Master Thesis

Development of a Framework and Service Design for Off-Terminal Check-In and Baggage Drop-off Services for Amsterdam Airport Schiphol



Christiaan Noordzij December 13th 2012







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> "Development of a Framework and Service Design for Off-Terminal Check-In and Baggage Drop-off Services for Amsterdam Airport Schiphol"

> > <u>CONFIDENTIAL</u>

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Preface

The research conducted and expressed in this report, is performed as the Master Thesis project of the combined master of: Transport, Infrastructure and Logistics of the faculties of Technology, Policy & Management, Civil Engineering and Mechanical, Maritime and Materials Engineering at the Technical University of Delft. This research was facilitated by Schiphol in the SIM environment. SIM is a cooperation between Schiphol Group, TNO, KLM, NLR and the in TU Delft. In realizing this report and research, several people have helped me. Therefore, I would like to thank:

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I hope you enjoy reading this report,

Christiaan Noordzij

Schiphol, December 2012

Summary

Problem description

Schiphol is experiencing a growth in the amount of passengers travelling via the airport. In 2011, 50,9 million passenger made use of Schiphol airport. In 2025 this is expected to be 70 million passengers. This will become a terminal capacity problem for Schiphol. Not only in the long term capacity problems exist, but already in peak hours the full capacity demand cannot be delivered. At the same time Schiphol research has indicated, that departing passengers want to be relieved from stress and baggage hassle in an early phase of their journey towards Schiphol.

Combining both the need for terminal capacity pressure relief and the need for an increased quality of the passengers ground travel process to Schiphol, Schiphol has chosen to research the possibilities for implementing remote check-in (CI) and baggage drop-off (BD) processes at off-terminal locations. Therefore the objective of this research is:

To develop a framework, that can decide on remote check-in & baggage drop-off location suitability and can state location design choices that have to be made, in order to make a remote check-in & baggage drop-off location service design, from which an estimation of potential quality increase and potential terminal capacity relief can be extracted. Furthermore, the service design should satisfy security legislation, be financially feasible and should take future developments into account.

Approach

An extensive literature study has been done on remote CI and BD, in order to formulate 4 success criteria. These criteria are derived from theory and practical experiences. Recent and past literature on remote CI and BD, literature on transportation services and customer needs, and literature on check in and baggage drop-off functionality are combined with documented practical Schiphol remote CI and BD experiences. These success criteria with associated requirements were then used to develop the framework. This framework consists of three parts. The first part estimates location feasibility according to five steps, the second part states location design choices that are needed for the service design and from the third part a functional process design is used for detailed remote CI and BD services. From the application of the framework a detailed location design is extracted.

Success criteria

four criteria for the success of remote CI and BD design are stated. Passenger usage, airline industry cooperation and support, check-in and baggage drop-off functionality and availability of space. Passenger usage is related to the quality of use, the quantity of use and the service cost. The airline industry cooperation and support is related to requirements several stakeholders have, before participating in a remote CI and BD service. CI and BD functionality is related to all the functional requirements that must be fulfilled to facilitate CI and BD. Finally, the availability of space is related to the crucial types of space that are needed for a remote CI and BD service.

Conclusion

With the application of the framework, it became clear that the WestCord Fashion Hotel is the most feasible location for remote CI and BD, if common use can be applied. The main reason for this is, that the estimated quality gain, due to the lack of a direct public transportation connection to the airport is expected to be large. Due to this large quality gain, passengers are more likely to be willing to pay for the service. And if passengers are more willing to pay for the service, the chance of a closing business case is largest. A closing business case is needed for the participation of all relevant stakeholders needed for setting-up a remote CI and BD service.

The train service was estimated to not have a sufficiently large budget for a remote CI and BD service. A service for all potential long term parkers at P3 is found unfeasible, due to the lack of the estimated passenger's unwillingness to pay for the service. This is caused by the insufficient quality increase that is expected. The Home pick-up service can be feasible only if mobile CI and BD devices can be connected to an airlines Departure Control System and passenger *and* baggage transport are offered to the passenger.

Christiaan Noordzij Remote check-in and baggage drop-off

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List of Abbreviations

CI	Check-in
BD	Baggage drop-off
Рах	Passenger(s)
Bax	Bag(gage)
AAS	Amsterdam Airport Schiphol
SRA	Security Restricted Area

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1. Introduction

In this chapter, the problem, from which this research came forth, is introduced. Before the problem is introduced, first a company introduction is made in section 1.1. Schiphol Group is the company that initially was involved in a project for Off-terminal check-in (CI) and baggage drop-off (BD) and requested this research. Secondly, the platform in which Schiphol takes part, SIM, is introduced in section 1.2. Finally, in section 1.3, the problem from which this research came forth is defined. Following from the problem description (1.3.1), a project initiation (1.3.2), the research objective (1.3.3), the research scope (1.3.4) and research questions (1.3.5) are provided here.

1.1 Schiphol Group

Schiphol Group (SG) is the company, which exploits Amsterdam Airport Schiphol (AAS). AAS is the largest airport in the Netherlands and is the "home-base" of one of the largest airlines in the world: AirFrance-KLM. Next to AAS, SG also exploits Rotterdam-Den Hague Airport, Eindhoven Airport and Lelystad Airport. AAS also has interests in some other international airports around the world. AAS is a large international hub airport. In 2011, 53,522 million passengers travelled through this airport. AAS had a turnover of 1,278 billion euro's in 2011 (Schiphol, 2012). Schiphol Group has 4 main business areas:

- <u>Aviation</u>: Provides services and facilities to airlines, passengers and handlers at AAS
- <u>Consumer Products & Services</u>: Consist of activities around development, granting and managing concessions for shops, catering outlet, services and entertainment, operating shops and car parks, and marketing advertising opportunities at AAS.
- <u>Real Estate</u>: Develops, manages, operates and invests in property at and around domestic and foreign airports
- <u>Alliances & Participations</u>: consists of Schiphol Group's interests in airports abroad, domestic airports and other activities, including Telematics and Utilities.

Schiphol's mission is to maintain and become Europe's preferred airport. Schiphol Airport has received the price, for the European airport with the highest quality for passengers, several times. This has mainly to do with the airport's one terminal concept. All passenger and baggage processes take place under a single roof. This one terminal concept, results in a, much appreciated, feeling of compactness in passengers.

Schiphol's vision is to be an airport city, which on the one hand has a societal function and on the other hand has company goals to strive for. Schiphol Group has a strong focus on passenger quality (perception). This research contributes to this focus and is initiated from this focus. Offsite/remote (outside the terminal) check-in and baggage drop-off research, the subject of this thesis, should help to provide insights in increased passenger travel quality experience. The platform which facilitated this research is introduced next.

1.2 SIM

SIM is an abbreviation for "Samenwerking Innovatieve Mainport". It is a platform, which consist of scientific institutions: Technical University Delft (TUD) and a Dutch knowledge institution for applied research (TNO), together with aviation oriented companies: Schiphol Group (SG), Royal Dutch Airlines (KLM) and National Aerospace Laboratory (NLR). This platform is initiated to support the aviation industry with innovative research in the aviation field. Researches, that find their origin from this platform, are mostly executed by students as part of their Masters Thesis.

1.3 Problem definition

This section provides a systematic description towards the research questions. To get to the research questions, first the problem is described, followed by the description of the project initiation, resulting from the problem. Then, the research objective, extracted from the problem description and the project initiation, is formulated. Next, the scope of the research is given, to clarify the boundaries of this research. This allows for the careful formulation, of the appropriate research questions in the final sub-section of this section.

1.3.1 Problem description

Schiphol Group aims to maintain Europe's preferred airport. They have won the price for Europe's best quality airport in 2012 (Schiphol, 2012). However, to maintain this status, Schiphol will have to constantly monitor and improve this quality where needed. In that light, Schiphol Group has conducted research about the passenger's journey in 2011. This research reflects upon the perceived quality aspects of passengers during their journey to and at the airport. here It is also indicated, that quality and capacity are strongly connected to one another. If capacity limits are reached, this will have direct consequences for the quality. Therefore, this research also points out the airports capacity problems and expected future passenger growth. Findings about this are bundled in an "Integral vision on the Passenger Journey" document. These findings are formed by Schiphol data and by interviewing all types of passengers travelling to and from Schiphol Airport. The document is to extensive to add here. Two, amongst others, conclusion can be drawn from this research.

First, the integral vision on the passenger journey indicates that 80% of passenger motives are generic. These generic motives can be categorized in three parts: The passenger wants to have a *personal fit*, wants to have an *authentic* journey and wants to be *in control* of that journey. One of the explanations of being in control of the journey, is to have a *hassle free* journey. Baggage carrying is an important factor of this feeling of "hassle" in passengers.

