is shown in Figure A.13. After the ULDs are ready they can be stored on the roller beds on the right side as shown in Figure A.14. When the truck has to be loaded the roller beds on the left side near the cargo doors are used. The storage roller beds are indicated in the map of terminal 1 in Figure A.2 by the large grey area in Hall 1. The roller beds used for loading the trucks are indicated by the smaller grey area's in Hall 1 in Figure A.2.

Figure A.13: [BLL] Build up of the cargo

Figure A.14: [BLL] Roller-beds for ULD storage and loading of trucks

A.3.4 Departure of Cargo

When the truck arrives at CCB the trucker can wait in the designated parking lot for truckers. This truck parking location is shown in Figure A.15. Following the trucker has to report at the documentation office of CCB. The documentation office is shown in Figure A.16. The documentation office is located on the top right side of terminal 1 as shown in Figure A.1. Following the trucker gets a loading dock and loading time assigned. The trucker can either go directly to the assigned loading dock or has to wait in the truck parking lot until the assigned time. Often it happens that the trucker does not report at the office. The office staff has to go to the truck parking lot and find the trucker to tell him that he is allowed to load.

Figure A.15: [BLL] Parking / waiting area's for the trucks

Figure A.16: [BLL] Reporting of the truck driver

In Figure A.17 the office of CCB can be seen. In the office the AWB's are processed entered into the Elwis system, security declarations are made, tags and information is entered in the KLM systems. The delivery trucker has to hand in all the documents at the documentation office and the departing trucker has to collect all the documents.

Figure A.17: [BLL] Office for preparation of documentation

Finally the truck can load as is shown in Figure A.18. As mostly ULD are loaded often rollerbeds are used. In case of a joint loading of MP and KL the trucker first has to go to a normal loading dock where the loose cargo of MP is loaded. Following the trucker can go to the roller deck loading dock where the ULD's can be loaded. In Figure A.19 a loaded truck can be seen.

Figure A.18: [BLL] Loading of the truck

Figure A.19: [BLL] Cargo in the truck

B Process Analysis of WFS in Copenhagen

In this appendix the process analysis of Copenhagen is explained. First the process locations will be presented followed by the schematic process flows and a pictorial tour of the cargo acceptance journey. A short explanation will be given with each picture. The process analysis of the ground handling agent (GHA), Worldwide Flight Services (WFS) in Copenhagen is performed by field research by multiple visits at WFS in Copenhagen. The visits have taken place on the 24th and 25th of April, 15th till the 19th of May, 25th till 28th of May and 13th till 17th of June and 19th till 22nd of June. In addition interviews have been performed with Jennifer Hansen [Hansen, 2017a], Henrik Thunbo [Thunbo, 2017], Ulrik Geraldie and the entire team [Worldwide Flight Services, 2017b].

B.1 Process Locations

Figure B.1: [CPH] Map of Worldwide Flight Services [Google Maps, 2017]

In Figure B.1 a top view of WFS in CPH can be found. WFS consists of the documentation building, terminal 1 and terminal 2. Terminal 2 is assigned to KLM Cargo. In Figure B.2 an top sight of the terminal 2 building where the AFKL cargo is located can be found. In the middle the KL bulk storage location can be identified (KL074). 074 is the prefix of the KL/MP AWB numbers.

Figure B.2: [CPH] Map of Worldwide Flight Services Terminal 2 [Worldwide Flight Services, 2017a]

B.2 Process Flow

The process flows of the cargo delivery and cargo export are shown below. The process flows have been constructed based on interviews with Jennifer Hansen (Office supervisor at WFS) [Hansen, 2017a] and Hendrik Thunbo (Lead agent at WFS) [Thunbo, 2017]. Three process flows have been identified, relevant to the EGFL project. First, the import truck flow shown in Figure B.3 identifying the steps in the cargo delivery process. Secondly the physical flow of the export truck in Figure B.4 identifying the steps that the cargo make in the process and finally the documentation flow of the export truck in Figure B.5.

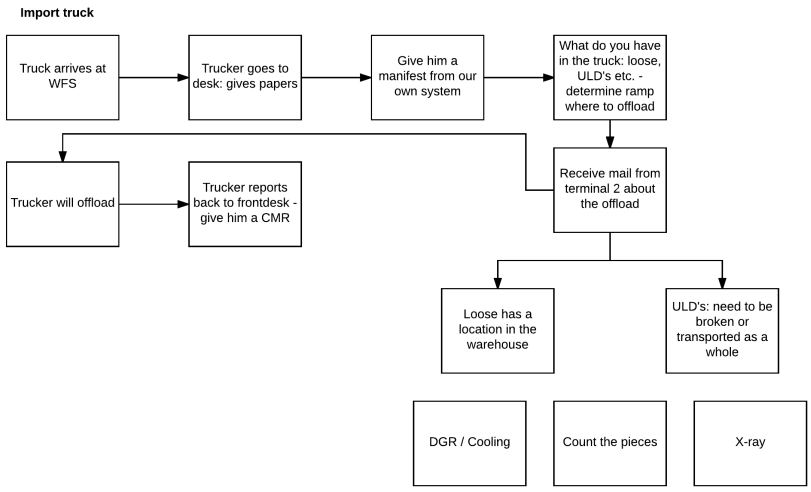


Figure B.3: [CPH] Import truck flow

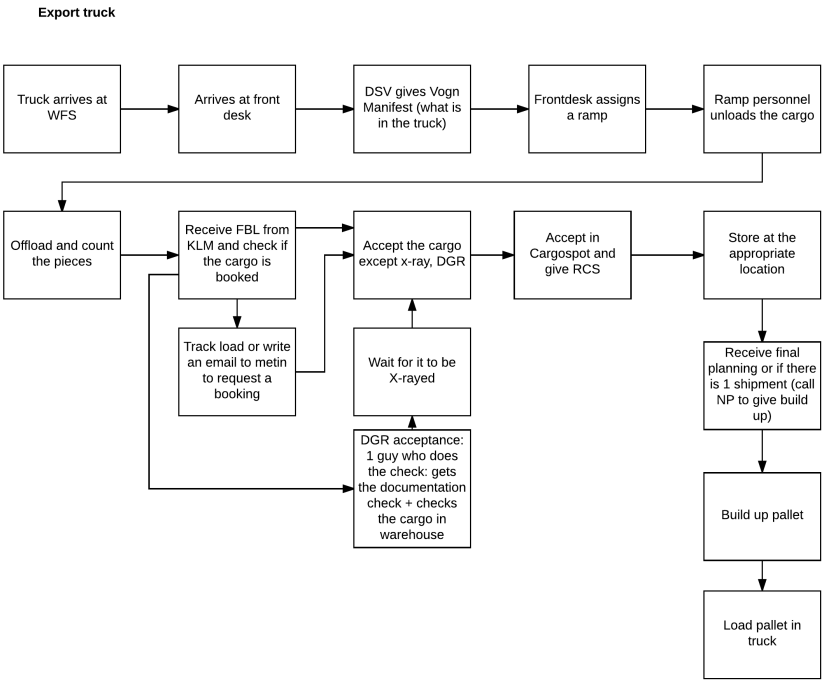


Figure B.4: [CPH] Export truck physical flow

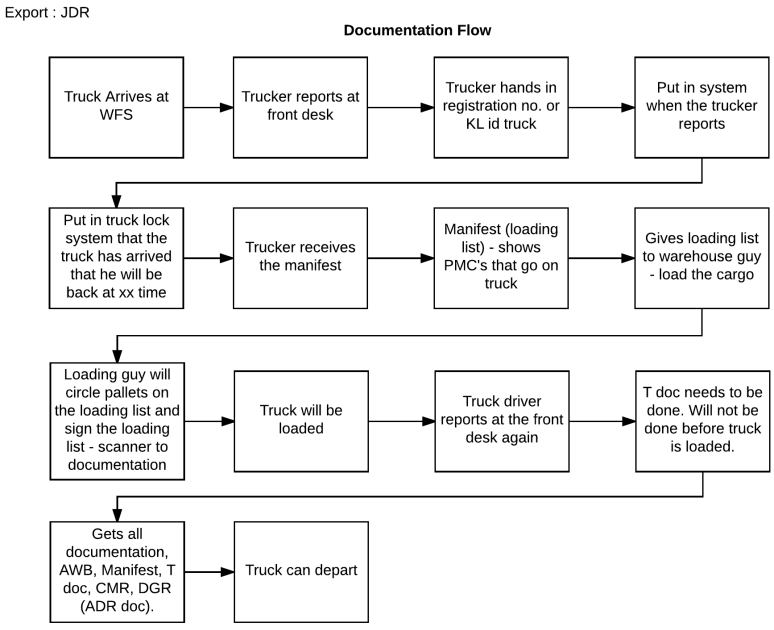


Figure B.5: [CPH] Export truck documentation flow

B.3 Cargo Acceptance Journey

In this section the pictorial tour of the cargo acceptance journey is displayed. The different steps of the processes at the GHA are explained. Firstly the delivery of the cargo followed by the acceptance of the cargo, handling of cargo and finally the departure of the cargo.

B.3.1 Delivery of Cargo

Figure B.6: [CPH] Worldwide Flight Services, Denmark

figures/CPHProcess15.JPG

Figure B.7: [CPH] Cargo Acceptance Area

The forwarder / customer will deliver the cargo to the WFS warehouse. The WFS warehouse is shown in Figure B.6. In accordance with the import process flow in Figure B.3 the trucker reports at the front desk of WFS. Following WFS will give him a manifest from their own system and ask the truck driver if he has to unload loose cargo or ULD's. Following a time and a unloading dock is assigned. The trucker unloads the cargo and the cargo will be temporarily stored in the acceptance area. The acceptance area is shown in Figure B.7. The acceptance area is also shown on the map in Figure B.2.

B.3.2 Acceptance of Cargo

figures/CPHProcess9.JPG

Figure B.8: [CPH] X-ray scanner

figures/CPHProcess10.JPG

Figure B.9: [CPH] Dangerous goods storage

The cargo at the acceptance area has to go through the x-ray scan, if dangerous goods (DGR) are present they need a separate check etc. In Figure B.8 the x-ray machine is shown and in Figure B.9 the storage location of dangerous goods is shown. In the map of terminal 2 in Figure B.2, the x-ray machine and the dangerous goods location are also indicated. The dangerous goods have to be checked by a staff member who has followed the appropriate training to give this clearance.

B.3.3 Handling of Cargo

Figure B.10: [CPH] Storage of KLM Cargo

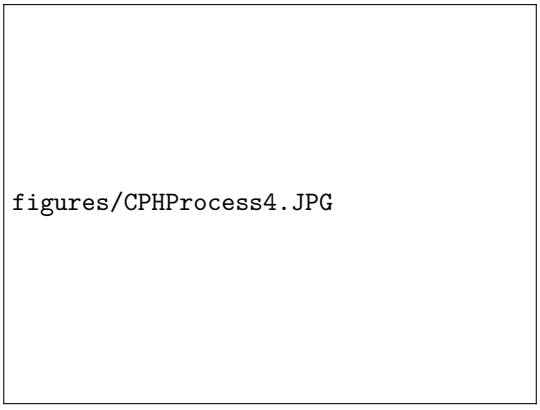


Figure B.11: [CPH] Cargo is build up on ULD

When the cargo is checked the cargo will be transported to the secured area. In this secured area each airline has a separate location where the loose cargo will temporarily be stored. In Figure B.10 the storage location of KL is shown. This storage location can also be seen on the map in Figure B.2, it is indicated with KL/MP). When the build up planning has been sent by NP the warehouse will know how to build up each ULD. The build up planning by NP is based on the connection time that the cargo has in Amsterdam. 'hot' cargo has a short connection time and will all go together on one ULD and 'cold' cargo has a longer connection time and also will be consolidated on a ULD. In Figure B.11 the build up of a ULD is shown. The items that have to go on a ULD are collected from the KL storage location. The ULD is put on a destinated location. This build up location has a build in scale to measure the total weight of the ULD. The available build up locations are indicated in Figure B.2 by the grey areas. Following plastic is put over the ULD and the different KL cargo items are loaded on the ULD.

Figure B.12: [CPH] Fully build up ULD

Figure B.13: [CPH] ULD transported by forklift

When the ULD is completely loaded, the top of the cargo will also be covered with plastic to ensure that no cargo is uncovered and can get damaged by rain or other liquid matter. Following a net is placed over the cargo and made secure to the ULD so that the cargo can not shift during truck and flight transportation. A complete cargo ULD is shown in Figure B.12. Following the complete ULD is transported to be either loaded directly in the truck or if it is build up earlier or if it arrives from the delivery truck as a complete ULD is it stored outside the warehouse as shown in Figure B.14.

Figure B.14: [CPH] Finished ULD is stored outside

Figure B.15: [CPH] Finished ULD is transported using fast lane roller bed

B.3.4 Departure of Cargo

Figure B.16: [CPH] Trucker reports to the front desk

Figure B.17: [CPH] Cargo is transported using the roller bed to the truck

The export truck arrives at WFS in Copenhagen, Denmark. The truck can be parked on the parking terrain and the trucker has to report at the front desk of WFS, as shown in Figure B.16. The trucker hands in his registration number or the KLM id. Often the trucker reports too early or too late. In the case that the trucker reports too early, WFS has to check if there is a slot in which the truck can be (un-)loaded. The trucker is informed at what time at what loading dock he can load / unload. The reporting time is entered into the cargoal system of KLM. Following the trucker receives the manifest, this is a document which shows which cargo he will take in his truck. Following the trucker goes back to the truck and drives the truck towards the correct loading dock as shown in Figure B.18. When the truck is correctly parked with the doors open and the roller bed available the trucker hands over the manifest to the warehouse operational staff. The operational staff will assist in loading the truck and will circle the ULDs that are loaded into the truck to ensure that all ULDs are correctly loaded. After loading the trucker will drive the truck away from the loading dock and will close the doors. Next the trucker will report back to the front desk of WFS and receives all the documentation including the T-document and the seal. The trucker will seal the truck to ensure that in Amsterdam he can directly go to the unloading warehouse instead of the REST department. When the cargo and documents are available to the trucker, the truck can depart. WFS will enter the reporting time and departure time in cargoal.

Figure B.18: [CPH] Loading of the truck

Figure B.19: [CPH] Truck is loaded

C Stakeholder Analysis

This chapter describes the stakeholders involved in the arrival performance and their relation to one another. The stakeholder analysis will be performed according to the methodologies defined by Enserink et al. [2010] in the book *'Policy Analysis of Multi-Actor Systems'*. Every phase of the stakeholder analysis is verified with a KLM employee.