Secondly, this Passenger's Journey research indicates, that passengers experience a lot of stress, from the day before flying until the moment they board the aircraft. The passengers want to be relieved from stress in an early phase of their journey, when departing from Schiphol airport. Baggage check-in is an important aspect in the forming of stress in passengers. This is the second important conclusion. To indicate stress levels perceived by passengers at different phases of pre-flight, Figure 1 is shown below:



Figure 1: Perceived stress level by passengers per phase of pre-flight

The figure distinguishes 9 pre-flight phases indicated at the top of the figure. The red line in the figure represents the perceived stress levels indicated in 2011. The blue line indicates the height of stress levels, Schiphol aims for.

From this indicative figure, it can be concluded that substantial stress relief should/can be realized in the "parking and bus to terminal" - and "check-in and bag drop" pre-flight phase (indicated by the arrow from the small 1 to the small 2). The pre-flight phases are indicated at the top of the figure. Highest stress levels are perceived at the passport check pre-flight phase ¹(big point 1 in Figure 1). The big point 2 in Figure 1 *represents* the reduction in stress and point 3 the shift in stress towards an earlier phase.

Combining both conclusions, Schiphol has concluded it can improve the **quality** perception of travel for passengers, through facilitating an earlier baggage check-in.

Furthermore, the "Integral Vision on the Passenger Journey", indicates that growing passenger amounts in the existing terminals at Schiphol airport are becoming a problem in the near future. At peak times, the terminal already sometimes is over-crowded. Long waiting times for passengers, passengers who are irritated towards the airport and the airline, and stressful times for terminal employees are the result. Based on this, Schiphol also concluded it has a **capacity** shortage. This capacity shortage now, is only visible in peak times. However, Schiphol passenger amounts, are expected to grow significantly in the coming few years. Figure 2 below, shows three possible future passenger growth scenario's:

Expected Schiphol passenger growth (mio)



Figure 2: Expected Schiphol passenger growth (millions)

When considering the medium (Med) scenario (represented by the grey line in the figure), a likely passenger increase of 50% in the year 2025 compared to now is expected. So, *Schiphol has a peak time capacity problem now and a structural capacity problem for the long term.* Because of this long term capacity problem, Schiphol has planned (in a master-plan) the building of a new terminal which is planned to be operation in 2018. To cope with the short term capacity problem, Schiphol is trying to find solutions where passengers and baggage can be checked-in outside the current terminals.

So, for both quality and capacity reasons, it seems to be beneficial to find baggage check-in solutions outside the terminal. But this cannot be done at all **costs**. Due to the future investment in this new terminal, all budgets are reduced. However, when the terminal is to be built is not yet decided. This new terminal will not only be built to cope with passenger growth on landside, but is also needed for expansions on airside (Schiphol, 2012).

¹ This research will not focus on stress relief at the passport check pre-flight phase, even though stress levels are highest there.

Any projects initiated to deal with the short term capacity and quality issues, will therefore not be allowed at any **cost**. To be feasible, careful trade-offs need to be made in order to have potentially "enough" quality increase and capacity relief for an "acceptable" **price**.

1.3.2 Project initiation

In order to find a solution for these quality and capacity issues in the short term, related to earlier baggage check-in, Schiphol has decided to initiate a project on "remote check-in and baggage drop-off". Such a project has been initiated by Schiphol before (Schiphol Group, 1993). This remote check-in and baggage drop-off concept, intents to bring the terminal more to the passengers , instead of the passengers coming to the terminal (for check-in and baggage drop-off). Passengers and baggage would be checked-in somewhere outside the terminal and transported to the terminal. Such concept, could partly, relieve passengers from pre-flight baggage hassle and could relief some peak time capacity pressure in the terminal, according to Schiphol. To test/research the concept of remote check-in (CI) and baggage drop-off (BD), Schiphol has decided to conduct a feasibility study for a remote CI and BD facility at P3, the Long term Parking lot at Schiphol. P3 was chosen as location for this study, because a large concentration of (departing) passengers can be found there, testing of the concept was done there before, the location is under the ownership of Schiphol Group and the location is on-airport. This would make research and testing more easy and representative than any other location (Schiphol Group, 2011). After this feasibility study, a remote CI and BD pilot was started at P3 to test the concept.

Concluding the above described problem and project initiation, the following problem statement can be formulated:

Schiphol needs to find a feasible way of facilitating baggage check-in somewhere outside the current terminals, in order to deal with the discovered passenger quality needs and the short term peak-time capacity problem, to remain Europe's preferred airport.

1.3.3 Research objective

Following from the problem statement, the objective for this research can be formulated:

To develop a framework, that can decide on remote C I & BD location suitability and can state location design choices that have to be made, in order to make a remote CI & BD location service design, from which an estimation of potential quality increase and potential terminal capacity relief can be extracted. Furthermore, the service design should satisfy security legislation, be financially feasible and should take future developments into account.

In order to accomplish this objective, it is important to state the scope of this research first. In this way it can be made clear, within what boundaries the research takes place and when the research objective is accomplished. The next section will describe the scope.

1.3.4 Scope

For researching the implementation of remote CI & BD it is chosen to research five possible services. These service possibilities where indicated by Schiphol. Schiphol has asked to research a remote CI and BD service for train passengers, for cruise ship passengers arriving in Amsterdam, for passengers at home, for passengers staying in hotels and for a service for passengers parking their car at the long term parking lot of Schiphol (P3).

Furthermore, the research of a remote CI & BD service will only be focussed at the departing Schiphol passenger. A baggage pick-up service for arriving passengers will require the help of (a) foreign airport(s) and handlers stationed at those airports. For such a service to work, baggage labelling must be done at the airport of departure of the arriving passengers. Only In this way service employees can pick-up the baggage that is to be handled differently.

Furthermore, this research will provide an oversight of literature on remote check in and baggage drop-off. This study includes researches on the facilities and services of remote baggage drop-off around the globe. Also, later on in the report another study is done focussing only on Schiphol's experiences with remote CI and BD.

Christiaan Noordzij Remote check-in and baggage drop-off 1.3.5 Research Questions

To accomplish the research objective formulated in section 1.3.3, the following main research question is formulated:

"How and on which locations can Schiphol accommodate remote check-in and baggage drop-off services for passengers and baggage outside the current departure halls, in order to sufficiently answer to the quality need of Schiphol departing passengers and relief sufficient terminal capacity pressure, while satisfying all stakeholders involved "

To answer the main research question, the following research sub-questions are formulated:

- **A.** What are the most important criteria, to successfully implement remote CI & BD services for Schiphol?
- B. Which locations are feasible for remote CI & BD services and why?
- **C.** What location design choices have to be made in order to be able to come to a remote CI & BD service design?
- D. How does the service design of locations that are suitable for remote CI & BD, look like?
- **E.** What quality and terminal capacity improvements can be expected, when the service designs of the remote CI & BD locations are feasible?
- **F.** What will the future of remote CI & BD services be for Schiphol, when considering technical developments, stakeholder perspectives and the services?

What the research approach is, for answering these sub-research questions is shown in the final section of this chapter. Furthermore, the structure of the thesis is presented there as well.

1.4 Research Approach and structure

To answer the research questions the following research approach is chosen, visualized in Figure 3. In the figure, the letters A - F represent the research sub-questions from the previous section. The numbers 2 - 10 represent the chapters, which are shown in the "building blocks" of the thesis, visualized in the figure. The bigger orange arrows represent the main story line of the thesis and at the same time represents input. The smaller black arrows represent input for, or a sequential step in/or between thesis "building blocks". The building blocks are chapters and parts presented in the figure.



Figure 3: Research approach and structure

The next page will provide a "walkthrough" explanation of the research approach.

Christiaan Noordzij

Remote check-in and baggage drop-off

Master Thesis

In Part 1, the success criteria for remote CI and BD are formed. These success criteria are formed by three parts of theoretical research and by Schiphol's experiences with remote CI and BD presented in chapter 2. The first part of theoretical research is general literature on remote CI and BD. The second part of theoretical research is literature on services and customer needs in general. The third part of theoretical research, is literature on the functional requirements of CI and BD. From each theoretical research part and Schiphol's experiences requirements (indicated by requirement numbers) are derived. These requirements can be categorized into the, in chapter 3 formulated, 4 success criteria for remote CI and BD.

Part 2 describes a framework on remote CI and BD. This framework consists of three parts. The first part, presented in chapter 4, provides a (sub-)framework to estimate a service location's feasibility for a remote CI and BD service. This is the service location where the offsite facility is intended to be put. Requirements are used to formulated 5 steps that estimate the service location's feasibility. The second part of the framework, presented in chapter 5, states offsite facility service design choices that have to be made once a service location is estimated to be feasible. These offsite facility service design choices, also are formulated with the use of the requirements from chapter 3.

The last part of the framework, presented in chapter 6, provides for a "best" functional process for remote CI and BD. Here, several functional process options are shown. The "best" functional process option is chosen based on the requirements from chapter 3. This functional process is further worked out in a detailed functional process. This detailed functional process is used in part 3.

In Part 3, the design of remote CI and BD services is elaborated upon. Before the design is done, first in chapter 7 the services, that Schiphol requested to be researched, are given a service *location*. This location (associated with the service) is needed in order to apply the framework from part 2. Once a service location is (still) estimated to be feasible, after the application of the framework in chapter 7, the detailed functional process can be customized to that particular feasible location, in the service design chapter 8.

The roadmap for the future, presented in chapter 9, will elaborate on the future developments of remote CI and BD. Stakeholder developments and technology developments are discussed here. Also advice is given to Schiphol, on how to develop remote CI and BD in the future. Chapter 10 finalises this thesis report with conclusions and recommendation.

Part 1: <u>Success criteria for remote check-in & baggage</u> <u>drop-off</u>

2. Research on remote check-in & baggage drop-off

This chapter will provide requirements for remote CI and BD, from theoretical research on remote CI and BD and literature on Schiphol experiences. These requirements, form the basis of the success criteria , presented in chapter 3. The first section of this chapter (2.1) will give insight in what is meant with - and important about remote CI & BD, indicated by literature found on the subject. Also from this section general remote CI and BD requirements, service customer requirements, service requirements and functional CI and BD requirements are derived. The second section (2.2) provides insight in the experiences of Schiphol with remote CI and BD. Conclusions from evaluation reports, concerning remote CI and BD, are mainly presented here. From these evaluation reports of these services, also requirements are derived. Theory and practice are, herewith combined to provide for the most important requirements of remote CI and BD.

Section 2.1.1 states reasons for implementing remote CI and BD, 2.1.2 states strategies for off-airport baggage processing. Then section 2.1.3 discusses the impact of 9/11 on remote CI and BD. Section 2.1.4 states challenges for remote CI and BD from theory. This chapter discusses, theory on remote CI and BD challenges, theory on service and customer needs and theory on the functional requirements of CI and BD. 2.1.5 derives requirements from the challenges in section 2.1.4. The derived requirements are indicated by letters in orange tables. These orange tables provide for a link to the success criteria requirements, that are indicated by a number in the same orange tables.

2.1 Theoretical research on remote CI and BD

To answer the question, what remote CI and BD actually is, a definition for airport offsite passenger facilities is given: *"Airport offsite passenger service facilities provide a variety of services to departing air passengers including baggage check-in, issuance of boarding passes, and transportation to the airport"* (Goswami et al, 2011). All the elements of this definition together are seen as: remote CI and BD. Many variations of these services provided from these offsite facilities exist.

Remote CI and BD's first known service dates from 1953. Below Figure 4, provides an overview of most of the services being operated in the last few decades all around the globe (Goswami et al., 2011). This overview aims give insight in the variety of countries, durations and modes used for remote CI and BD. Remote CI and BD services, by train, boat and bus exist or existed in the past, as can be seen in the figure.



Figure 4: Past and current remote CI and BD services in the world

Each of the above shown services (names, cities and times) have their own unique service characteristics. Because of the specific and different variables of these services, it is less valuable to discuss each individual case. However, they have the same reasons for being implemented (2.1.1). Also several service strategies (2.1.2), a major impact (2.1.3) and some generic challenges for remote CI and BD can be distinguished (2.1.4). These challenges are derived from theory on remote CI and BD, theory on services and customer needs and theory on the functional requirements of CI and BD.

2.1.1 Reasons for implementing remote CI and BD

Why these services started to arise in the past few decades, is explained by a number of reasons. First, it was found that passengers would benefit from terminals away from the airport, that provide baggage check-in and transport to the airport. It gave air travellers the possibility to avoid parking at the airport. Also congested airline counters could be avoided (Mansel, 2000). Furthermore, it allows for a hands free travel to the airport, boarding cards and preferred airplane seats are obtained sooner than in the terminal (sharp, 2004). This indicates, that the expected quality gains from remote CI and BD, stated in chapter 1, are justified.

Next to the benefits for passengers, also airports saw benefits. Due to the rapid and sustained growth in the amount of air travellers, airports where unable to expand the capacity of their terminal building, or groundside facilities to accommodate for this growth. This growth would cause undesirable levels of service and delays (Mansel, 2000). Due to an increase in landside congestions at major airports in the late 1980's and early 1990's a revived interest in offsite facilities was shown (Goswami et al, 2011). This confirms the fact that capacity and quality are strongly related to each other and that remote CI and BD services are suitable for relieving terminal capacity, as was stated in chapter 1.

Also, through improved public transportation access modes towards the airport, catchment areas for airlines and airports could be enlarged. Airlines could attract more passengers to the airport they where operating from. Furthermore, airlines are able to provide a lower stress facility, by relieving pressure on airport check-in desks (sharp, 2004)

The combination of the benefits for passengers, airports and airlines has made offsite passenger service facilities come to life. However, the services (often shared public transportation services) from these offsite facilities have to compete with other services. This is due to the fact that, shared transportation services to the airport need to compete with cars and taxi's, that have the advantage of personal service and ample *room* for baggage (Transportation Research Board, 2002).Several strategies have been developed and executed to deal with this challenge of baggage. In the next section these strategies are briefly discussed.

2.1.2 Strategies for off-airport baggage processing

Three main strategies have been developed over the years. The *first* strategy is the one where offairport baggage check-in is used. In the *second* strategy, no off-airport baggage check-in is used. In the *last* strategy, hybrid combinations are made that provide for some, but not all services.

In the first strategy two options are found. In the first option, the off-airport baggage processing is done by the airline. This means that both the check-in process and the baggage acceptance is done by the airline. A second option in the first strategy is the off-airport baggage processing by a third party.

In the second strategy the focus is more on the transport of passengers and baggage in one vehicle. A baggage accommodation in a dedicated – or in a shared service is distinguished in this strategy.

The last strategy first provides, possibilities for services on-airport, for passengers arriving at the airport by public mode services. Secondly it provides possibilities for services at the offsite public transportation terminal, including the assignment of baggage tags, while the passenger retains the responsibility of getting the bag to the airport (Transportation Research Board, 2002) .Now, insight is gained in the variations of the baggage service degree, that can be provided to the passenger. Several of these strategies, can be recognized in section 2.2 where Schiphol's experience with remote CI and BD projects are described.

Christiaan Noordzij Remote check-in and baggage drop-off 2.1.3 The impact of 9/11 on remote CI and BD

Most of the services, along with their strategies, where endangered by the events on September 11th 2001. The next section briefly discusses regulation that was implemented, shortly after the twin tower attacks. This regulation, forms the basis of the baggage security issues associated with remote CI and BD around the world.

Although the twin tower attacks occurred in the United States (US) and stricter rules on security therefore originate from the US, they have affected aviation security all over the world. Here, only briefly the impact on baggage security is discussed.

On September 12, 2001 the Emergency Security Amendment implemented by the FAA (Federal Aviation Authority in the United States), imposed alert level 4 security measures at all U.S. airports. This regulation resulted in the temporary discontinuance off all remote baggage handling services for the US (Transportation Research Board, 2002). In November 2001, this regulation was signed into law. This law required the following:

"The TSA (Transportation Security Agency) and the airlines (1) ensure either the inspection of all (100%) of checked passenger baggage by staff, specially trained dogs, or EDS (explosive detection systems), or the implementation of baggage reconciliation procedures that match all baggage and airline passengers on board an aircraft and (2) inspect all checked passenger baggage using EDS by the end of 2002 if equipment is available"(Transportation Research Board, 2002)

In addition to this law, before the end of 2002 the TSA required that all passenger and baggage screening was to be performed by TSA employees in the United States. This law and TSA requirement made remote check-in and baggage drop-off facilities in the US, hard to sustain. To comply with these regulations, these facilities had to provide 100% positive baggage matching and install and supervise EDS equipment, which was to be operated by TSA employees. 100% positive baggage matching is defined as a 100% match of passengers and baggage.