According to Enserink et al. [2010] p. 80: *"Actors are those parties that have a certain interest in the system and / or that have some ability to influence that system, either directly or indirectly"*. As explained in Chapter 1 no single actor has the power to change the process individually while it would be beneficial for all individual actors. Therefore the problem owner has to be aware of the interests and objectives of the other actors. First a formulation of the problem is taken as point of departure (Section C.1), secondly the actors involved the cargo arrival performance are identified (Section: C.2), thirdly a formal chart is produced in Section: C.3, thereafter the interests, objectives and problem perceptions of the actors are identified in Section: C.4 and finally the interdependencies between actors are determined in Section C.5.

C.1 Problem Formulation

In this first section, the initial problem formulation is determined. An initial problem formulation is required to serve as a point of departure for the actor analysis. The problem as identified by the problem owner is used as a point of departure. Actor perception of the problem (KLM Cargo): The current arrival performance of cargo from the outstations to the hub in Amsterdam causes serious performance issues on the Flown As Planned and measures should be taken to improve the reliability.

C.2 Actor Inventory

In this second section, the actors involved in the arrival performance of the export cargo at the Amsterdam hub are identified. The stakeholders are divided into internal and external stakeholders. The internal stakeholders are organizations, entities or people within the KLM Cargo organization. The external stakeholders are located outside the KLM Cargo organization or other external parties. As the boundaries of this project are limited to the export cargo arriving from Denmark at the Amsterdam hub all actors involved with other cargo flows are disregarded in this actor analysis. First the internal actors will be discussed followed by the external actors. A short description of each actor is provided below.

C.2.1 Internal Stakeholders

1. **Air France - KLM Cargo Amsterdam**: Air France - KLM MartinAir Cargo as it is officially called is the specialized air cargo business of the Air France KLM Group. Air France KLM cargo is the initiator of this project. The company is in contact with all other external actors and consists of many departments. The departments relevant for this project are described below. Air France - KLM Cargo has two hubs, one at Amsterdam (Schiphol Airport (AMS)) and one in Paris (Charles de Gaulle (CDG) Airport). For this thesis only the Amsterdam location - Schiphol Airport will be taken inside the system boundaries, CDG will not be involved in the arrival process. CDG will be introduced to the EGFL project in a later stage of this project. Air France - KLM Cargo will take the lead in developing this EGFL project as the first airline worldwide.
2. **Accounting**: Accounting is the internal KLM Cargo department responsible for billing the flown cargo to the customers. Not only the price per kg or volume is billed but also the reparation needed such as physical cargo packaging reparation or document reparation, the statistics stated on the document. In addition if the cargo has to be made secure this is also billed to the customer.
   The accounting department will not be taken into account in the research scope as this only includes the arrival performance. However, the information sent towards this department will however be taken into account.
3. **Animal Hotel**: The animal hotel is a department within KLM Cargo fully focused on all aspects regarding animal transportation and storage. KLM Cargo is specialized in the transportation of

animals. Animals are a special handling good and therefore it must comply with several rules and regulations. The rules and regulations are partly influencing the document acceptance and the physical acceptance. Generally live animals are not transported by road by KLM.

The animal hotel department is not further taken into account in this research because the scope of this research only includes the arrival performance.

4. **Central Operations Management**: Central operations management also known as Operations Development Managers. The 8 market's in Europe are managed by 4 Operations Development Managers. The four markets are: 1) Nordics and France 2) Benelux & UK / Ireland 3) Italy, Switzerland and Iberia 4) Germany, Austria and Central & Eastern Europe. They are responsible to manage these markets together with the Local Operations Management. This includes a wide range of structural issues in the supply chain related to their markets such as customer, GHA, trucker or hub related issues. In addition each of the Operations Development Managers is responsible for the quarterly review with the trucking company that they are responsible for. An overview of the outstations in each market can be found in Appendix I.
5. **Customer Service Organisation (CSO)**: This department is responsible as an information broker between the Air France - KLM - MartinAir Cargo and the customers. CSO is part of the sales devision. The CSO will make new bookings for customers. Customers can also make bookings themselves without directly contacting CSO. As part of CSO is the sales department responsible for pro-active acquisition of shipments. A central CSO is located in Amsterdam and a local CSO is located in Copenhagen for the Nordics. The local CSO is responsible for bookings and is the single point of contact for the customers for all information regarding their bookings. Central CSO is focused on the Dutch market and serves as back-up for the local CSO's if needed.

   Only the CSO located in the Nordics will be considered within the system boundaries of this research. The customers in the Netherlands will not be taken into account and therefore the influence of the CSO in Amsterdam will be neglected.
6. **Dangerous Goods Competence Centre**: The dangerous goods department is specialized in all aspects related to the transportation of dangerous goods. This means documentation, packaging, build-up, storage and aircraft hold limitations. Different rules and regulations exist for dangerous goods and therefore the documentation and physical acceptance of dangerous goods will take place at a specialized department.

   The dangerous goods department will only be mentioned but considered outside the scope of the research boundaries.
7. **Network Planning (NP)**: This department is responsible for capacity management. They order capacity with the trucking companies (FTL/ LTL) based on the actual amount of cargo on daily level. They take into account the weight and volume of booked shipments for the next day and place the order >5 hours before scheduled time or departure. Monitoring the reservations, build-up planning for the GHA and provide feedback to CSO, RM, GHA, local-to-local CSO's, truckers. They are the first point of contact for the GHA's and for the truckers regarding daily operational questions and issues. NP is in close contact with local CSO, RM and flight planners at the Hub. In the new set-up NP is also responsible for the daily and weekly trucking performance monitoring and capturing of any irregularities.
8. **Procurement**: Responsible for the acquisition of goods and services for the Air France KLM Group, such as local contracts Air France KLM [2017]. Procurement of cargo handling not based on tenders but on preferred ground handler. General contract with trucker company to and from Amsterdam (usually based on tenders).
9. **Project Management**: Initiator, executor and ownership of the project. Responsibilities that the project is successful. KLM Cargo is currently developing the European Green Fast Lanes project. This project is managed and directed by the project management of Business Process Improvement (BPI) department of KLM Cargo. The project management team is not involved in the arrival performance directly but is involved in the design of the new acceptance process and trucking schedule, affecting the arrival performance.
10. **REST**: Remote Explosive Scent Tracking. The REST department is responsible for performing the REST procedures. Non-secured trucks first have to report to the REST department which follows several procedures to ensure that no explosive devices are located in the truck. This process takes about 15 - 45 minutes depending on the number of trucks in the queue. They take an air from the closed truck which is then sniffed by a K-9 specialized in detecting explosives. Without the secured status the truck is not allowed on the hub. REST is also known as RASCargO (Remote Air Sampling for Canine Olfaction) regulated in Europe as comercially available cargo screening technology according to DiagNose [2010]. KLM Cargo is offering the REST procedure since 2013

and outstations are not asked to secure the cargo for KLM any longer. If requested by agents to secure the cargo in the outstations, this is billed directly to the agents. If secured at the hub, klm charges the customer via “other charges" on the AWB. This is only applicable for trucked cargo, flown cargo, also handled by the GHA must be secured before loading an aircraft.

11. **Revenue Management (RM)**: Revenue Management releases the truck to be open for a booking 11 - 13 days in advance. They determine the entry conditions (= minimal rate per kg) for a cargo to be booked on the flight. Their goal is to increase the load factor of flights, thus achieving the highest revenue. Monitor the capacity of the flights versus the revenues and monitor the allotment contracts with key accounts. Whereas profitable cargo has a higher priority. Revenue management is located in Amsterdam and in Paris.
12. **Security**: The security department is responsible for secured access to the hub to authorized vehicles and personnel. In the cargo arrival process they are responsible to provide access to the hub to secured trucks and authorized people.
    The security department only plays a minor role in the arrival performance of trucks and therefore will only be mentioned and not be included in the scope of this research.

Table C.1 provides a summary of the identified internal organizations, entities, department and people including a short description. The table can be used for a short summary of the above detailed descriptions of the stakeholders.

Table C.1: Overview of the current internal stakeholders for the arrival process

Internal Stakeholders

Stakeholder	Description
Air France - KLM Cargo	Air cargo business of Air France KLM Group.
Accounting	Invoicing of the customers.
Animal hotel	Physical acceptance and well-being of transported animals.
Central operations management	Responsible for certain markets.
Customer service organization (CSO)	Contact with customers.
Dangerous Goods (DGR)	Responsible for the physical and document acceptance of dangerous goods.
Network Planning (NP)	Capacity management of trucks.
Procurement	Contract with trucker company and ground handling company (GHA).
Project Management	Ownership of the EGFL project.
REST	Responsible for securing non-secured trucks.
Revenue Management (RM)	Determine the rate for a cargo booking.
Security	Responsible for the access and exit of the HUB.

C.2.2 External Stakeholders

1. **Air France Cargo**: Air France - KLM Cargo operate under the same airline flag however they have their different Hubs and different cargo flows. The Air France cargo is cargo booked on Air France flights and will be handled by the Charles de Gaulle Airport.
   Only the cargo flow to Amsterdam Schiphol Airport will be considered in this research. Occasionally CDG cargo will be found in the KLM streams but this is in general not considered in this research.
2. **Amsterdam Airport Schiphol**: The KLM Cargo hub is located at the Amsterdam Schiphol Airport. Therefore they are subjected to the rules and regulations of Schiphol.
3. **Customers**: Customers are the stakeholders who book their cargo to be transported with KLM Cargo. The customers are responsible to provide the cargo with the correct documentation and physical packaging according to the confirmed booking as described in the Cargo Handling Manual (CHM) [AFKL Cargo, 2016]. If the customer fails to do so the cargo will be repaired and the customer will be billed for this handling.
4. **Customs**: Executors of the governmental rules and regulations. Taxes and compliance. For compliance the information on the documents has to be correct. In some countries (e.g. Spain and Italy) the cargo is delivered at the customs warehouse before being handled.
5. **Delta Cargo**: Delta Airlines is part of Sky Team Cargo. Some cargo is also transported by the KL trucks. As this is a separate airline their rules and regulations have to be taken into account.

6. **Document Acceptance**: The document acceptance department is responsible for all the paperwork regarding air transportation. It is important that all information in the paper (AWB) or electronic Air Way Bill (FWB) is correct. If incorrect Air France KLM MartinAir Cargo can receive a fine at the destination. Items that are included in the compliance check are destination address, weight, volume, commodity, packaging and other checks. Document acceptance both takes places at the outstations and at the Amsterdam HUB.

   The document acceptance at the outstation is taken inside the scope of this research while the document acceptance at the Amsterdam HUB is not taken into the research scope.

7. **Freight Forwarders**: A freight forwarder is a person or a company that organizes shipments for individuals or corporations to get goods from the manufacturer or producer to a market, customer or final point of distribution. The freight forwarder arranges the importing and exporting of goods on behalf of the customers (shippers) from the beginning till the end of the supply chain. Forwarders often have contracts with carriers (the airlines) to transport the goods. The freight forwarder often provides a range of services such as track and trace, preparation of documentation and physical cargo, customs, booking cargo space, negotiating cargo prices, insurance, warehousing and consolidation.

8. **IATA**: The International Air Transportation Association is a trade association for the world's airlines [International Air Transport Association, 2017a]. IATA represents 275 airlines equivalent to 83% of the total air traffic. IATA formulates the industry policy on critical aviation issues. KLM Cargo has to comply with the rules and regulations of IATA.

9. **IOSA**: is the IATA Operational Safety Audit program. IOSA is an internationally recognized and accepted evaluation system designed to assess the operational management and control systems of an airline [International Air Transport Association, 2017a]. KLM Cargo has to comply with the rules, regulations and systems designed by IOSA.

10. **Local operations management**: The local operations management department is located in Stockholm for the Nordics. This department is responsible for the local operations of the stations in the Nordics. The stations in the Nordics are for Denmark: Billund (BLL) and Copenhagen (CPH), for Norway: Oslo (OSL), Stavanger (SVG), Alesund (AES), Kristiansand (KRS), Trondheim (TRD), Sandefjord (TRF) and Bergen (BGO), for Sweden: Malmo (MMX), Stockholm (ARN), Goteborg (GOT) and Norrkoping (NRK) and for Finland: Helsinki (HEL). In addition the local operations management is responsible for the bi-weekly, monthly or quarterly reviews, depending on the size of the station with the preferred suppliers. This is WFS in CPH, Menzies in MMX, Swissport in HEL.

11. **MartinAir Cargo**: MartinAir Cargo is since 2008 part of the Air France - KLM Cargo group. MartinAir is specialized in the airfreight business and operated both from Paris Charles de Gaulle and Amsterdam Schiphol Airport hubs. MartinAir focuses solely on airfreight business and does not perform passenger operations anymore MartinAir Cargo [2017].

12. **Other Airlines**: There are numerous other airlines competing on the air cargo market. As the cargo should be transported in the fastest and cheapest way there is a lot of competition in the air cargo industry. Outstations often handle multiple airlines as well as the truckers who also often have contracts with many parties.

    Other Airlines will only be mentioned in this thesis but not considered in depth as this is outside the research scope of this thesis.

13. **Outstations**: The cargo is delivered by the customers or freight forwarders to the outstations. The outstation following consolidates the cargo and ensure that the documentation and physical complies with the requirements. The trucking companies will collect the cargo from the outstations and transport the cargo towards the hub. In Appendix I a list of all the outstations delivering to the Amsterdam Schiphol Airport hub can be found. In the outstations, all cargo handling is outsourced to the GHA. The GHA's handle the AF / KL / MP freight under one roof. In the case of Billund by Cargo Centre Billund (CCB) and for Copenhagen by Worldwide Flight Services (WFS). The outstations are monitored by the local operations management.

14. **Physical Acceptance**: The physical acceptance department of the GHA is responsible for the physical acceptance of the cargo. The cargo is checked for compliance on the weight, volume, packaging, labeling, commodity among other checks. The physical acceptance department is responsible for unloading the truck and following the storage and further handling of the cargo. Physical acceptance both takes place at the outstations and at the Amsterdam HUB.