One EDS screening unit costs over 1 million US dollars. Resulting from these additional costs and restrictions, most services with remote baggage check-in where found to be unfeasible. Large operators of remote baggage check-in facilities where seeking amendments to security regulations to re-institute their services (Transportation Research Board, 2002). Throughout the whole world security for passengers and their baggage was and still is tightened.

2.1.4 Challenges for remote CI and BD from theory

However, also remote CI and BD facilities where closed before the events of 9/11. Apparently, more factors play an important role in the success of remote CI and BD facilities. In this section, these factors and the challenges associated with these factors are discussed.

As was said in the beginning of this chapter, the first offsite facilities were implemented in the US during the early 1950's. However, usage of those facilities steadily decreased and by the early 1980's several were closed (Goswami et al., 2011). This is however not visible from figure 4 in section 2.1. Not all cases of remote CI and BD are visible in that figure.

Theory on remote CI and BD challenges

Several authors and organisations (also used in the previous sections of this chapter) involved in aviation have done research on remote CI and BD and documented their findings and conclusions. An extensive literature research is done. In the next part, quotes from articles and reports on remote CI and BD and its major challenges are presented:

- "The two most significant challenges to be overcome are satisfying FAA security requirements and justifying to airlines that the benefits of providing baggage check-in at a satellite terminal outweigh the associated costs" (Mansel et al., 2000).(1A2+TO1)
- "There are many models of off-airport bus, water and rail terminals for the processing of airline passengers and their baggage. Each has developed to meet the needs, constraints and culture of the area it serves. Major problems and challenges appear to be in the areas of security, integrated ticketing, coding, customer confidence, and economics" (sharp, 2004). (1A1+1A2+1B3+1C1+1D1+2A1)

- "Without challenging the level of service brought about by these state-of-the-art facilities, the issue of operating cost must be dealt with" (Transportation Research Board, 2002). (TO2)
- "Multiple reasons have been cited for their closure, including issues regarding security of checked bags, cost of operation, poor level of service offered, and lack of air passengers in the vicinity of the offsite facility" (Goswami et al., 2011). (1A1+1A2+1B3+1C1+1D1+2A+2B1)
- "Likely candidates for an offsite facility are airports that are not easily accessible, and departing air passengers with early morning flight departure times and high variability in ground travel times to the airport" (Goswami et al., 2011). (2A)

Most of these reports and articles originate from the US, but they often also looked at European and Asian cases of remote CI and BD for their research. This makes their findings useful around the globe. Not only the fact that report's and article's findings are useful, is important to state. It is also wise, to spend a remark on the interrelated nature of aviation. By this is meant, that for instance, security rules on passengers and baggage in the US, also need to be applied outside the US for passengers and baggage travelling to the US. This also is an argument in favour of the usability of findings and conclusions of US oriented reports and articles.

Theory on service and customer needs

Next to literature on remote CI and BD specific, also literature on services and customers in general is used. This is useful, since a remote CI and BD *service* is researched and service customers are involved. Several statements were found on services in general.

- "The processes have a strong time-bound character and efficiency is key; the more efficient and smooth the service process runs, the more satisfied the customers will be"(Hagen,2011).(2A)
- "If the environment is clean, safe and appropriate for the service offered, then the consumer will have greater confidence in the quality of the service provider" (Hagen, 2011).(2A)
- "People who wish to cover a long distance can choose whether they travel by car or train, opting for that mode of transportation which they feel offers the best quality in relation to the investment of the three budgets, money, time and effort" (Hagen, 2011). (2A)

To know, what drives people to use a service, it is useful to know what people/customers need. Also the order of importance of these needs are valuable for service design. For this, Hagen's pyramid of customer needs, is used and shown in Figure 5 below (Hagen, 2011). Van Hagen has based his theory on the well-known pyramid of Maslow (Maslow, 1954). This figure indicates that service customers judge services in an order of importance. This is useful to know when designing a service and determining what is important. In this way the feasibility of services can also be done in steps of importance, viewing from a customer's perspective.



Figure 5: Hagen's pyramid of customer needs

In Figure 5, two major categories become visible. First, customers, when travelling, **must** travel fast. Trust in the service, travel time from door to door, and the mental effort, together form this "must" feeling. However these are not equally important. The second major category that can be distinguished is the customer's **lust** to travel relaxed. Again trust and mental effort contribute to this. But, also the physical effort (personal convenience) and the emotions (that time is valuable) contribute to this second category. The sub-categories in this pyramid, are listed and discussed below in the order of importance:

- **Safety and reliability** (2A1) is the most important. When a transport mode is not safe and reliable passengers won't travel, states van Hagen. Each transport mode, has its own safety record. When a mode is discussed this safety record will not be addressed. It is seen as a fixed variable. Trains are generally safer than busses, however, both modes are considered to be "safe enough" for users to use the service.
- **Speed** (2A2) is the second most important. When travelling, passengers want to be at their destination as fast as possible. Speed is defined in this research, as the passenger and baggage travel time, between the offsite facility and the airport.
- **Ease** (2A3)is the third important category. Ease is defined as, the degree of no hassle and no stress feeling in passengers. Schiphol, states "ease" as one of the justifications for the implementation of remote CI and BD services. The ease of not having to drag baggage to the terminal is seen as a major advantage of remote CI and BD facilities (see, chapter 1).
- **Comfort** (2A4) then, is the fourth important category. It is defined as, personal convenience when travelling. It is mainly the physical comfort of using a transport system.
- **Experience** finally, is defined as the emotion that comes with travelling. For instance, that time is valuable. But, also architectural design features etc., could contribute to this feeling.

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Theory on functional CI and BD requirements:

As a final element of theoretical research, it must be known what CI functions and BD functions at least must be provided for in a remote CI and BD service design. For this it must be known *what* needs to be done by *whom* in the departure process , from booking a flight until dropping baggage. Below Figure 6 visualizes the functional departure process steps (1-12), done by the several actors in the process (airline, passenger, government/authorities and baggage department). Also the type of information exchange is visualized by means of the arrows between the process steps. A legend of these lines is provided at the bottom of the figure. (SPT Interest Group, 2006)



Figure 6: Functional departure process (SPT interest group, 2006)

A detailed explanation of each process step (and its abbreviations) can be found in Appendix A. From the figure it becomes clear that CI systems at an offsite facility need to be able to facilitate step 4 and step 8. However information from the airline and government is also needed from step 5 and step 6. Finally the airline needs to approve the print of a boarding pass in step 7. This boarding pass is then printed in step 8 and handed over to the passenger. When checking in at home from a computer, an id authentication (step 4) is not required. However, a passengers with haul baggage is required to use/show his/her id at either CI or BD (SPT Interest Group, 2006). When passengers don't carry haul baggage and are checked-in at home, a passport check is done at the security filter or at the gate in

the airport terminal. However, the "passenger's right to fly" and the airline's "authority to carry the passenger" are validated, before a boarding pass is issued.

Below Table 1 is presented, that is extracted from Figure 6 shown above. This table represents the functions that need to be facilitated at the offsite facility. Some steps in Figure 6 are also used in the table below. Computer systems linked to airline systems and government systems are required to facilitate these functions. Furthermore, a boarding pass printer, a baggage tag printer and a weighing device must be available.

process	Step 4	Step5	Step6	Step6	Step7+8
passenger Cl	Retrieve passenger booking information	Confirm passenger's "right to fly" (Validate and confirm: flight reservation, identity, ticket payment status, travel docs, airline no-fly list and confirm	Confirm airline's "authority to carry" passenger (confirm validity travel docs + identity)	Assign passenger plane seat	Print and Receive Boarding pass
process	Step 9	Step 9	Step 10	Step 10	Step 10
Baggage	Retrieve	validate travel docs	determine	baggage	Print and
Drop (BD)	passengers	+identity	baggage amount	payment	Receive
	booking		+	according to	baggage tag(s)
	information		weight	airline	
				policy	

Table 1: Check-in and baggage drop-off functions

Stakeholders can decide to only facilitate a remote BD service, without CI. This means that only passengers that have already checked-in themselves can make use of the service. As a consequence of these CI and BD functions, resources are needed to execute these functions. In the first place a computer system with an airline and government link must be available (3A). Secondly, a weighing device is needed to be able to apply airline policy (3B). In the third place, in the case of overweight of baggage, a payment device is needed (3C). To be able to print the baggage label (tag), in the fourth place a baggage label printer is needed (3D), And finally, boarding passes need to be issued. Therefore a boarding pass printer is required (3E).