    The physical acceptance at the outstation is taken inside the scope of this research while the physical acceptance at the Amsterdam HUB is not taken into the research scope

15. **Sales and Distribution (S&D)**: The local sales and distribution for the Nordics is located in Stockholm, Oslo and Copenhagen. S&D contains of 1 market manager, multiple sales managers, 3 CSO departments and 3 pricing and contracting departments. They are together responsible for the revenues exported from the Nordics. The commercial part of the supply chain. In addition the sales and distribution department is the account manager of the larger customers. Their responsibility is to acquire and maintain customers.
16. **Shippers (Jan de Rijk)**: The shipper, in the case of Billund and Copenhagen is responsible for the transportation of the cargo from the outstation to the Amsterdam Schiphol Airport hub. Their responsibility is to report on time for loading with the correct functional equipment and licensed driver's. Depart on time and finally arrive in AMS within the contracted transit time, with the correct cargo and documentation in an airtight trailer.
17. **Sky Team**: Sky Team is an alliance of cooperating airlines, established in 2000. The alliance of airlines enables the airlines to offer their passengers a larger network of flights enlarging their market share and reducing cost. Being part of the Sky Team alliance enables KLM Cargo to be transported on a flight of a Sky Team partner. The airlines part of the Sky Team alliance are; Aeroflot, Aerolineas Argentinas, Aeromexico, Air Europa, Air France, Alitalia, China Airlines, China Eastern Airlines, China Southern Airlines, Czech Airlines, Delta Airlines, Garuda Indonesia, Kenya Airways, KLM, Korean Air, Saudia, Middle East Airlines, TAROM, Vietnam Airlines and Xiamen Airlines [Sky Team, 2017].

    Sky Team will only be mentioned as a stakeholder but will not be included in detail in the research boundaries of this thesis.

Table C.2: Overview of the current external stakeholders for the arrival process

Stakeholder	Description
Air France Cargo	Management of cargo going on an Air France Flight from the Parishub. They have a stake in the EGFL project.
Amsterdam Airport Schiphol	The Air France - KLM Cargo hub is located within this airport and therefore we are subjected to their rules and regulations.
Customers	Book their cargo to be transported with Air France KLM Cargo. Air France KLM has to satisfy these customers.
Customs	Executors of the governmental rules and regulations.
Delta Cargo	Part of Sky Team. Some cargo is transported on KL trucks. Due to different rules and regulations these need special attention.
Document Acceptance	Responsible for the paperwork of the cargo air transportation.
Freight Forwarders	Person or company that organises shipments for individuals or cooperations to get goods from the manufacturer or producer to a market, customer or final point of distribution.
IATA	The trade association for the world's airlines.
IOSA	The IATA Operational Safety Audit program.
Local Operations Management	Responsible for the local operations of the stations in the Nordics.
MartinAir Cargo	Part of the AFKL group and specialised in airfreight business.
Other Airlines	Competition
Outstations	Consolidate cargo and ensure that the documentation and physical acceptance complies with the requirements.
Physical Acceptance	Responsible for the physical acceptance of the cargo. Compliancewith weight, volume, packaging etc.
Sales and Distribution	Responsible for the larger customers
Shippers (Jan de Rijk)	Responsible for the transportation of the cargo from the outstations to the hub in Amsterdam.
Sky Team	Alliance of cooperating airlines, enabling airlines to offer a larger network of flights enlarging the market share and reducing costs.

C.3 Relations between Stakeholders

In this section the formal relations between actors are mapped using a formal chart. The formal chart describes the formal tasks, authorities and relations of actors and the current legislation. The analysis begins with mapping out the formal positions and relations. The formal chart will be limited to the actors identified in Section C.2. The informal relations are not taken into account in this formal chart although they often do exist and do have an influence on the relation. In addition not all the existing formal relations are displayed but only those deemed most important for the problem analysis. KLM Cargo is the problem owner and therefore will be displayed in the center of the formal chart for the external stakeholders. For the internal formal chart KLM Cargo is represented by the white boxes. The blue boxes are external stakeholders. The relations between the other actors are displayed by arrows. A single-sided arrow indicates a hierarchical relationship and a two-sided arrow indicates formal representation relationship / membership. The formal charts are verified with KLM employees. The relations of the stakeholders with the greatest importance to KLM Cargo with regard to the EGFL project are further elaborated below the formal charts.

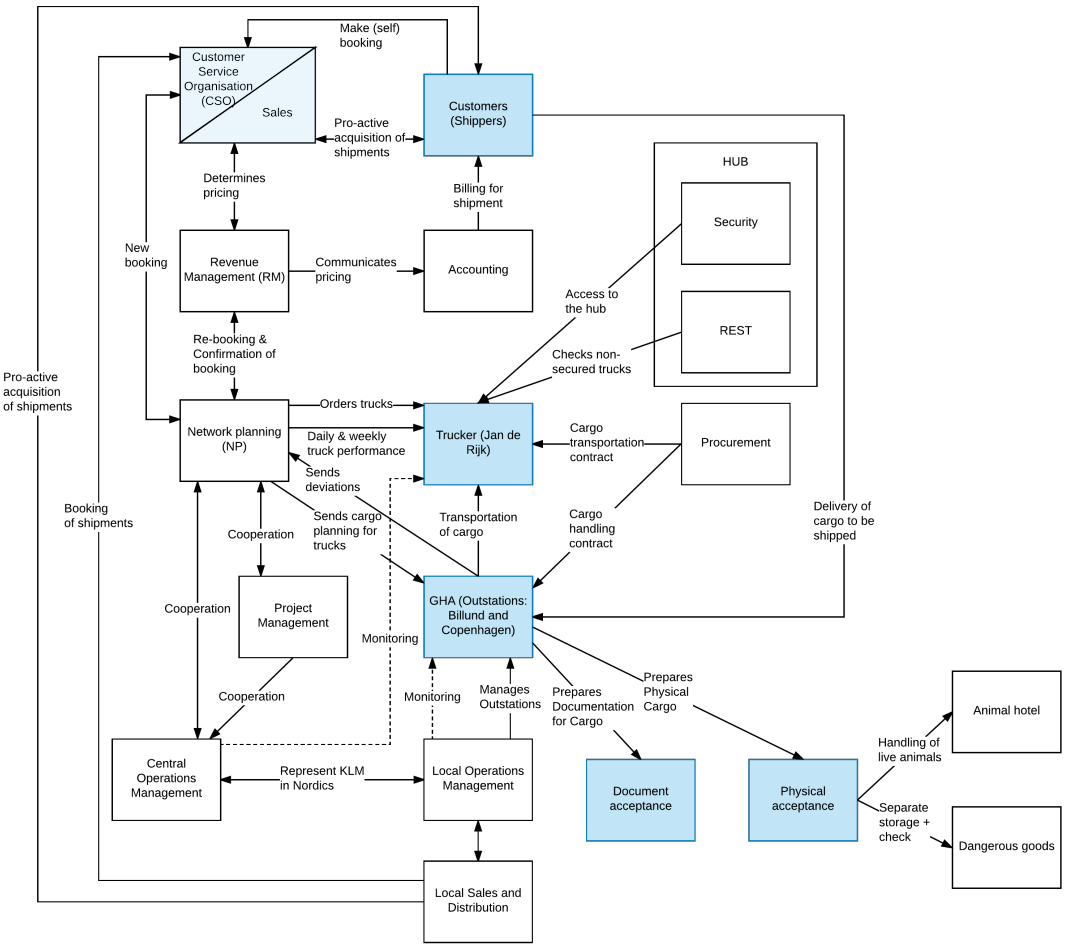


Figure C.1: Formal chart showing the relations between the internal stakeholders for KLM Cargo

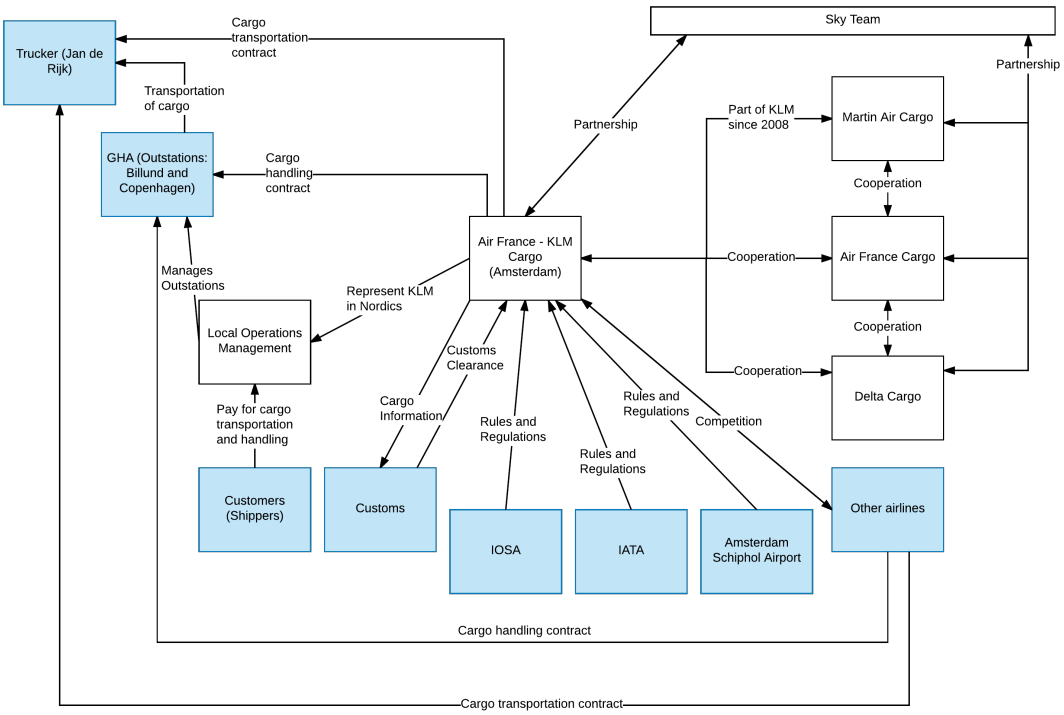


Figure C.2: Formal chart showing the relations between the external stakeholders for KLM Cargo

Netwerk Planning - Trucker (Jan de Rijk)
Network Planning on behalf of KLM Cargo orders trucks at the shipping company Jan de Rijk. The 8 European markets are divided over 4 desks at NP. Each responsible for the truck capacity ordering for their own market / station. For the booking of the trucks they have to take into account the height of the truck, the number of ULDs, number of trucks needed, special handling codes (DRG or COL), rollerbed, sidecurtains if it is a large shipment. In addition NP is the first contact entry point for truckers, CSO's, local operations for any questions regarding the daily operations.

Netwerk Planning - Outstations
Network Planning on behalf of KLM Cargo sends build up plannings based on the booking list to the outstations. The cargo which has a short connection time at Amsterdam (also called hot cargo) will be build together on a ULD, so that when arriving in Amsterdam only 1 ULD has to be broken down instead of all ULDs. The cold cargo, cargo with a long transit time (>24 hours) at Amsterdam is also build on one ULD. If enough cargo is available for one destination this cargo is build up on one ULD and does not have to be broken down but can directly enter the airplane, these are called T-ULD (Through ULD). The final type of ULD that exists is a BUP, this is a ULD which has already been build up by the customer. Plannings are send several days and hours in advance for the outstation to prepare the build up. The outstations in return send the deviation reports to Network planning. Deviation reports are reports about freight which has not been send on the booked truck for example due to late delivery (Late-show) or no-booking (Go-show). Network planning in return sends this to CSO who can make a new booking for the customer.

Trucker - Hub
The trucker is responsible for the transportation of the cargo from the outstations to the hub. As the hub has to schedule manpower, facilities and unloading space for a truck arrival it is of utmost importance that the truck arrives on time in Amsterdam. In addition the truck has to arrive in time to ensure that the cargo will be able to make it's connecting flight. It is important that the truck is made secure at the outstation so that the cargo can directly go into the warehouse without first making the cargo secured by the REST department. If the cargo is delivered unsecured to Amsterdam the trucker first has to go to the REST department following each shipment has be made secured by checking the physical acceptance, document acceptance and it has to be x-rayed increasing the handling time at Amsterdam.

C.4 Interests, Objectives and Problem Perceptions

In this section the interests, objectives and problem perceptions of the various internal and external actors are discussed. Not all above-identified stakeholders wil be taken into account in the further analysis. This is due to the fact that they are not actively taking part in the current arrival process due to the scope of this research. In a future stage they might provide an added value and therefore they have not been omitted from the stakeholder identification. The stakeholders that will not further be analyzed are: accounting, Air France cargo, Amsterdam Airport Schiphol, Animal hotel, Delta cargo, Freight forwarders, IATA, IOSA, other airlines, REST, security and sky team.

Actor	Interest	Existing or expected situation and gap	Causes	Possible solutions
Air France KLM Cargo	Transport more cargo and make more profit	The Cargo market has crashed in the past years leaving KLM with no profit	Cargo market demand has fallen, reliability of cargo transportation is low	Increase reliability to attract clients and cargo
Central Operations Management	Improve the processes to gain higher reliability of cargo transportation	Cargo is not very reliable, outstations and truckers not performing optimally	No strict rules for trucking, clients, outstations	Increase management supervision and set up incentives.
Clients	Cheapest and fastest transportation of goods	The cargo transported by AFKL is not very reliable	Delivery of cargo by clients not according to standards, clients not billed for reparation	Improve entire supply chain of air cargo transport
Customer Service Organisation	Book as much as possible cargo and keep customers informed.	Not as much customers as desired.	Cheaper alternatives with improved quality at the competition	Increase reliability to attract clients and cargo
Customs	Taxes and compliance of cargo	Needed customs document incomplete or incorrect	No checks at outstation / client	Incentive for outstations to do document and physical check more thoroughly
Dangerous Goods	Correct physical and documents	Documents and physical arrival of dangerous is not according to standards needs a lot of	No checks at outstation / client	Incentive for outstations to do document and physical check more thoroughly
Document Acceptance	Correct and complete document acceptance	Documents contain incorrect or incomplete information	No checks at outstation / client	Incentive for outstations to do document check more thoroughly
Local operations management	Correct and complete cargo handling at the outstations	Outstations are not performing optimally.	No incentives and consequences	Create incentives for outstations and truckers
Martin Air Cargo	Transport more cargo and make more profit	Cargo does not arrive on time at hub - does not reach connecting flight	No incentives and consequences	Create incentives for outstations and truckers
Network Planning	Optimize truck arrival and truck loading for fast handling at the hub	Many deviations in truck performance and outstation performance - need a lot of reparation.	No incentives and consequences	Create incentives for outstations and truckers
Outstations	Handle much cargo in a correct way as cheap as possible as fast as possible	Cargo is delivered late, incomplete, not delivered, truckers arrive late, inconsistant, need a lot of manual handlings	Clients not informed well, clients don't know correct procedure and have no incentive to perform correctly.	Inform clients about correct procedure, educate the outstations about the correct handling procedure
Physical Acceptance	Correct and complete physical acceptance	Cargo is incorrectly labeled or packaged or is incomplete	No checks at outstation / client	Incentive for outstations to do physical check more thoroughly
Procurement	Services with highest quality for the cheapest price	Pay high prices for service that is not performed without error.	No strict rules for trucking, clients, outstations	Make strict rules, follow the rules, incentives / enforce penalties
Project Management	Successful completion of the EGFL project	-	-	Improve entire supply chain of air cargo transport
Revenue Management	Gain most revenue per shipment and the highest load factor per aircraft	Clients do not pay high prices as the competition offers lower.	Competition offers cheaper prices and higher reliability	Increase reliability to attract clients and cargo
Sales and Distribution	Sell as much cargo as possible for the highest revenue. Have many satisfied clients.	Limited cargo sales	Competition offers cheaper prices and higher reliability	Increase reliability to attract clients and cargo
Shippers (Jan de Rijk)	Transport as much cargo for a as high as possible price.	Trucker arrives late and often not on time.	Problems with planning. No incentives to increase performance.	Design a manageable schedule, take into account their bottlenecks

C.5 Mapping the Inter-dependencies

The relationship between the actors can be analyzed by determining the dependency relations between actors. This can be done by the importance to the problem owner of resources of other actors, the extent to which those resources are replaceable and the degree to which the interests and objectives of other actors are similar (Hanf & Scharpf, 1978). In addition the dedication of actors can also be used to map the inter-dependencies between actors.

C.5.1 Resource Dependency

The criticality of an actor is dependent on if the resources can be replaced and the dependency of the resource. According to Enserink et al. [2010] critical actors are those on whom a problem owner critically depends for solving his problem. Critical actors have either the power for realization or blocking power.

Table C.3: Resource dependency of stakeholders

	Limited importance	**Great importance**
Limited options to replace	Medium dependency	High dependency
Can easily be replaced	Limited dependency	Medium dependency

Using Table C.3 on the external actors the critical actors can be identified based on their resources and replaceability. This overview can be found in Table C.4. Each of the classifications is described below the table.

Table C.4: Overview of the external critical actors

Actor	**Important Resources**	**Replaceable?**	**Dependency Classification**	**Critical Actor?**
Customers	Yes	No	High	Yes
Customs	Yes	No	High	Yes
MartinAir Cargo	No	Yes	Low	No
Outstations	Yes	Yes / No	Medium	Yes / No
Document Acceptance	Yes	No	High	Yes
Physical Acceptance	Yes	No	High	Yes
Shippers	Yes	Yes	High	No

Customers
Customers are the most important actor for KLM Cargo. Without customers no shipments would be booked, no cargo transported and no profit made. The resources of the customers, the shipments that they would like to have shipped by aircraft are of great importance. Individual customers are replaceable but the overall customers aspect is not. KLM Cargo is very dependent upon the customers and therefore it is important that the customers are satisfied with the quality of the product. In addition KLM Cargo is dependent on the quality of the physical cargo, documentation, booking and reliability that the customer delivers. If the customer delivers bad quality repair is needed before the cargo can be shipped.

Customs
Customs (both domestic and foreign) has a large influence on the arrival process. Only if customs have cleared the cargo the cargo is allowed to be transported otherwise it will be stopped. It is therefore important that the customs documents are complete and correct. The clearance can only be gained via customs and not via another institute. Many of the checks performed during physical and document acceptance are due to rules and regulations from customs. If a cargo is incorrectly shipped and it arrives at a foreign customs the cargo will be stopped and will not be handed over to the customer.

MartinAir Cargo
MartinAir Cargo is part of the Air France - KLM Cargo. Trucks will depart from the outstations with both KLM cargo and MartinAir cargo as co-loads. This is advantageous as especially when there is limited amount of cargo the truck can still be filled reducing cost. The MartinAir cargo has to be unloaded at another warehouse, often KLM Cargo is unloaded first, therefore not influencing the arrival process of the KLM Cargo much. Only loading at the outstation might take longer due to more cargo that has to be loaded but also due to the fact that MP cargo is loose loaded cargo while KL cargo is mostly build up on aircraft ULD's. KLM Cargo is not dependent on the resources of MartinAir cargo therefore they are not a critical actor.

Outstations / Document Acceptance / Physical Acceptance
The Document Acceptance and Physical Acceptance are two important activities outsourced by KLM Cargo to the different GHA's in the outstations such as Swissport, WFS, CCB, Betatrans, Menzies who handle the cargo on behalf of KLM Cargo. KLM Cargo has 3 preferred GHA's suppliers in Europe: WFS, Menzies and Swissport. The Document Acceptance and Physical Acceptance departments are departments that have very important resources. It is critical that the document acceptance and the physical acceptance are performed correctly and completely to avoid bottlenecks further in the chain. Therefore the Document Acceptance and Physical Acceptance departments are not replaceable and they are critical actors. The outstations are not seen as a critical actor because it does not have a significant influence on whether Swissport or WFS handles the cargo except for the price. Therefore these in theory are replaceable. Swissport, WFS and Menzies are the preferred suppliers due to the large amount of stations that are covered by these suppliers and therefore only one contact person for multiple stations and improved partnership (called for Purple suppliers due to the 'Purple' project that initiated this). However due to the fact that CCB (Billund) and WFS (Copenhagen) handle the cargo from KLM cargo for many years they are experienced with the procedures.

Shippers
The shippers in the case of Billund and Copenhagen: Jan de Rijk is an important resource as they transport the cargo from the GHA in Billund and Copenhagen to the hub in Amsterdam. They are however replaceable by other shipping companies such as van Swieten, Breogan, Bergwerff, Brinkman etc. The dependency is high as without the shippers the cargo would not be transported from the outstations to the Amsterdam hub. Jan de Rijk is therefore identified as a non-critical actor.

C.5.2 Dedication

The dependency on other parties is also influenced by their interest in the problem and their willingness to use their resources. If an actor experiences clear costs or benefits the actor can be classified as a 'dedicated actor' while if this is not the case the actor is classified as an 'non-dedicated' actor. Over time the classification of an actor can change. In Table C.5 the stakeholders, how they should be managed, their involvement and the potential for resistance are identified. In Figure C.3 a power / interest matrix is constructed of the various stakeholders. Critical actors are those with a high level of power and dedicated actors are those with a high level of interest. The actors that should receive extra attention are the GHA, truckers, central operations management and local operations management.

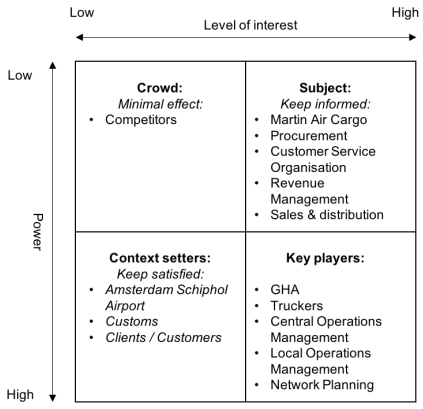


Figure C.3: Power interest matrix of the stakeholders

Table C.5: Classification of interdependencies of the most important stakeholders

Stakeholder	Class	Involvement	Potential to Resistance
Central Operations Management	Manage closely	Responsible for managing the interface with truckers GHA and CSO. Important stakeholder can be consulted when critical issues related to these parties arise.	Low
Customers	Manage closely	To enable on time shipment of cargo the customers are required to deliver the cargo to the GHA that matches with booking, correct and complete documentation and physical delivery.	Medium
Customer Service Organisation (CSO)	Manage closely	CSO is responsible for all communications towards the customer - design of the local conditions.	High
Customs	Keep satisfied	Customs require a steady flow of information about the shipped cargo to give customs clearance. The cargo must meet the quality and safety standards	Low
Local Operations Management / Sales & Distribution	Manage closely	Responsible for the local operational activities in the region specifically the GHA within the Nordics.	Medium
Network Planning	Manage closely	Network planning orders and monitors trucks capacity to the trucking schedule and sends build up plans to the GHA.	High
GHA / Document & Physical Acceptance / DGR	Manage closely	The GHA are responsible for the document acceptance, physical acceptance, dangerous goods acceptance on behalf of KLM Cargo. Handling the cargo and loading it on the truck.	High
Procurement	Manage closely	Procurement is responsible for the local contracts and the Selective Loading Rules.	Low
Revenue Management	Manage closely	Responsible for ensuring that cargo is profitable	Low
Truckers	Manage closely	The truckers transport the cargo from the GHA to the hub in Amsterdam. It is important that the truckers are on time.	Medium
Competitors	Minimal effort	No strong involvement	n/a

D Customer Booking Behaviour

In the figures below the behaviour of customer booking can be found. The booking opens 11 days before departures at which moment an increase in the booking volume can be seen. Following the booking volume increases and as more information becomes known about the shipments the booking volume decreases until the final is reached on the day of departure. In the figures also the customers with the largest booking volume can be identified.

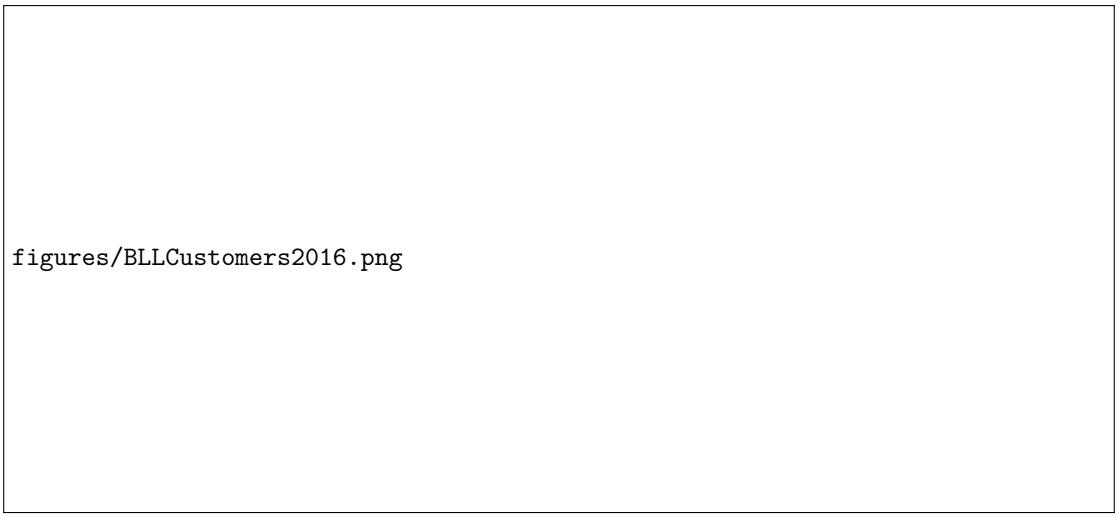


Figure D.1: Customer booking behaviour Billund July and August 2016 [Asselman, 2017c]

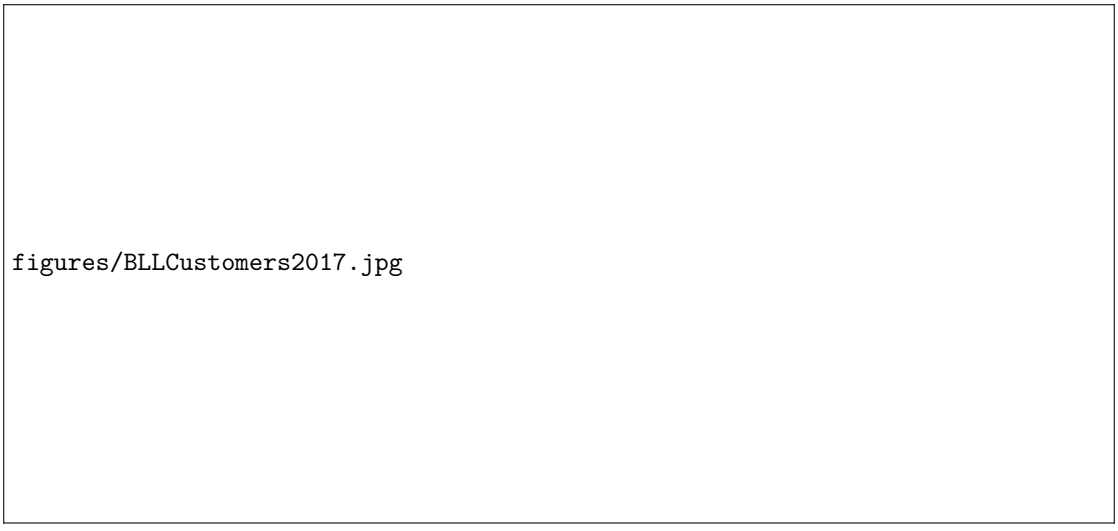


Figure D.2: Customer booking behaviour Billund March and April 2017 [Asselman, 2017c]

In Figure D.1 the booking behaviour in Billund in July and August 2016 can be found. According to Figure 8.5 July and August are the peak months in which cargo departs. From the figure below figure it can be concluded that DSV and Schenker are the largest customers in peak months transporting both almost 2000 m^3 from Billund. It can also be seen that both adjust the volume of the booking until the day of departure. In Figure D.2 the booking behaviour in Billund in March and April 2017 can be found. March and April are average months showing that only Schenker has a large volume to be transported from Billund to Amsterdam by truck. Schenker almost transports 1800 m^3 while the rest of the customers have significantly lower volumes. Again the customer adapts the volume until the day of departure.