Remote check-in and baggage drop-off

2.2 Schiphol experience with remote check-in & baggage drop-off

The theory of the previous section, has stated several requirements that contribute to the success of remote CI and BD. In this section Schiphol's experience with remote CI and BD will be discussed. From each project, on remote CI and BD, that Schiphol has initiated in the past (and from one visit), a short service description, most important evaluation findings and reasons for success/failure are presented. Not all projects documentation provided for the same information, however it was possible to extract requirements from them. The most important evaluation findings from each project are given a requirement, presented between brackets behind each important evaluation finding. These requirements are then related to a higher level requirement and linked to the success criteria requirements from chapter 3. In this way it can be seen how the evaluation of the projects are used in the success criteria requirements. In section 2.2.1 the 1990 train station CI service will be discussed. Next, the 1993 P3 Cl and BD in section 2.2.2 is viewed upon. Furthermore, the Schiphol Rail Service project from 1993 is discussed in section 2.2.3. Then, in section 2.2.4, the visiting of Vienna's City Airport Train is discussed. Section 2.2.5, discusses the 2012 P3 CI & BD project. Finally, section 2.2.6, describes lessons learned from the experiences of Schiphol with remote CI and BD. In this section interrelations between requirements are described. These interrelations are also made visible in the tables presented in chapter 3

2.2.1 1990 Train station Check-in service pilot

The Dutch railway company (NS), together with the Royal Dutch Airlines (KLM) and Schiphol have done a pilot on remote CI at Rotterdam Central station and Den Hague Central station in 1990.

Short service description:

The air traveller had been given the opportunity to check-in at a KLM desk at a railway station. The check-in procedure was done by NS personnel. Air travellers received their boarding cards at both stations, were the baggage was weighed and sealed on the spot.

The air travellers could then go to the airport, with their sealed baggage (preferably by train). Upon arrival at Schiphol, they only had to deliver their sealed baggage to a special desk for this type of baggage. Air travellers of around 50 airlines were able to check-in at the two railway stations. KLM had made arrangements with these airlines (van den Bogert, 1990).

Most important evaluation findings:

Here findings from an evaluation report on the service are presented:

- 75% of the respondents live(d) in Rotterdam or Den Hague (2B1)
- 47% of the respondents indicated, they used the service due to information about the service at the stations themselves. (2B4)
- 93% of the respondents indicated they were generally satisfied with the remote CI service at the stations.(2A)
- Most important advantage: faster process/no queuing time for CI(2A2)
- Most important disadvantage: self carrying of baggage (2A3)
- 2/3 of the respondents indicated to make use of the service again (2A).
- 33% of the respondents indicated they took the train to Schiphol due to the CI service at the station. 41% indicated this was not or hardly the case and 25% indicated they had no other choice, than to travel with the train to Schiphol.(2A)
- 78% of the respondents flew with KLM (2B5)

2.2.2 1993 P3 Check-in & Baggage drop-off pilot

In the beginning of April 1993, a pilot for remote CI and BD at the long term parking lot (P3) of Schiphol was started. Schiphol and KLM cooperated in this project.

Short service description:

KLM passengers, who parked their car at P3, could come to a small building at P3, where they could check-in their baggage. The labelled and weighed baggage, was then transported in a small truck to the terminal. Baggage was manually put in the Baggage Handling System(BHS) via an empty check-in desk in the terminal building. Passengers with their acquired boarding passes, proceeded with a shuttle service to the terminal, where they could go straight through to passport control. Passengers for European and international flights had to be at the remote CI and BD terminal at least 60 min prior to flight departure. The remote CI and BD facility was opened every day from 06:30 – 18:00 (Bloks, 1993).

Most important evaluation findings:

Here findings from an evaluation report on the service are presented

- Remote check-in has, in all aspects, been appreciated more than the terminal check-in. (2A1)
- Waiting time has been evaluated very positive, 90% did not wait in a queue at all.(2A2)
- Getting rid of baggage earlier and short waiting time are the 2 most important advantages (2A3 + 2A2)
- Most important disadvantage, was the need for an earlier presence at the remote CI and BD facility for European flights (60 min instead of 40 min prior to flight departure)(2A2)
- Most important reason for not using the P3 check-in: passengers did not know the service existed.(2B4)
- Improve promotion of service.(2B4)
- Find solutions for group check-in and "extra" (too much) baggage.(2B6)
- 67 pieces of baggage per 10.000 not checked-in on time. Stricter check-in time allowance policy.(2B4)

Reason(s) for no further/permanent implementation:

KLM withdrew from the service due to the (too) high operational costs.(costs)

Christiaan Noordzij Remote check-in and baggage drop-off 2.2.3 1993 Schiphol Rail Service pilot

From May 1993 until November 1993, a Schiphol Rail Service (SRS) pilot had been done. The project was initiated by KLM, Schiphol and the NS. An increase in the amount of public transportation travellers was seen as necessary to guarantee Schiphol accessibility in the future. SRS was a means to get travellers from the car into the train.

Short service description:

Air travellers on their way to Schiphol, where able to check-in, in the train. Special 1ste class coupes where reserved for SRS passengers. Specially trained personnel was present inside the train for the check-in. SRS passengers in the train were given coffee and a newspaper. The service was applied at the Enschede - Schiphol train connection. Passengers were able to get in the train at Enschede, Hengelo, Almelo, Deventer, Apeldoorn, Amersfoort and Hilversum. The coupes had been indicated from the outside with stickers. In this way passengers would be able to directly get in the right train part. Passengers were able to buy an integrated airplane - and rail ticket. At Schiphol there was a baggage service available. A man with a cart carried your baggage to the BHS (Baggage Handling System). The primary target group for the service was the business traveller (van Leeuwen, 1993).

Most important evaluation findings:

Here findings from an evaluation report on the service are presented

- Passenger certainty all was taken care of (2A1)
- No time loss from check-in at Schiphol (2A2)
- No baggage hassle (2A3)
- Possibility to go straight through to passport control upon airport arrival(2A3)
- No logistical problems from the process (1D2)
- Not enough baggage space in the train available (4C)
- The business traveller needs a door-to-door approach, so service integration with taxi's might be interesting. (passenger type/characteristic)
- The service target group should be expanded with non-business travellers (2A)
- Train product: more direct connections with Schiphol, focus on the long distance. Also, make use of existing NS-routes.(2A)
- Product should be offered as a whole door-to-door package. (2A3)
- keep In-train phone check-in (2A3)
- Check-in for all flights of all airlines should be made possible (2B)
- Keep integral ticketing (train-airline ticket) (2A3)
- More intensive communication is needed.(2B4)
- Total costs for the project where 1.600.000 FL guilders (726.000 Euro), the ministry of traffic subsidized 85% of this amount. (1A1+1B3+1C1+1D1)
- 724 persons made use of SRS (2B)

Reasons for no further/permanent implementation:

- Not more passengers in train to Schiphol due to SRS service (2A +2B)
- Break event point with cost, had by far not been reached.(1A1+1B3+1C1+1D1)

2.2.4 2012 Vienna's City Airport Train visit

Schiphol has visited Vienna Airport and Wien Mitte train stations, where a successful remote CI and BD facility with a dedicated train service exists today. Vienna airport has developed a City Airport Train (CAT) service, together with the Austrian Federal railways.

Short service description:

The service operates between "Wien Mitte" train station and the airport of Vienna. At Wien Mitte train station a terminal is constructed for the purpose of CI and BD. CAT offers a first class transportation for Viennese, as well as for international travellers. The project was launched in 2002 and put into operation in 2003. The CAT project is a between the Airport of Vienna and the Austrian Federal Railways. Vienna Airport has an interest of [###²] in CAT, whilst the Austrian Federal Railways have an interest of [###]³ in CAT. The train concept has a totally new branding, compared to the traditional trains in Austria. A completely new train is designed. For instance, a separate secured baggage compartment is part of the train. They have chosen a specific (green colour) for the trains and branding of CAT. In this way they want to get in contact with passengers and show that there is a complete new service, with its own completely new branding.

The airport, at first, approached handlers to participate in the service and not the airlines. They were willing to participate because they could earn money with the service. The handlers where chosen due to the size of their market potential. 2 handlers were found to be suitable for the service.

The service is operational 24/7. The train leaves twice an hour and arrives at the airport after 16min and covers a distance of 19km. $[\#\#\#]^4$ airlines participate in the service. Once your baggage is dropped at the counter a small baggage transport belt takes the baggage to the train platform. The baggage compartment of the train is aligned with the end of the baggage transport belt. The baggage is put into special containers at the end of the belt and the containers are taken into the special baggage compartment of the train. Before the baggage enters the train, it is scanned manually by a barcode scanner device operated by a baggage handler. When the train arrives at the airport, the baggage is scanned again (for intake) and transported to the BHS via an extension of the BHS to the train platform. The service required space for the offsite facility (4A), space for the logistical process from the offsite facility to the train platform (4B) space for the baggage in the train (4C) and space for an extension of the BHS at the airport's station (4D). Due to the high punctuality of the service (99,8%) passengers need to arrive at the station at a minimum of just 75 minutes before flight departure. Passengers pay 10 euro (for an internet train ticket), 12 euro (for a counter ticket) and 18 euro for a ticket both ways.