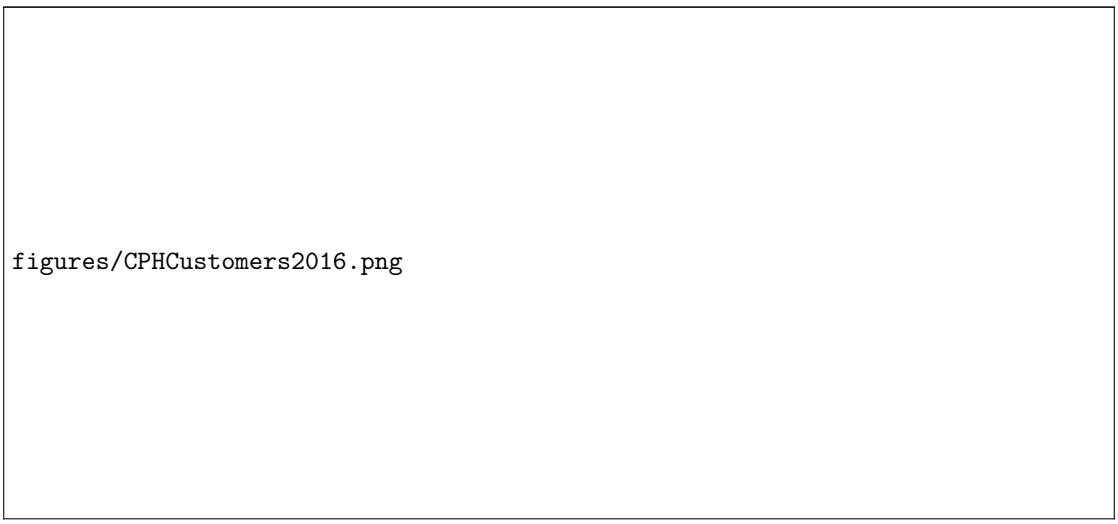


Figure D.3: Customer booking behaviour Copenhagen July and August 2016 [Asselman, 2017c]

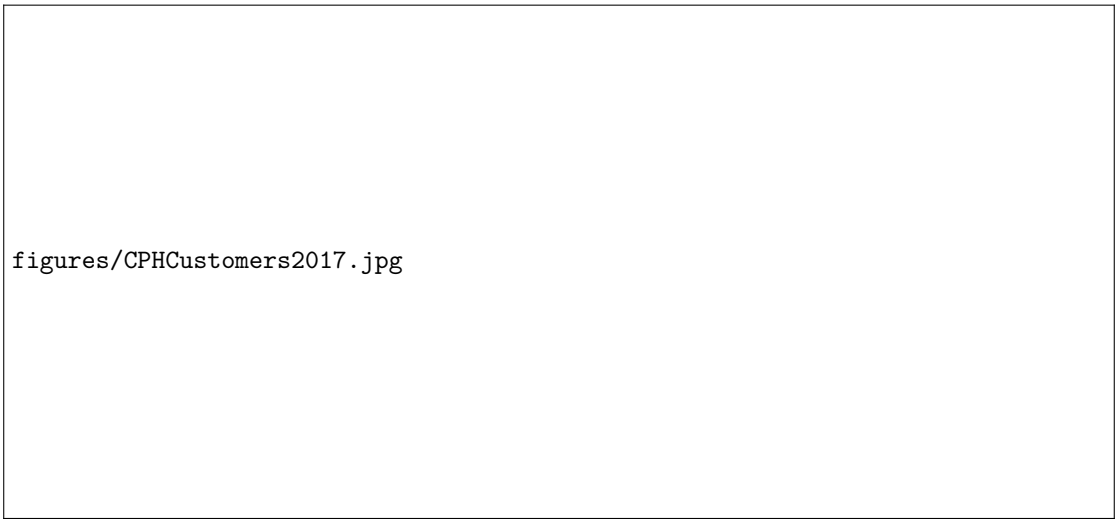


Figure D.4: Customer booking behaviour Billund March and April 2017 [Asselman, 2017c]

In Figure D.3 the booking behaviour in Copenhagen in July and August 2016 can be found. According to Figure 8.10 July and August are the peak months in which cargo departs. From the figure below it can be concluded that Scan Global Logistics is the largest customer in peak months transporting both almost 1800 m^3 from Copenhagen. It can also be seen that they adjust the volume of the booking until the day of departure. In Figure D.4 the booking behaviour in Copenhagen in March and April 2017 can be found. March and April are average months showing that again Scan Global Logistics has a large volume to be transported from Copenhagen to Amsterdam by truck. Scan Global Logistics indicated as SGL in Figures D.3 and D.4, almost transports 1600 m^3 while the rest of the customers have significantly lower volumes. Again the customer adapts the volume until the day of departure.

E Interviews and Meetings

In this Appendix the actions, meetings, interviews and calls performed are summarized. First in Section E.1 an overview of all meetings, interviews, field observations is given including the date on which is was performed, the event that has taken place, the company that is represented the attending individuals and their functions. Secondly in Section E.2 the stand-up sessions in accordance with the Agile scrum method that have taken place twice a week are described including the attending KLM Cargo personnel and their functions. The stand-up sessions allowed for constant verification of the design of the EGFL project. Finally in Section E.3 the daily conference call that took place with the other interns and directly supervising KLM Cargo employees is described. 10 Stations are simultaneously enrolled during this project divided over 6 interns allowing for cross-feedback for all stations.

E.1 Interviews and Meetings regarding Billund and Copenhagen

During the EGFL project several interviews, meetings and calls have taken place to gather information about the current state. Following the new EGFL project designed for BLL and CPH was explained to the market management located in Stockholm, trucking company Jan de Rijk and GHA stations BLL and CPH. During the implementation of the EGFL project several problems have been encountered which were discussed with the relevant staff of both the GHA, trucking company and KLM Cargo. In Table E.1, Table E.2 and Table E.3 an overview of all meetings that have been performed are shown.

The twice a week EGFL stand-up meetings have not been included in this overview but will be discussed in Section E.2. The daily call with the interns and supervising staff is also not included in this overview but is discussed in Section E.3. Finally the daily meetings with Sanja Mravik the Operations Development Manager directly responsible for the stations BLL and CPH have also not been included. Daily supervision and guidance was provided by Sanja Mravik from the preparation period (17 March 2017) onwards.

Table E.1: Meetings, interviews and calls during the EGFL project [1]

Date [2017]	Event	Representing	Attendee	Function
03/03 - 05/03	Field Research Frankfurt	KLM Cargo	Fred Timmers	Outstation Messaging / Cargoal booking
16/03 & 17/03	Meeting Procurement	KLM Cargo	Willem van Roozendaal	Cargo Procurement Manager Europe
16/03	Meeting Cargo Control Centre	KLM Cargo	Pieter de Haan John Tulen	Planner Europe
20/03	Meeting Trucking schedule	Capgemini	Vincent de Wolf	Management Consultant
20/03	Meeting Documentation	KLM Cargo	Michael Macintosh Huseyin Tuncer	Shiftleader Edit Team Shiftleader Documentation
30/03	Meeting EGFL Nordics	KLM Cargo	Sanja Mravik	Operations Development Manager - Nordics/France
03/04	Meeting EGFL Setup	KLM Cargo	Jonas Gustafsson Veton Tairi Willem van Roozendaal Sanja Mravik	Operational Manager Nordics Senior Operations Agent Cargo Procurement Manager Operations Development Manager
05/04	Meeting Truckingschedule	KLM Cargo	Sanja Mravik Fred Timmers	Operations Development Manager Outstation Messaging
10/04	Meeting Local conditions	KLM Cargo	Willem van Roozendaal	Cargo Procurement Manager Europe
19/04	Meeting Introduction EGFL	KLM Cargo	Jaco Vaneman Magnus Glans Ulf Grip Rickard Gustafsson Jonas Gustafsson Kars Huisman Veton Tairi Simon Spoor Fred Timmers Sanja Mravik	Director Nordics Commercial Manager Nordics Sales Manager Nordics PCC Manager Nordics Operational Manager Nordics HR Manager North Europe Senior Operations Agent Project Manager Outstation Messaging Operations Development Manager

Table E.2: Meetings, interviews and calls during the EGFL project [2]

Date [2017]	Event	Representing	Attendee	Function
21/04	Call Jan de Rijk	Jan de Rijk	Stephan Pieters	Business Development
			Patrick Verheezen	Planner
		KLM Cargo	Sanja Mravik	Operations Development Manager
24/04	Introduction EGFL Copenhagen	WFS	Jennifer Hansen	WFS Office Supervisor
			Jimi Daniel Hansen	WFS Station Manager
			Stijn Hottat	WFS Office Manager
		KLM Cargo Procurement	Willem van Roozendaal	Cargo Procurement Manager
			Carine Courtel	Procurement Groundhandling
			Veton Tairi	Senior Operations Agent
		Nordics	Jonas Gustafsson	Operational Manager Nordics
			Simon Spoor	Project Manager
		EGFL project	Fred Timmers	Outstation Messaging
			Sanja Mravik	Operations Development Manager
25/04	Introduction EGFL Billund	WFS	Jan Ditlevsen	CCB Station Manager
			Tonny Hansen	CCB Customer Service Manager
			Jørgen Hvenegaard Hansen	CCB Documentation and Quality
			Janne Juul Jensen	CCB Office Supervisor
		KLM Cargo Procurement	Willem van Roozendaal	Cargo Procurement Manager
			Carine Courtel	Procurement Groundhandling
			Veton Tairi	Senior Operations Agent
		Nordics	Jonas Gustafsson	Operational Manager Nordics
			Simon Spoor	Project Manager
		EGFL project	Fred Timmers	Outstation Messaging
			Sanja Mravik	Operations Development Manager
26/04	Meeting Jan de Rijk	Jan de Rijk	Stephan Pieters	Business Development
		KLM Cargo	Sanja Mravik	Operations Development Manager
02/05	Meeting EGFL	KLM Cargo	Jonas Gustafsson	Operational Manager Nordics
			Sanja Mravik	Operations Development Manager

Table E.3: Meetings, interviews and calls during the EGFL project [3]

Date [2017]	Event	Representing	Attendee	Function
04/05	Process analysis	KLM Cargo	Cor Scrama	Business Analyst
08/05	EGFL project	KLM Cargo	Simon Spoor	Project Manager
08/05	Meeting Jan de Rijk	Jan de Rijk KLM Cargo	Stephan Pieters Sanja Mravik	Business Development Operations Development Manager
08/05	Meeting	KLM Cargo	Laurella Asselman	Operations Research Consultant
15/05 - 17/05	Field Research Billund	CCB	Employees	Analysis of process in BLL
16/05	Interview CCB	CCB	Agnessa Nielsen	CCB Documentation office staff
17/05	Interview CCB	CCB	Tonny Hansen	CCB Customer Service Manager
17/05 - 19/05	Field Research Copenhagen	WFS	Employees	Analysis of process in CPH
18/05	Interview WFS	WFS	Jennifer Hansen	WFS Office Supervisor
26/05 - 28/05	Field Research Copenhagen	WFS	Employees	Analysis of process in CPH
27/05	Interview WFS	WFS	Hendrik Thunbo	WFS Lead agent
29/05	Interview	KLM Cargo	Bob Bokern	Consultant Decision Support
09/06	Interview	KLM Cargo	Jonas Gustafsson	Operational Manager Nordics
13/06 - 15/06	Field Research Copenhagen	WFS	Employees	Analysis of process in CPH
13/06	Call	KLM Cargo	Bram Snel	Operations Research Consultant
15/06 - 17/06	Field Research Billund	CCB	Employees	Analysis of process in BLL
16/06	Meeting CCB	CCB	Jan Ditlevsen Tonny Hansen Jørgen Hvenegaard Hansen	CCB Station Manager CCB Customer Service Manager CCB Documentation and Quality
19/06 - 22/06	Field Research Copenhagen	WFS	Employees	Analysis of process in CPH
21/06	Call	KLM Cargo	Gregory Camoenie	Area Operations Director Europe
21/06	Meeting	WFS	Jennifer Hansen	WFS Office Supervisor

E.2 Twice a Week Stand-up Session

The Stand up session for the EGFL project would take place twice a week, on Tuesday and Thursday from 09:00 - 10:00. The following people have attended the stand-up at least once:

Table E.4: Attendees at the EGFL stand-up sessions

First Name	Surname	Function
Wilbert	Akkermans	Outstation Messaging
Laurella	Asselman	Operations Research Consultant
Hans	Baljet	Process Engineer
Sam	Baljet	Intern - Florance and Bologna
Krol	Bart	Project Manager
Peter	Dreesens	Manager Regional Planning Europe
Shirley	Eussen	Intern - Manchester
Kenneth	Fong	Operations Development Manager United Kingdom, Ireland, Benelux
Jaap	Groen	Area Revenue Manager
Pieter	Haan, de	Regional Planner Europe
Gerard	Harte	Regional Planner Europe
Emma	Kouwenberg	Intern - Brussels
Annemijn	Kwikkers	Intern - Madrid
Kimberley	Lelieveld	Project Buyer
Harmony	Meijers	Intern - communications
Sanja	Mravik	Operations Development Manager Nordics & France
John	Oosterbaan	Team Manager Network Europe
Willem	Roozendaal, van	Cargo Procurement Manager Europe
Cor	Schrama	Business Analyst
Femke	Sickler	Intern - Copenhagen & Billund
Bram	Snel	Operations Research Consultant
Simon	Spoor	Project Manager
Tim	Tilborg, van	Intern - Dusseldorf, Vienna & Liendz
Fred	Timmers	Outstation Messaging
Duncan	Tol	Operations Development Manager Iberia, Switserland & Italy
Marco	Van den Berg	Operations Development Manager Central East Europe, Germany, Austria
Vincent	Wolf, de	Management Consultant Capgemini

E.3 Daily Conference Call

During the roll-out a daily conference call would take place to discuss all the updates and problems encountered at the outstations. This conference call would take place from 16:00 - 17:00 with the following people:

Table E.5: Daily conference call for EGFL project

First Name	Surname	Function
Sam	Baljet	Intern - Florance and Bologna
Shirley	Eussen	Intern - Manchester
Emma	Kouwenberg	Intern - Brussels
Annemijn	Kwikkers	Intern - Madrid
Femke	Sickler	Intern - Copenhagen & Billund
Simon	Spoor	Project Manager
Tim	Tilborg, van	Intern - Dusseldorf, Vienna & Liendz
Fred	Timmers	Outstation Messaging
Vincent	Wolf, de	Management Consultant Capgemini

F Air Cargo Operations

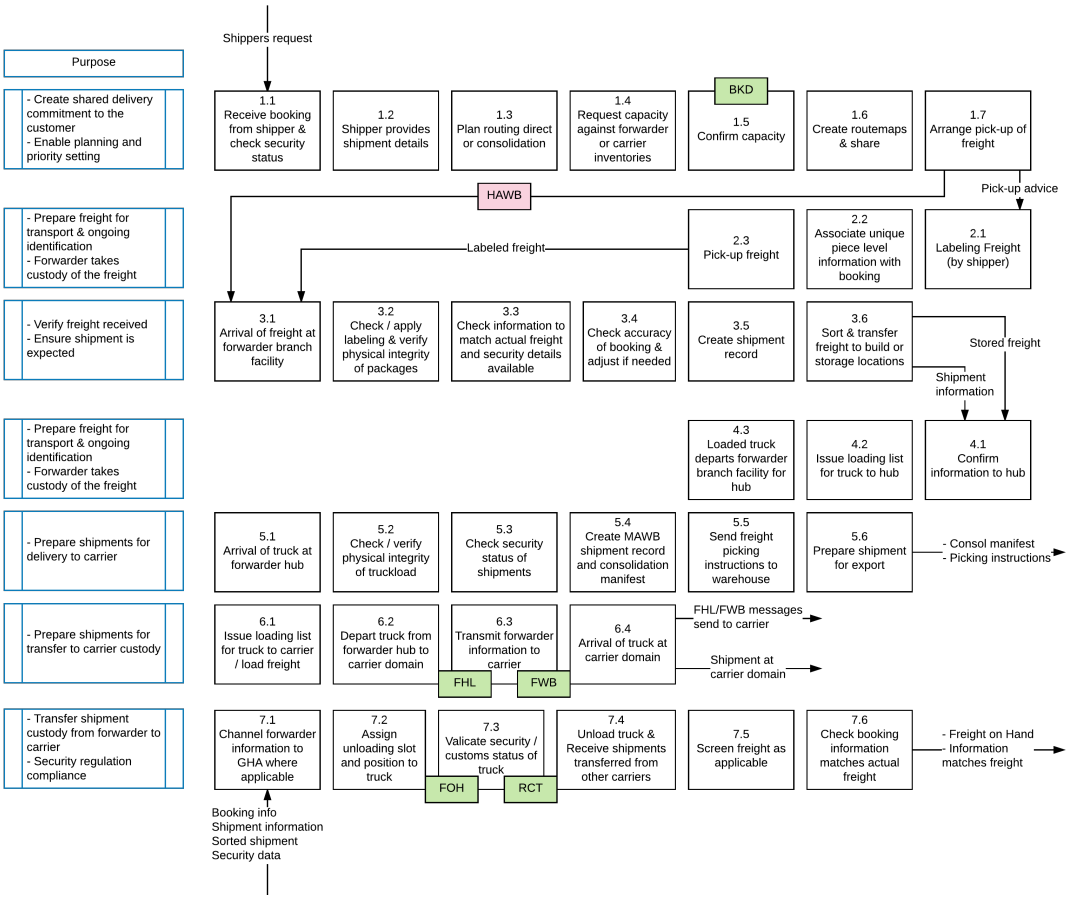


Figure F.1: The IATA air cargo supply chain process steps 1 - 7 based on[IATA, 2016]

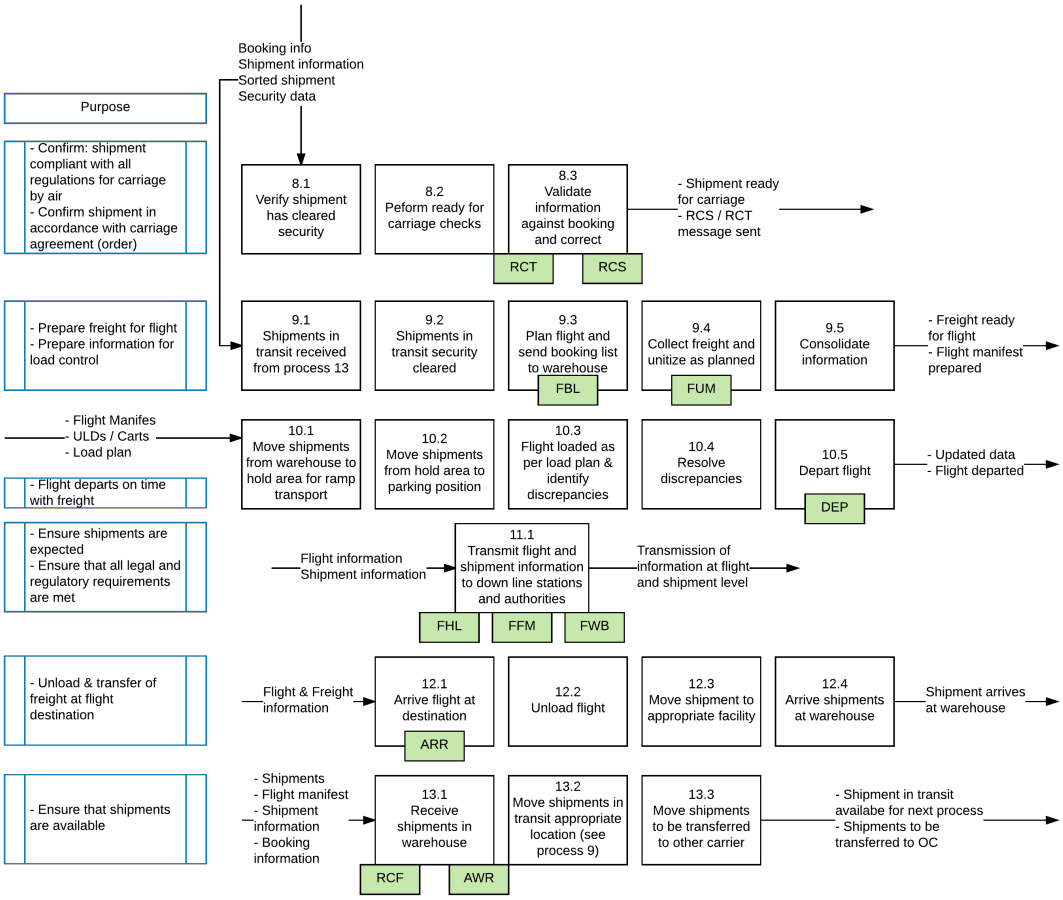


Figure F.2: The IATA air cargo supply chain process steps 8 - 12 based on[IATA, 2016]

G Trucking Schedule Iterations

G.1 Billund

The trucking schedule has been through many iterations. The schedule has been discussed with JdR, CCB, Sales managers in the Nordics, verified in the twice a week stand up sessions. Below a short list with dates and changes can be found, with reasons why the schedule was adjusted.

1. **10 April**: 2 booking trucks, each with 3 operational trucks and a total of 3 MP trucks. The booking trucks KL8480 and KL8980 both LTL trucks departing at 16:00 and 08:00 respectively. In total 2 LTL trucks and 2 FTL trucks.
2. **12 April**: 2 booking trucks, each with 4 operational trucks. The booking truck is now an FTL truck, the KL8980 departing at 11:00 on day 2 and 6 and the KL8480 departing at 17:00 on all days. Each booking truck has 3 MP operational trucks. Based on the number of trucks expected over the months it was decided that only 3 operational trucks would not be sufficient if the current volume of cargo from BLL is expected to grow in the future.
3. **25 April**: KL8980 departing at 07:00 on days 2 until 6 and the KL8490 departing at 18:00 departing on days 1 - 6, all on an LTL schedule. This schedule was proposed by KLM Cargo during the introduction of the EGFL program at the GHA.
4. **26 April**: KL8980 departing on days 2 til 7 and the KL8480 departing on days 1 til 6. On request of the GHA the departure dates of the trucks have been adjusted. The GHA is closed from Saturday evening 23:00 until Sunday morning 09:00. In addition almost no cargo is delivered on Saturday due to the fact that most companies are closed during the weekend.
5. **1 May**: KL8980 departing at 04:00 and the KL8480 departing at 18:00. The 04:00 was requested by the GHA opposed to the 07:00 asked by the market in the Nordics.
6. **9 May**: KL8980 departing at 06:00 and the KL8480 departing at 18:00. A compromise between the 04:00 departure requested by the GHA and the 07:00 departure requested by the market was found. 06:00 departure time of the KL8980.

G.2 Copenhagen

The trucking schedule has been through many iterations. The schedule has been discussed with JdR, WFS, Sales managers in the Nordics, verified in the twice a week stand up sessions. Below a short list with dates and changes can be found, with reasons why the schedule was adjusted.

1. **10 April**: 1 booking truck departing at 00:00 arriving at 19:00. The LAT was 3 hours with both FTL and LTL trucks. Only 3 MP trucks in total.
2. **24 April**: Truck schedule was changed to a DEP of 04:00 ARR at 23:00 due to the fact that the connection time required at Amsterdam is 5 hours. Therefore it does not matter at which time the truck departs as the arrival will be sufficient to make the 07:00 departure flights. However it must be taken into account that the truck can not arrive in the peak at Amsterdam, nor depart in the peak at WFS.
3. **26 April**: Only LTL trucking schedules are selected as the truck will arrive early in Amsterdam so 4 hours extra trucking time will cause not problems. In addition often no full trucks depart from Copenhagen. Therefore from a cost perspective as shown in Table 7.9 it is more profitable to depart with LTL trucks only.
4. **1 May**: Trucking schedule is increased with an extra booking truck departing at 20:00 with a LAT at 16:00. This extra truck will only depart on Mondays, Tuesdays, Wednesdays and Thursdays. A very profitable shipment, the Madrid shipment with medical equipment otherwise will not make the short connecting flight in Amsterdam. 4 hours of LAT is introduced to give the GHA more time to allow for correcting and completing all aspects of the shipment before departure of the truck.
5. **16 May**: go-live date of the EGFL project.

6. **24 May**: the Monday truck is canceled as no shipments are booked on this day. No customer delivers cargo on Sunday. All shipments booked for Sunday are already delivered on Friday or Saturday, increasing the storage costs. Therefore as often the trucks are not full they can also be re-booked to earlier days.
7. **25 May**: the second booking truck of 20:00 DEP is removed as the MAD shipment will be flown from now on. From experience it is shown that all customers are not able to make the 16:00 LAT due to their internal production schedules. Therefore almost nothing is booked on this truck.

H Literature Study on Agile Scrum

In this chapter a small description of the Agile Scrum method will be given. The description will be limited to the aspects that are of relevance to this project.

H.1 Why Agile Scrum

The Agile scrum method was developed due to the fact that there was a lack of methods which accommodated change. Often projects work with methods which apply the serial approach, which works with guidelines and guarantees results in a static and straightforward situation. However today's environment is dynamic and unexpected and due to the nature of the work a different approach was required [Jongerius and Berghuis, 2012].

According to [Jongerius and Berghuis, 2012] the Agile Scrum method can be used specifically in a:

1. Dynamic work environment
2. Customers that are asking for a shorter lead time
3. Customers that want to actively participate
4. Projects that are too large for controlled development and documentation while at the same time keeping up the pace with conventional methods
5. Customers that want to influence the journey towards the goal

Originally Scrum is developed as a software development method. However the agile approach, with scrum as a method can also be used for improving entire processes of concept, design and development [Jongerius and Berghuis, 2012]. Agile is a way of thinking is in depth described in the *Manifesto for Agile Software Development* [Agile Manifesto, 2001]. Scum allows all disciplines within a project to interact with each other and eliminates the intermediate deliverable as much as possible to leave room for new insights. Based on [Jongerius and Berghuis, 2012] and [Agile Manifesto, 2001] the following points of view are adopted:

- **Individuals and interactions** over processes and tools.
- **Working software** over comprehensive documentation.
- **Customer collaboration** over contract negotiation.
- **Responding to change** over following a plan.

Important requirements for using the Agile Scrum method are [Jongerius and Berghuis, 2012] and [Agile Manifesto, 2001]:

- **End users first**: Scrum is about being relevant to end-users
- **Freedom vs. Commitment**
- **Eliminate waste**: direct and ad-hoc communication replaces the costly overhead of time spent on meetings, documentation and re-workings
- **Self-propelled team**: Open, energetic and self-motivating
- **Timebox everything**: Time is bound for each set sprint
- **Shippable product**: End result is ready to deploy

H.2 Scrum

For Scrum it is more important to accommodate change than to follow a strict plan. Scrum is referred to as the "rugby" approach. Ideally scrum has many activities simultaneously performed within one room. The activities are based on an overall vision instead of fixed content and goals. As the environment is constantly changing there is not one master plan but the activities are adjusted based on the requirements.

Each project is made up of sprints. Each sprint will be a unit of several weeks, often 2 - 3 weeks. A sprint can be seen as an iteration. Sprints have tight deadlines and ambitious goals, in which adjustments can be made. A sprint can either have it's own delivery or a collection of all sprints relating to the project as a whole will be the deliverable. The scrum allows to be flexible. Probably the project will be exposed

to all kinds of influences requiring the project to adjust. The scrum approach is not to predict these changes but accept them and deal with them in an intelligent and flexible manner. The following points can be identified for sprints according to [Jongerius and Berghuis, 2012]:

- A project has a fixed sprinting pattern, determined in advance.
- There are only a few sprint days per week. Other days can be used for other activities.
- A sprint usually lasts 2 weeks to allow for fast feedback.
- In sprint 0 the scope and planning are determined.

H.3 The Scrum Team and Activities

The scrum team consists of several roles:

1. **Scrum Master**: the scrum master is the facilitator and motivator. Ensures that the scrum elements such as the daily stand-up takes place at the correct and is expected to motivate the team, improve collaboration, spot and discuss any difficulties and ensure that a positive atmosphere is upheld.
2. **Product Owner**: Owns the product on behalf of the client and represents the client in the team. Decides what the priorities are.
3. **Stakeholders**: all interested parties in the project.
4. **The Scrum team**: carry out the work and is committed to the sprint goals.
5. **Project Manager**: supporting role.

One of the most important activities is the daily scrum. The daily scrum takes place each day at a specific time and place for a specific duration. During this daily scrum the synchronization happens and the team discusses updates and problems encountered [Kniberg, 2015].

H.4 Agile Scrum Applied to the EGFL Project

According to [Spoor, 2016] the aspects of agile can also be used for preparing and executing business changes. For the EGFL project Agile Scrum will be used for business change development instead of software development.

The agile scrum method works in an iterative manner and therefore no simulations will first be performed. The requirements are determined and a roll-out approach is designed. Following, using the iterative design approach, the changes are implemented and adjusted if required. No prediction of the problems encountered will be made. The project team as described in Appendix E Section E.2 is self motivating and dedicated. From the project team Simon Spoor acts as the product owner and Vincent de Wolf as the scrum master. The daily stand-up is changed into a twice a week stand up. Namely on Tuesday from 09:00 - 10:00 and on Thursday from 09:00 - 10:00. This allows for many verification opportunities of the design proposals. The scrum room can be found in Figure H.1.