At the airport and airline's homepages the service is announced and promoted. The airport and airlines have chosen for simple communication to the passenger. They have chosen to be non-transparent about security to passengers. They have used several media to promote the service and also looked at the type of passengers that where going to use it. This has also led to the promotion of the service to German passengers, whom make use of the CAT a lot.

² Number not included due to confidentiality of the data

³ Number not included due to confidentiality of the data

⁴ Number not included due to confidentiality of the data

Most important evaluation findings:

Here, findings from an evaluation report on the service is presented.





A survey amongst passengers that used the CAT has indicated that 96% of the passengers is satisfied with the service, 90% will use the service again in the future, 93% recommends CAT to their friends and 94% of the residents of Vienna and every 2 visitors know about CAT.

Furthermore in the survey they have asked passengers which possibilities of city check-in they prefer in general and which they used for their recent journey. Below Figure 8 shows this. The rows in the figure represent the type of check-in and the columns represent the amount of passengers.



Figure 8: City check-in preference Vienna (CAT, 2011)

What can be concluded from the diagram presented above is that people still prefer personal contact with a desk employee. Passengers indicated what the advantages of the CAT service are. A non-stop connection, a fast (16 minute) train ride and the fact that check-in is possible in the city centre are

seen as advantages. So far, $[###]^5$ of all passengers travelling from Wien Mitte to the airport took advantage of the City Check-in. In an online customer survey in 2011, 700 passengers gave feedback on the new train design. 2 had no comment, 348 said the design is "very good", 242 said the design is "good", 8 said the design is "fair", 2 said "poor" and 98 passengers did not realise it was a new design (CAT, 2011). This means that a service with a new train design will contribute to the quality perception of passengers.

Reasons for success:

- Dedicated connection between city centre and airport with punctuality of 99,8%. (2A1)
- Dedicated service transport vehicle with passengers and baggage (2A1 + 2A4)
- Space for complete remote CI and BD terminal in city centre. (4A)
- Remote CI and BD facility situated in an area with much airport travellers (2B1)
- Passengers (want to) pay for the service. (2B2)
- Despite big initial investment (new dedicated trains, remote CI and BD terminal construction, baggage infrastructure connection with BHS at airport, high promotion costs) and operational costs, a positive business case.(1A1+1B3+1C1+1D1)
- 2 largest handling companies approached, before approaching the airlines for participation (2B5)
- Travel time advantage in relation to alternative travel options to airport from city centre. (2A2)
- Good communication to passengers in advance and during service operation.(2B4)
- High amounts of users in the first year and growing numbers in the next years.(2A+2B)
- Baggage unmanipulable from BD point on. (1A2)

⁵ Number not included due to confidentiality of the data

Christiaan Noordzij Remote check-in and baggage drop-off 2.2.5 2012 P3 Check-in & Baggage drop-off

In the summer of 2012, Schiphol initiated a second remote CI and BD pilot at P3. The goal of this pilot was to provide (more) insights in several aspects that are of importance, for the potential broader application and/or development of remote CI and BD. The service is almost the same as the pilot that had been done in 1993 described in section 2.2.2. However, different airlines participated in this pilot. Also operational hours differed from the one done in 1993. Furthermore, more is known and documented of this service compared to the pilot done in 1993.

Short service description:

Transavia (HV) and ArkeFly (OR) passengers, that wanted to park their car at P3, could come to a small hired (neat & professional look) building at P3, where they could check-in their baggage. The labelled and weighed baggage, were then put in smaller loading units by 4 baggage handlers. These loading units were sealed by means of a simple rubber band (with hook). The loading units were sorted with HV or OR baggage and put into a small truck. The small truck, also sealed and locked, left every 20 minutes for a 7 minute drive to the terminal. The baggage handler of Schiphol (and not the airline) did all the handling, including the transport of baggage. The airline needed to have certainty on the liability of the baggage transport operating party, in this case the handler (1A4). This is due to the fact that the airline is responsible for the baggage from the moment the passenger drops his/her bag, until the moment the passenger retrieves his bag at his/her destination airport. Once the baggage arrived at the terminal, first HV baggage was unloaded and entered in the Baggage Handling System (BHS) in terminal 1 via an empty check-in desk. Special terminal handlers were used for this. Then, secondly the OR baggage was driven to terminal 3 for baggage entry in the BHS. 3 baggage handlers were used for the unloading and BHS entering in the terminal. In Appendix F a visualization of this process is given. Passengers with their acquired boarding passes, proceeded with a shuttle service to the terminal, were they could go straight through to passport control. Passengers for European and international flights had to be at the remote CI and BD terminal at least 90 min prior to flight departure. The remote CI and BD facility was opened from May – June from 09:00 – 15:00 and from July – August from 01:00 – 05:00. These operational hours were chosen according to known HV and OR peak hours. From the operational hours and parking data, the potential amount of users was set to 50.000. The costs for the pilot are completely financed by Schiphol. (van der Lee, 2012).

Most important evaluation findings:

Here findings from an evaluation report on the service is presented

- 36.000 pieces of baggage (72% of potential group) were handled during the pilot (2A+2B)
- 99% of the passengers said the service was excellent (2A)
- 100% of the passengers want to use the remote CI and BD service again (2A)
- Passenger appreciates staff friendliness, waiting time, find ability and ease better than in the terminal. (2A1 +2A3)
- 10% of terminal check-in capacity for HV and OR is dealt with at the offsite facility. (2B)
- 80% more baggage was handled than expected. (2A+2B)
- Only 2 mishandled bags (logistical feasibility + baggage drop allowance time)
- Logistical process completely under control (1D2)
- TSA has approved service. (1A2)
- No closing business case (1A1+1B3+1C1+1D1)
- Costs per bag around 10 Euro's (2B2)
- If (users) passengers were charged 2 Euro's for the service the () intention to use service would drop with 1/3. With a price of 3,50 Euro's, half of the passengers intends to use it(indicative research!).(2B2)
- Non-users indicate a smaller drop in the intention to use the service (from 88% to 59%) if a fee of 2 Euro would be asked. A fee of 3,50 Euro's would, however, lead to a dramatic drop (only 37% would use it) (2B2)
- 85% personnel costs and 15% truck and loading units rental costs (1A1+1B3+1C1+1D1)
- Low amount of mishandled bags. Only 0,4% was mishandled (1A3)

It has not yet been decided if the service is continued in any way in the future due to the high operational costs. In the pilot, all costs were carried by Schiphol. The airlines are not yet willing to pay for a service, in the future.

2.2.6 Lessons learned from Schiphol experiences

From the Schiphol experiences it can be concluded that all services provided for an increase in passenger quality. It can also be concluded that all pilots done by Schiphol in the past had failed to continue in a more permanent form, because of the high operational costs. This has proven to be the biggest challenge for remote CI and BD facilities and services throughout the years (TO2).

These high operational costs are mainly due to the need for several types of personnel in the service. Check-in employees, baggage handlers, security personnel, drivers, floorwalkers and service supervisors have been used. Check-in employees behind a desk are still much appreciated by passengers (CAT,2011), although technology already provides for CI and BD solutions without a desk employee (Sneekes, 2012).

Furthermore, In the description of the services presented above, several important requirements for remote CI and BD can be identified. First of all, it seems to be important that *many* passengers (2B) are given the *opportunity* (2B6) for check-in (and baggage drop-off). If this is not done in the first place, the cost issue can never be resolved.

requirements that play an important role in this are:

- The *location* of the offsite facility, to provide for a sufficient potential service passengers market (2B1).
- The *possibility* to check-in with as many airlines as possible (done by as many handlers as possible) at the location (2B5+2B6).

The next important step is, attracting as many passengers as possible from that potential market, to actually use the service. Factors that influence this choice, made by the passenger, are:

- The *knowledge* of the existence of the service and its features (2B4).
- The *price* of this service for passengers (2B2).
- The *perceived added value* for passengers of this service, which can be divided in:
 - Travel time advantages of the service (2A2).
 - The degree in which the service is hassle free (2A3).

Another important lesson from the Schiphol experiences is, that there are basically two options to tackle the cost problem. Either passengers pay for the costs of the service, or operational costs are kept low (TO3). A consequence of the fact that passengers are willing to pay for the service, seems to be the fact that the perceived added value of passengers must be carefully weighed against the price of the service (2B2). This should be done as such, that the intention to use the service does not drop.