Figure H.1: The scrum room where the twice a week meetings would take place

Sprint 0 for the EGFL project was designed in September 2016, before the start of this research internship. Therefore the agile method is a system boundary of this project and within this system boundary this research has to be performed. An overview of the sprints designed in Sprint 0 is given in Figure H.2.

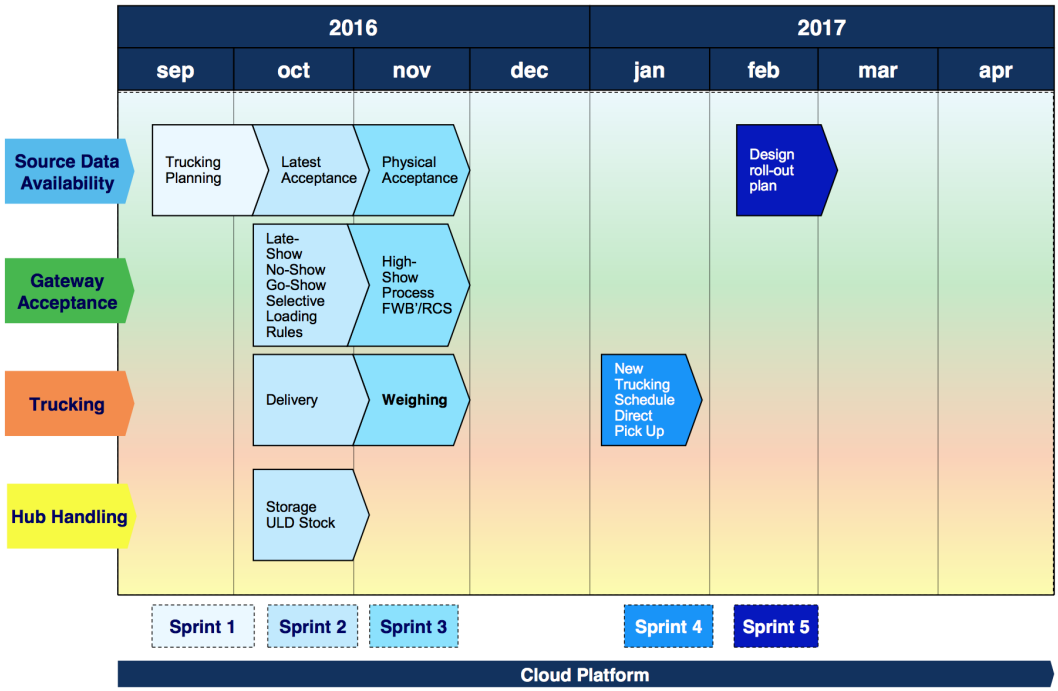


Figure H.2: Sprints planned for the EGFL project [Spoor, 2016]

I Overview of all Outstations

In this appendix all the Outstations are presented. From these locations cargo for KLM is transported by truck to the hub in Amsterdam from where it is transported to the final destination.

I.1 Nordics and France

Table I.1: Overview of stations in the Nordics and France

Abbreviation	City	Country
BLL	Billund	Denmark
CPH	Copenhagen	Denmark
HEL	Helsinki	Finland
LYS	Lyon	France
MLH	Basel-Mulhouse	France
BOD	Bordeaux	France
CDG	Charles de Gaulle	France
LIL	Lille	France
NTE	Nantes	France
TLS	Toulouse	France
SXB	Strassbourg	France
NCE	Nice	France
MRS	Marseille	France
AJA	Ajaccio	France
BES	Brest	France
BIA	Bastia	France
CFE	Clermont Ferrand	France
CLY	Calvi	France
MPL	Montpellier	France
ORY	Orly	France
PUF	Pau	France
RNS	Rennes	France
URO	Rouen	France
OSL	Oslo/Gardermoen	Norway
SVG	Stavanger	Norway
AES	Alesund	Norway
BGO	Bergen	Norway
KRS	Kristiansand	Norway
TRD	Trondheim	Norway
TRF	Sandefjord	Norway
MMX	Malmö	Sweden
ARN	Stockholm	Sweden
GOT	Goteborg	Sweden
NRK	Norrköping	Sweden

I.2 Iberia, Switzerland and Italy

Table I.2: Overview of stations in the Iberia, Switzerland and Italy

Abbreviation	City	Country
SWK	Milan/Segrate	Italy
FLR	Florence	Italy
BQY	Bologna	Italy
MXP	Milan/Malpensa	Italy
FCO	Rome	Italy
VCE	Venice	Italy
TRN	Turin	Italy
VRN	Verona	Italy
GOA	Genoa	Italy
BDS	Brindisi	Italy
BRI	Bari	Italy
CAG	Cagliari	Italy
CTA	Catania	Italy
LIN	Milan/Linate	Italy
NAP	Naples	Italy
PMO	Palermo	Italy
PSA	Pisa	Italy
REG	Reggio	Italy
SUF	Lamezia	Italy
TRS	Trieste	Italy
OPO	Porto	Portugal
LIS	Lisbon	Portugal
BCN	Barcelona	Spain
ZAZ	Zaragoza	Spain
MAD	Madrid	Spain
LCG	La Coruña	Spain
BIO	Bilbao	Spain
VLC	Valencia	Spain
AGP	Malaga	Spain
ALC	Alicante	Spain
ZRH	Zurich	Switzerland
LUG	Lugano	Switzerland

I.3 United Kingdom, Ireland and Benelux

Table I.3: Overview of stations in the United Kingdom, Ireland and Benelux (Belgium, Netherlands, Luxembourg)

Abbreviations	City	Country
BRU	Brussels	Belgium
LGG	Liege	Belgium
DUB	Dublin	Ireland
ORK	Cork	Ireland
SNN	Shannon	Ireland
LUX	Luxembourg	Luxembourg
RTM	Rotterdam	Netherlands
EIN	Eindhoven	Netherlands
GRQ	Groningen	Netherlands
MST	Maastricht	Netherlands
ENS	Enschede	Netherlands
QWZ	Best	Netherlands
UDE	Volkel	Netherlands
UTC	Soesterberg	Netherlands
LHR	London	United Kingdom
MAN	Manchester	United Kingdom
GLA	Glasgow	United Kingdom
ABZ	Aberdeen	United Kingdom
PIK	Glasgow/Prestwick	United Kingdom
BFS	Belfast	United Kingdom
BHX	Birmingham	United Kingdom
EMA	East Midlands	United Kingdom

I.4 Central East Europe, Germany and Austria

Table I.4: Overview of stations in the Central East Europe, Germany and Austria

Abbreviations	City	Country
LNZ	Linz	Austria
VIE	Vienna	Austria
GRZ	Graz	Austria
HOH	Hohenems-Dornbirn	Austria
SZG	Salzburg	Austria
SOF	Sofia	Bulgaria
ZAG	Zagreb	Croatia
PRG	Prague	Czech Republic
FRA	Frankfurt/Main	Germany
HHN	Frankfurt/Hahn	Germany
STR	Stuttgart	Germany
DUS	Düsseldorf	Germany
HAJ	Hannover	Germany
HAM	Hamburg	Germany
TXL	Berlin	Germany
MUC	München	Germany
NUE	Nürnberg	Germany
CGN	Cologne	Germany
FMO	Münster/Osnabrück	Germany
BRE	Bremen	Germany
DRS	Dresden	Germany
DTM	Dortmund	Germany
LEJ	Leipzig	Germany
BUD	Budapest	Hungary
KRK	Krakow	Poland
KTW	Katowice	Poland
LCJ	Lodz	Poland
WAW	Warsaw	Poland
OTP	Bucharest	Romania
BEG	Belgrade	Serbia
BTS	Bratislava	Slovakia
LJU	Ljubljana	Slovenia
GVA	Geneva	Switzerland
BRN	Bern	Switzerland

Deviation Report

Deviation Report

Truck number: KLXX

Deviation report to be sent to AFKL

Origin	Prefix	Serial	Date	Booked	Actual Pieces	Diff %	Booked	Actual Weigh	Diff	Diff %	Booked	Actual Volum	Diff %	BUP	Final Status	on Flight	Agent	n of offloa	remark
FRA	074	41316	#####	4	5	25%	603,5	706,7	103,2	17%	20,000	23,000	15%	N	FAP	MP401	Agility		

J EGFL in more Detail

In Figure J.1 the 5 workpackages in which the EGFL project is divided are shown. A short explanation for each of the work packages will be provided below in accordance with [de Wolf, 2017].

1. Improve booking reliability and quality of source data.
   (a) New process on booking updates and dealing with the difference between FWB's versus booking.
   (b) Increased correctness and completeness of information; House Air Way Bill (HAWB), Master Air Way Bill (MAWB) and Electronic Consignment Security Declaration (ECSD).
2. Modify and implement an 'advanced acceptance' process at GHA.
   (a) Reviewed truck scheduling.
   (b) Design new acceptance process with LAT.
   (c) Established Selective Loading Rules.
3. Optimum truck management 'hot' or 'not' status.
   (a) Optimized ordering and planning process.
   (b) Optimize the check-in process (CMR, QR code, location tracking).
   (c) Developed a prioritizing process.
4. Yard management at Schiphol.
   (a) Revised yard management.
   (b) Improved physical process.
   (c) Improved documentation process.
5. Data sharing / messaging.
   (a) Interaction with mainport team.
   (b) Focus on data.
   (c) Interfacing.
   (d) Security.

According to [de Wolf, 2017] logic in the cargo value chain is an important aspect of the EGFL project. Serveral aspects in the cargo value chain will be improved. These aspects will also be the baseline on which the current situation in Billund and Copenhagen have been analyzed and on which the future situation will be discussed.

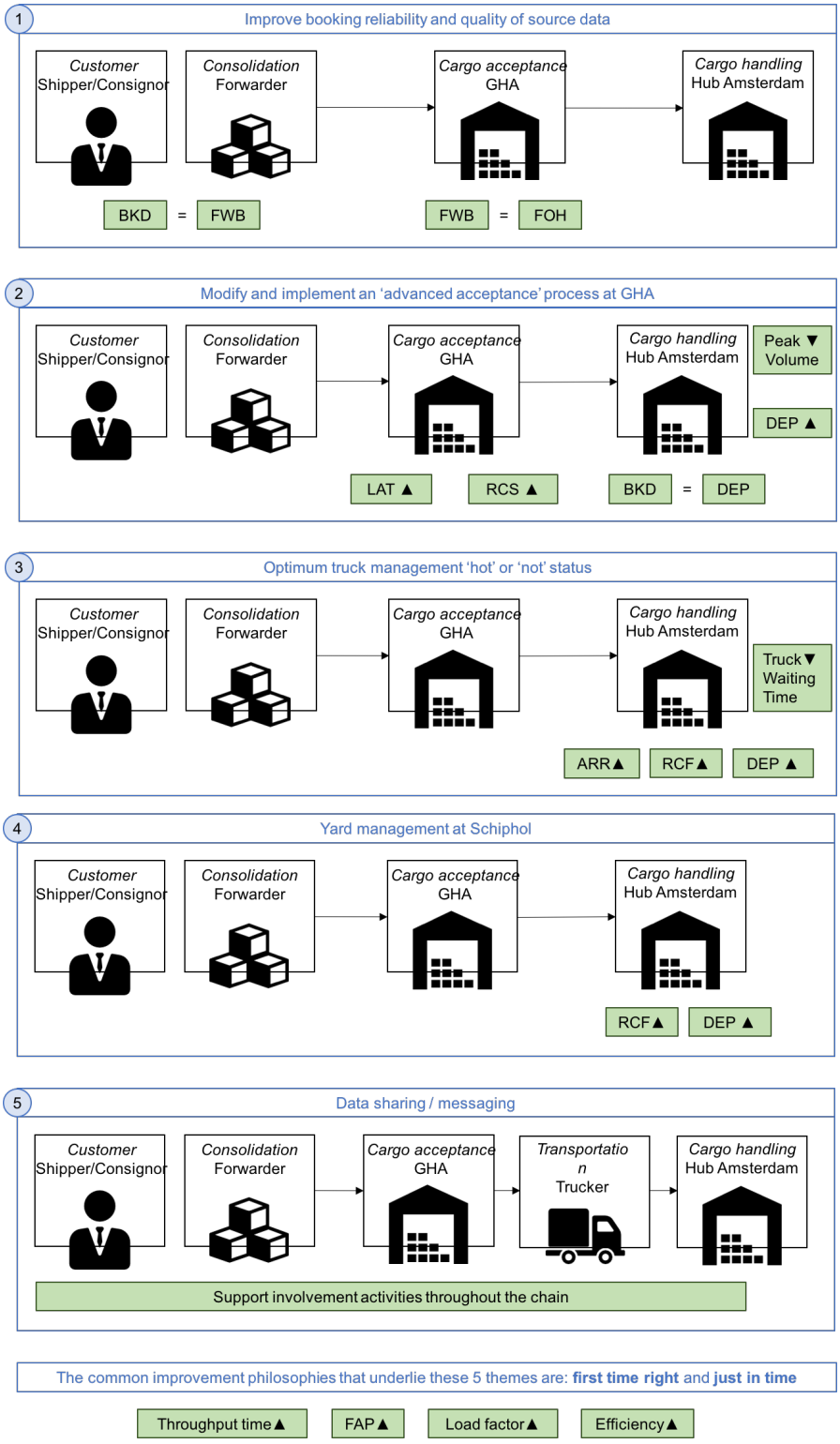


Figure J.1: EGFL program based on [Spoor, 2017b]

K Current Roll-Out Plan EGFL

1.1 Review trucking schedule

1.1 Review new trucking schedule

What and why?

Review and finalize the newly made trucking schedule to ensure that the schedule is ultimately viable

Actions

- ❑ **Review the newly made truck schedule to verify its suitability and validate.** This also involves finalizing the LAT times; have this discussion with the GHA, local operations and CSO.
- ❑ **If multiple truckers are contracted: assign truckers to the trucking schedule (based on their current performance);** which trucker is responsible for the booking trucks, and which for the others?