A consequence of the fact that operational costs are low, is inevitably that fixed initial costs have to be high (TO4). And, as was seen in the Vienna CAT case, it has been the high investments (for fixed costs), that provided the high perceived added value of passengers (TO4 + 2A). Consisting of: High investments in a dedicated, fast, first class transport. Investments in extensions of conveyor belts from the BD point to the train platform and from the train platform to the BHS. And the offsite facility itself was also invested in.

Important to notice moreover, is the fact that it is possible, again looking at the Vienna case, to gain lots of quality, lots of capacity and at the same time make it financially feasible. To put it in a different way: *In order for a remote CI and BD facility and service to succeed, high service quality for each passenger must be provided for, in order for him/her to be willing to pay for the service* (2A leads to 1A1+1B3+1C1+1D1). And a location for the offsite facility is needed, that has enough potential users for the service ((2B1).

Furthermore, a lesson is learned concerning the screening of baggage at the offsite facility. None of the above described services installed screening devices at the offsite facility. This is however
possible, but the associated costs of these EDS systems (as we have seen in section 2.1) are assumed to be too high for implementation in the service.

It has also been learned, what stakeholders are (or might be) involved in the setting-up and execution of remote CI and BD services. The airport, baggage handlers, airlines and baggage transporter operators. They must be seen as links in a chain. If one link is missing, the chain cannot be completed and no service can exist. Therefore, they are all equally important for setting-up and executing a remote CI and BD service, and they are mainly driven by costs.

3. Success criteria for remote check-in and baggage drop-off

In the previous chapter, theory related to remote check-in and baggage drop-off is discussed. Also the experiences of Schiphol with remote CI and BD in the past have been discussed. From the theory and Schiphol's experiences, requirements and trade-offs for remote CI and BD have been extracted. These requirements and trade-offs were indicated with a certain number and were put in between brackets behind of each requirement or trade-off. This chapter categorizes these requirements in 4 main criteria that are necessary for the success of remote CI and BD. These are put in Table 2 below. The colour of each main success criteria, corresponds to the related requirements discussed in the section below.

Table 2: Main success criteria

Nr.	main success criteria
1	Airline industry cooperation and support
2	Passenger usage
3	Check-in & Baggage Drop-off functionality
4	Availability of space

If remote CI and BD is to succeed, it is of crucial importance to have the support and cooperation of the airline industry (1). The airline industry is here defined as the airlines, Schiphol, baggage handlers and baggage transport operators. If the airlines industry is willing to set-up a remote check-in and baggage drop-off service, it is of crucial importance to do this in such a way, that the passengers are actually willing to use this service (2). To facilitate remote CI and BD, the functions that need to be performed during CI and BD must be provided for (3). And finally, sufficient space should be available for setting-up a remote CI and BD service (4).

In section 3.1 the requirements related to the airline industry cooperation and support are discussed. Then, in section 3.2, the requirements related to the passenger usage are elaborated upon. Next, in section 3.3, the requirements related to the CI and BD functionality are discussed. And finally, the availability of space is elaborated upon in section 3.4.

3.1 Airline industry cooperation and support

In this section, the requirements for getting airline industry cooperation and support are discussed. The airline industry (in this case) consists of airlines operating from Schiphol (1A), Amsterdam Airport Schiphol (AAS) (1B), baggage handlers operating at Schiphol (1C) and baggage transport operators that are needed to facilitate the transport of baggage from the offsite facility to a location at Schiphol (1D). These stakeholders all have their requirement (or conditions) for participating in a remote CI and BD service. This is visualized in the blue Table 3 below.

Table 3: Airline industry cooperation and support requirements

Nr.	Airline industry cooperation and support requirements
1A	Airline cooperation and support requirements
1B	Schiphol cooperation and support requirements
1C	Baggage handler cooperation and support requirements
1D	Baggage transport operator cooperation and support requirements

In the dark blue Table 4, the requirements, derived from chapter 2, for airline cooperation and support are listed. These requirements are each given a number. These numbers can be found in chapter 2 in between brackets. The airlines are responsible for the baggage of passengers from the moment the passenger drops his/her bag, until the moment the passenger retrieves his/her bag at the destination airport. For this reason requirements 1A2, 1A3 and 1A4 are needed for airline

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cooperation and support. Furthermore, requirement 1A1 is also needed for airline cooperation and support. The airlines are not willing to pay (on top of the harbour fees each airline needs to pay) extra for remote CI and BD services⁶. Only, if passengers book more tickets with their airline due to the service, the airline has a clear benefit in terms of money and are then expected to be willing to pay extra. But still in these troubled economic times, airlines are not eager to spend extra money⁷.

Table 4: Airline cooperation and support requirements

Nr.	Airline cooperation and support requirements
1A1	closing business case (no extra costs)
1A2	secured baggage process
1A3	low amount of mishandled baggage
1A4	liability of baggage transport

In the(slightly lighter) blue Table 5 below, the requirements for the cooperation and support of Schiphol are listed. Schiphol is the initiator of the P3 remote CI and BD pilot and is clearly seeing benefits with the implementation of remote CI and BD services. Chapter 1 has formulated the problem from which the need for remote CI and BD came forth. Schiphol requires a remote CI and BD service, to increase the quality perception of the passenger (1B1) and to relief terminal capacity pressure. The need for a closing business case is also required, not because Schiphol is not willing to pay extra for passenger quality increase and terminal capacity pressure relief, but because otherwise the other stakeholders will not participate in a remote CI and BD service. Schiphol is willing to pay some, but not all costs for such services. Although most benefits can be expected for the passengers and the airport, the airport is not willing to pay for all costs (Eindevaluatie P3, 2012).

Table 5: Schiphol cooperation and support requirements

Nr.	Schiphol cooperation and support requirements
1B1	passenger quality perception increase
1B2	terminal capacity pressure relief
1B3	closing business case (participation other stakeholders)

In the(light) blue Table 6 below, the requirements for the cooperation and support of baggage handlers are listed. Also the baggage handlers do not want to pay extra for participating in remote CI and BD services. They do not experience benefits from such services, unless they can earn money from it (1C1). The baggage handlers (or handlers), should more be seen as the required persons needed to facilitate the process. Handlers are licensed to handle baggage and are trusted baggage handling parties of airlines. The airlines have contracts with these handlers, were the liability of the baggage is delegated from the airline to the passenger⁸. Therefore the baggage handlers want a low baggage handling risk (1C3) and a low amount of mishandled baggage (1C4). Because the baggage handlers are held accountable for any form of baggage mishandling, if it does happen, it will therefore cost them money. This money is claimed by passengers via the airlines. The baggage handlers also need to be protected from a too high workload and need to have a good working environment. All people who are working are protected by these so called "Arbo" rules (1C2), but is especially mentioned here, because it could lead to higher costs for remote CI and BD services, as

⁶ This is known from P3 pilot project participation

⁷ This is known from P3 pilot project participation

⁸ This is known from P3 pilot project participation

was seen in the P3 pilot project. This is due to the need for sufficient baggage handlers, loading units and offsite facility facilities (toilets/coffee machine etc.).

Table 6: Baggage handler cooperation and support requirements

In the lightest blue Table 7 below, the requirements for the cooperation and support of the baggage transport operating party are listed. By the airline it is desired that an airline baggage handler is the baggage transport operating party. This is due to the fact that baggage handler know the issues of baggage security and are a trusted partner of the airlines⁹. Also a third party can be the baggage transport operator. This is, for instance, seen in the Vienna City Airport Train (CAT) case. These third parties, also are facilitators of a remote CI and BD service and want to make money if the participate in the service.

Table 7: Baggage transport operator cooperation and support requirements

Nr.	Baggage transport operator cooperation and support requirements
1D1	closing business case (no extra costs)
1D2	logistical feasibility of service

3.2 Passenger usage

In this section, the requirements, related to the "passenger usage" success criterion are discussed. The two main requirements for the passenger usage are, the required increased passenger quality (2A) due to the service and the required volume of the service (2B). If the quality of the service for an individual potential service user is not high enough, this potential service user will not become an actual service user. Furthermore, the goal of Schiphol is to enhance the quality perception of passengers (see chapter1). Also sufficient volume of service is required, because otherwise the goal of terminal capacity pressure relief cannot be achieved (see chapter 1). Furthermore it has become clear that a large volume is needed, in order to lower the price per bag. A lower price per bag will increase the chance of a closing business case, because Schiphol or passengers are then sooner willing to pay¹⁰. The passenger usage requirements are shown in Table 8 below.