- LAT is typically three hours before DEP, however this may still change depending on local circumstances. Be sensitive to what the local context requires!
- Take good notice of (1) the current trucking schedule and practice and (2) the new trucking schedule, to identify how strong (3) the change for the station will ultimately be

Detailed roll-out plan
1.2 Implement new trucking schedule

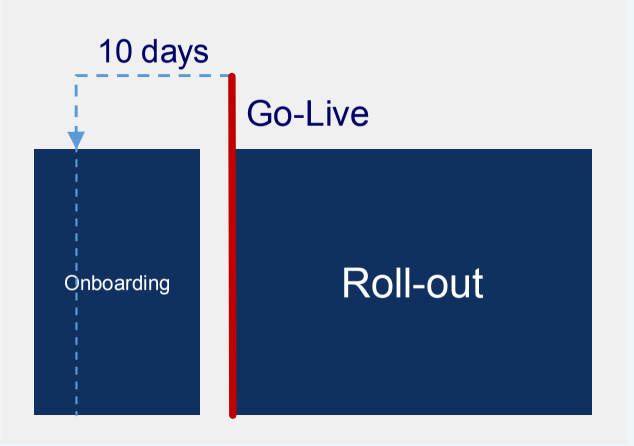
1.2 Implement new trucking schedule

What and why?

Coordinate the timely loading of the new trucking schedule into the NP and GHA systems to ensure that the schedule is in place at Go-Live

Actions

- ❑ **Schedule Go-Live on Tuesday in week 3 (unless the local situation requires otherwise).** Tuesdays typically have low volumes, which allows you to have a smooth start towards peak volumes on Friday/Saturday. It also allows you to fly in on Monday and prepare.
- ❑ **Notify Network Planning of the Go-Live date, and oversee that the validated trucking schedule is loaded into the systems of NP and the GHA, at least 10 days before Go-Live** (i.e. end of Friday of week 1). During this 10-day transition period, NP works with both old and new schedules.



- It is critical that one, identical trucking schedule is loaded in the NP and GHA systems. Deviations between loaded schedules have earlier caused signficicant problems
- After Go-Live, you will face resistance from stakeholders in the local context, but also potentially from AFKL commercial. This is a major pitfall and potential inhibitor to the success of the programme. Be prepared to identify these (political / emotional) issues and deal with them. Seek support from e.g. Simon, Fred or the Operations Developers (FJ's). Also stick to your monitoring, 'meten = weten' ☺

2.1 Assess current acceptance process

2.1 Assess current acceptance process

What and why?

Assess and map day-to-day challenges and behavior, available resources and potential for Direct Pick Up. This gives an idea of the intensity of the change required and allows you to take actions in preparation for Go-Live

Actions

- ❑ **Visit the GHA and interview the AFKL Operations manager to assess IT capabilities, local acceptance procedures and behavior, as well as off-the-record agreements and ways of working established locally**. The goal of this is to make a comparison with the desired situation in EGFL, to find out the degree of change in behavior and system setups required.
- ❑ **Make an assessment of physically available resources at the GHA (e.g. scanners, calibrated scales) that are needed for EGFL.** The aim is to eventually enable weighing of 100% of shipments. If GHA resources are insufficient, this requires contractual changes (see 4.1).
- ❑ **Investigate data quality: discuss with Documentation at AMS to find common data errors originating from this specific station.** This allows you to map the extent of the issues at this station.
- ❑ **After the assessment is completed, define and make a short report of where the focus of this roll-out will be**. For example, will the most work be in aligning IT? In the new trucking schedule? And/or in the local conditions?

- Before implementation in FRA, it often happened that late deliveries were still loaded on their original trucks, as these trucks would wait for the shipments to be loaded. This is wrong, as it rewards the wrong customer behavior (i.e. late deliveries are still accepted and 'fixed') while we improve our own non-quality (we have less time at the Hub).
- Also, a lot of Go-Show shipments were simply sent from FRA to AMS without a booking. This is also something that needs to change in the context of EGFL.

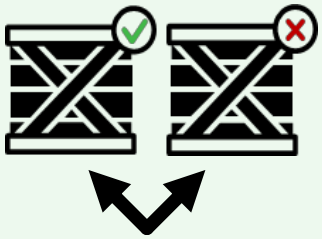
Mind your step

Link to: 4.1

2.2 Implement new acceptance processes

What and why?

Ensure that the pre-defined EGFL acceptance processes are implemented and physically carried out as laid out in the process descriptions



Actions

❑ **At the GHA, oversee that Late-show, No-show, Go-show, Early-show and High-show processes are carried out correctly.** This also entails that communication lines with e.g. NP, RM, CSO are established. Refer to the EGFL process descriptions. Checklist:

Forwarder arrival registration
- ❑ Time registration in place (reporting)

Door management
- ❑ Truckers informed about truck dock

Acceptance
- ❑ All cargo is weighed, weighing receipts stored
- ❑ Green/Yellow/Orange/Red flows followed

Documentation
- ❑ RCS and FWB' process followed correctly (see 3.2)

Customs
- ❑ Role and impact mapped and integrated

After acceptance
- ❑ Correct storage, build-up and planning

Interaction CP/Swissport
- ❑ Line-truck ordering process in place
- ❑ Pre-planning in place

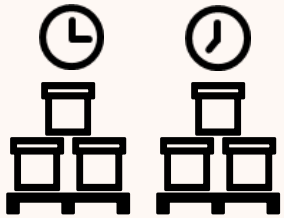
Line-haul driver process
- ❑ Truck arrival reporting in place
- ❑ Booking checks performed (ADR/COL/height/etc.)
- ❑ Manifests / FFM Secure / DEP reporting in place
- ❑ Departure registration (STM) in place

- This step represents the actual, physical changes on the ground, starting directly after the Go-Live and system setup is finished (see 1.2).
- Previous issues in this context (at FRA) have been a lack of available scanners
- Another potential threat can be a lack of truck docks at the GHA

3.1 Selective Loading Rules

What and why?

Oversee the adoption of Selective Loading Rules by the GHA, to ensure that ‘hot’ cargo is not mixed with ‘cold’ cargo, which will help the Hub operation



Actions

- ❑ **Discuss with Network Planning to verify the need for implementation of Selective Loading Rules at this station.** Selective Loading Rules may not be necessary or beneficial in all cases.
- ❑ **If Selective Loading Rules are deemed valuable for this station, discuss with Fred about next steps to take.**
- ❑ **Ideally, achieve that 4 build up locations (buffers) are set up per truck in advance (see Appendix).** This allows the incoming freight to be distributed as it arrives.

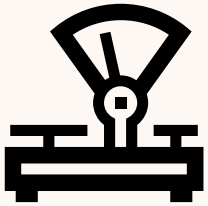
- Selective Loading Rules are not yet implemented at FRA. The more bookable trucks, the more necessary Selective Loading Rules will be, and the less necessary intervention from NP becomes (which typically prepared loading lists to ensure proper loading).
- If Selective Loading Rules are not followed, ‘hot’ cargo will be loaded next to ‘cold’ cargo, meaning extra work at the Hub as they need to break down multiple plates to get to the ‘hot stuff’. By applying the selective loading rules, pressure is relieved from the Hub.

Link to: SLR

3.2 Weighing and Measuring

What and why?

Realise the 100% weighing requirement of the EGFL programme, to improve insight in actual shipping volumes and help settle client disputes



Actions

- ❑ **Oversee that 100% of cargo is weighed and measured by the GHA**. This implies that the GHA must have the required equipment and practices in place (see 2.1 and 4.1).
- ❑ **Instruct the GHA to create and store weighing receipts of all cargo and ensure that this is adhered to**. This helps to counter potential claims by customers after they receive a bill for additional weight shipped versus the booking.
- ❑ **Make clear to the GHA and local AFKL what the benefit of weighing and measuring is.** It will avoid the CCA process (e.g. additional charges sent to the customer after the cargo has been transported for exceeding the booked weight) as the corrected weight will be directly invoiced to the customer.

- Weighing process is implemented at FRA, measuring not yet due to technological challenges with scanners. Will be implemented in the coming weeks/months.
- Some stations may already weigh 100% of cargo, other stations only a percentage of all cargo, and yet other stations may not conduct weighing at all. All will have to move towards 100% weighing

Link to: 4.1 2.1

3.3 Direct Pick-Up

What and why?

If DPU (Direct Pick-Up: shipments that are taken directly from customer to AMS, bypassing the GHA) were identified as beneficial and feasible for some customers at this station (see 2.1), manage its implementation by coordinating with the various stakeholders

Actions

- ❑ **Assess the number / percentage of BUP's (pre-built plates by the customer) at the station to assess the DPU potential.** This implies identifying fixed streams of BUP's that could be scheduled for DPU. Also, the GHA must cooperate, volumes must be sufficient (>2/3 plates to fill a truck), and it must be possible from a customs perspective.
- ❑ **If present, discuss with the commercial team about the DPU potential**. They will ultimately determine whether it will be implemented at this station or not.

- Clearance of goods by customs authorities is key, and customs authorities must allow DPU's: in some countries, it is a requirement to go through an airport/GHA.
- DPU's can alleviate some of the burden placed on the GHA's as it lowers the volume they have to process. This is especially important for cargo streams typically shipped during peak hours.
- Whether or not DPU is possible is dependent on many parties

Mind your step

Link to: 2.1

3.4 Compliance Checker

What and why?	Actions
The compliance checker is a software tool that checks the Air Waybills at ... wh... criter... auth...ities (e.g. PO box, address formats)	❑ ... ❑ ...

TO BE DETERMINED

▪ ...

4.1 Assess and modify local contract/SLA

4.1 Review local contract/SLA

What and why?

Review the existing local contracts and SLA's with GHA's and truckers to identify whether these require changes for EGFL and, if so, implement these changes before Go-Live

Actions

- ❑ **Contact Willem van Roozendaal (Procurement) to review the contract/SLA with the GHA.** Focus specifically on the weighing procedures, opening hours, feasibility of the contracted LAT (in minutes before DEP) and the acceptance processes described.
- ❑ **Modify (together with Procurement) the contract/SLA if it does not currently meet the requirements of EGFL.** Elements to be changed may include (but not limited to) the 100% weighing requirement, opening hours, or incentives for repairing late deliveries.

- Ensure that relevant contract changes if required are made at least *2 weeks before the scheduled Go-Live,* to ensure a smooth transition

Mind your step

Link to: 2.1

Detailed roll-out plan
4.2 Engage CSO to review local conditions

4.2 Review local conditions

What and why?

Review the existing local conditions for customers and (if necessary) ensure that these are updated in accordance with EGFL before the Go-Live

Actions

- ❑ **Look up the local conditions of the station/region on the AFKL Cargo website and review whether they meet the EGFL requirements.** This includes a described LAT of 180 minutes before DEP, the new acceptance policy and fees for No-show, Low-show, High-show, different cargo buildup (loose rather than pre-built) and cancellations.
- ❑ **Also engage the global key account manager when it comes to individual contract changes with key accounts.** Key accounts may require a specifically tailored contract, which are being managed by 4 global key account managers.

- See FRA local conditions for reference: https://www.afklcargo.com/WW/en/common/about_us/local_conditions.jsp

4.3 Set up KPI structure and monitor performance

What and why?

Ensure that daily and weekly performance data are captured from the GHA's systems to enable performance tracking, which forms the basis for corrective action during the implementation

Actions

- ❑ **Establish daily reporting of CargoIQ milestones (LAT, RCS, DEP at station; ARR, RCF, DEP at AMS) together with Performance Management (Bram Snel and/or Arend Feenstra).** This has also been done for FRA, should be in the same format.
- ❑ **With the GHA, establish daily reporting of in-depth data (FOH/LAT, RCS and DEP).** This includes, on an individual shipment level, AWB numbers, booking trucks, flight numbers, truck arrival times at FRA, FOH times, departure times, among other items. This helps to identify performance gaps. Discuss with Tim.

- Focus on actual Flown As Planned (FAP) as this is what customers care about and pay for!

5a. Ensure ongoing communication with local AFKL, Network Planning and RM

What and why?

Ensure high-intensity inward communication and alignment with local AFKL units, Network Planning and Revenue Management throughout the entire implementation phase

Actions

- ❑ **Before Go-Live: Discuss the new truck schedule with NP.** Particularly in regards to changing truck numbers, truck times and any other planning information. This is necessary to allow for NP to verify whether the new schedule is actually workable, and for them to make the necessary system changes to be ready for Go-Live.
- ❑ **Before Go-Live: Inform RM about which booking-related changes will occur at the station.** This entails process changes related to Late-show, No-show, and Rebooking (in the context of EGFL) and ensures that RM is ready to follow the new process upon Go-Live.
- ❑ **Before Go-Live, give an initial presentation to the local AFKL about the FRA case,** its success and the drivers thereof. Show the EGFL YouTube promotion video with Marcel de Nooijer. This can help improve local support.
- ❑ **Continuously align with local AFKL operations.** This is to ensure that the roll-out approach does not conflict with local requirements.

- Strongest focus of the communication effort is on the *first weeks up to the Go-Live.* From week 3 onwards, this turns more into monitoring and corrective action.
- The requirement to inform the Hub operations is limited; the new schedule and system should only make their life easier

5b. Ensure ongoing communication with customers, GHA and truckers

5b. Ensure ongoing communication with customers, GHA and truckers

What and why?

Ensure high-intensity outward communication and alignment with customers, the GHA and truckers throughout the entire implementation phase

Actions

- ❑ **Together with CSO, launch a customer newsletter to inform customers about EGFL-related changes.** This includes process changes (e.g. new LAT times, LAT 'enforcement'), but you can also use this to explain the benefits of EGFL to customers to build support. Do not send this letter too far in advance (e.g. 2 weeks prior to launch). Customers to direct the newsletter to can be found in the customer directory in the CSO system. In addition, it could be interesting to publish an interview with the German market manager (Koen Bolster) in a local professional magazine (logistics related) about the success of the FRA pilot to further build credibility.
- ❑ **Before Go-Live, give an initial presentation to the GHA about the FRA case,** its success and the drivers thereof. Show the EGFL YouTube promotion video with Marcel de Nooijer. This can help improve local support.
- ❑ **Maintain continuous alignment with the GHA.** This is critical as the EGFL project influences their way of working the strongest (Late-show, No-show, Tooling/IT, etc.)
- ❑ **Ensure solid performance monitoring after the initial 8 weeks to see whether implementation sticks.** See 4.3.

- Strongest focus of the communication effort is on the *first weeks up to the Go-Live*. From week 3 onwards, this turns more into monitoring and corrective action.
- Swissport, Jan de Rijk and Kühne + Nagel are involved from the start as consortium partners. Other actors will require an even stronger communication and change effort.
- As a general rule, relevant stakeholders should all be (thoroughly) informed before any process changes are implemented. Follow the communication triangle (see Appendix).

Mind your step

Link to: 4.3