Below in the dark red Table 9, the requirements for increasing the passenger quality with the use of a remote CI and BD service are listed. These requirements are derived from Hagen's pyramid of customer needs (see section 2.1.4). The passengers trust in the service (2A1) and a time advantage for the passenger (2A2) due to the service are seen as "need to have's". This is because in Hagen's

⁹ This was known from P3 pilot project participation

¹⁰ This is known from P3 pilot project participation

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Pyramid of customer needs these two requirements are most important for the transportation customer. A service will not be used if these two requirements are not fulfilled. Then the Schiphol goal of this service (the relieving of stress and baggage hassle for the passenger) are formulated in requirement 2A3, the ease a passenger experiences due to the use of the service. This is also seen as a "*need to have*", because it is the very (quality) purpose, Schiphol aims for as indicated in chapter 1. Then, the passenger service comfort (2A4) can be seen as a "*nice to have*". However, a certain comfort standard is needed. It is assumed all forms of transportation discussed in this research are comfortable enough.

Table 9: Increased	l passenger	quality	requirements
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Nr.	Increased passenger quality requirements
2A1	Passenger service trust
2A2	Passenger time advantage
2A3	Passenger service ease
2A4	Passenger service comfort

Below in the (light) red Table 10, the requirements for the volume of service are listed. All requirements listed here are "*need to have*" requirements in order to generate the maximum volume of passengers using the service. Without an area with a large potential group of passengers, the group of the amount of actual users can also not be large (2B1).

Furthermore, a good balance between the price asked from passengers (if a fee is needed) and the quality that can be offered from a location, needs to exist (2B2). If passengers find the price too high for the quality they receive in return, passengers will not use remote CI and BD services.

Also, it is crucial to have a good communication with the passengers. Passengers first need to *know* the service exists and then *who* can make use of the service (2B4). For instance, if only passengers that do not carry overweight baggage are allowed to make use of the service due to a lack of vehicle capacity used for the service, passengers need to know this in advance to avoid passenger disappointment.

If a large volume is to be created, it is also crucial to let large airlines (airlines with a lot of Schiphol departing O/D (Origin/Destination) passengers) participate in the service. And also all types of passengers need to be able to CI and BD at the offsite facility.

Nr.	volume of service requirements
2B1	Location with large potential volume
2B2	Good price/quality ratio
2B3	Large service operational time
2B4	Communication to passenger
2B5	Large participating airlines
2B6	All types of passengers allowed

Table 10: Volume of service requirements

3.3 Check-in and Baggage drop-off functionality

In this section, the requirements that are related to the CI and BD functionality criterion are listed. Below, the (green) table X shows these requirements. The requirements have been derived from the functional departure process described in section 2.1.4. These requirements are all "*need to have's*". Without the facilitation of the functions of CI and BD, a CI and BD service cannot exist.

A computer system with a link to the airline's Departure Control System and with a government link is required (P3 pilot, 2012) (3A). In this way the passenger's "right to fly" and the airline's "authority to carry" the passenger can be verified and confirmed. Furthermore, a weighing device (3B) is needed for the determination of overweight baggage (according to airline specific policy). If overweight is detected, the passengers must be allowed to pay. Therefore a payment device is needed (3C). A label printer is needed to print the label, that needs to be attached to the bag for baggage handling purposes. And a boarding pass printer must also be facilitated (3E). This is shown below in Table 11.

Table 11: Check-in and Baggage drop-off requirements

Nr.	CI & BD functional requirements
3A	Computer system with airline and government link
3B	Weighing device
3C	payment device
3D	label printer
3E	boarding pass printer

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3.4 Availability of space

In this section, the requirements for the availability of space criterion are discussed. Space cannot always be "just" created where it is needed. Space for the offsite facility, the logistical process and space at the airport are all "need to have" requirements (4A, 4B and 4C). Especially space for the offsite facilities can become problematic, if a city centre or train station is considered as the location for the remote CI and BD service. The availability of space requirement are listed below in the (orange) Table 12.

Nr.	Availability of space requirements
4 A	space for offsite facility
4B	space for the logistical process
4C	space at the airport

3.5 Remote Check-in & baggage drop-off most important trade-offs

The most important (and only found) trade-offs derived from the theory and Schiphol's experience stated in chapter 2 have been listed in Table 13 below. The first trade-off, TO1, suggests that if there are no benefits for the airlines to be extracted from participating in a remote CI and BD service it is hard to outweigh the associated cost of remote CI and BD services. The second trade-off, TO2, suggests that it is a challenge to keep the level of service high while keeping costs low. And the third trade-off, TO3, suggests that if passengers are not willing to pay for the service, the costs must be kept low. And the final trade-off, TO4, suggests that if operational costs need to lower, this will mean that the fixed cost will inevitable be higher.

Table 13: Trade-offs

Nr.	trade-offs
T01	benefits for airlines should outweigh costs
TO2	level of service vs costs
тоз	passengers pay vs low costs
TO4	low operational costs vs high fixed costs

The requirements and trade-offs presented in this chapter are used in the design and application of a framework for remote CI and BD service. This framework is discussed in the next part of this Thesis.

Part 2: <u>Framework for remote check-in & baggage</u> <u>drop-off</u>

4. Location feasibility

This chapter will describe one out of the three parts of a framework for remote CI and BD. This framework has the purpose of supporting Schiphol's decision on future remote CI and BD projects. A first step in judging the success of a remote CI and BD service, is to estimate the feasibility of a location, intended for implementation of such a service.

Below, in figure X, the framework part estimating the location feasibility is shown. It consists of 5 steps. Each step is related to one or more requirements from chapter 3. All research done on - and experiences with remote CI and BD services, indicated service cost are the most important reason for a "make" or "break" of a service. Therefore, the first step in 4.1 is to make sure, sufficient potential amount of service users are at the location. Then as was seen in Hagen's pyramid of customer needs, speed of travel is most important (assuming reliability and safety are guaranteed). The amount of estimated service users and the location travel time assessment are then used to estimate the logistical feasibility. With the logistical process determined, an estimation of the space availability and need can be done. Finally, costs per passenger with baggage is considered in step 5 with the help of all the data found in the previous steps. Figure 9 below, shows all steps (blue boxes) and the interrelations between the steps in this framework part. It also shows the link (green boxes) with requirements in chapter 3. The 5 steps are elaborated upon in the sections presented below.



Figure 9: Steps for estimating the location feasibility for remote CI and BD

4.1 Step 1:Estimated amount of potential service users

The first step in judging the feasibility of a location is to find an area which has *many potential* service users. This is important for four reasons related to costs.

- 1. If costs are high, at least the cost/passenger or piece of baggage can be relatively low.
- 2. With a large potential group of service users, the potential terminal capacity pressure relief is also large, which can also lead to quality increase in the terminal.
- 3. If a selection of passenger types, that can make use of the service, has to be made for any reason, the chance of the selected passenger types to consist of a sufficiently large amount of passengers is greater (which is convenient for reasons 1 and 2 above).
- 4. If it is needed to charge service passengers a fee for the service, at least the fee per passenger can be relatively low, so the intention to use the service remains high.

In short, it can be stated, that the *chance* of a "closing business case" is higher, if the offsite facility is located in an area, where much potential users are situated. Then it needs to be determined, how to find out, how much potential service users (and their baggage) are situated in a certain area. For this research, as was indicated in chapter 1, only the departing (non transfer) Schiphol passenger (and their baggage) is considered.

If the amount of potential service users is estimated, it is then important to know, to what extend the requirements for the use of a service (indicated by Hagen's pyramid of customer needs: safety & reliability, speed, ease, comfort and experience), can be determined by assessing a location.

This is done by looking at what kind of transport modes to the airport, already exist from the area/location. Those modes can then be assessed in terms of (safety and) travel time to the airport. Travel time strongly relates to the speed and reliability of a transportation mode. These, as we have seen, determine the use of a service the most. If there is an existing, safe, reliable and fast mode to the airport from that location, it might be possible to integrate with/use for a remote CI and BD service, that mode. Step 2 in section 4.2 will discuss this location travel time assessment, that should be done next.

4.2 Step 2: Location travel time assessment

The second step in judging the feasibility of the location should be to assess the possible travel time advantage, that potential service passengers can gain from that location to the airport. Travel time is related to the speed and reliability of a transportation mode. Reliability is the ability of a system to consistently perform its intended or required function or mission (Wikipedia, 2012). Location travel time assessment of existing modes to the airport is important, because:

- 1. If the total travel time of a possible remote CI and BD service to the airport is higher, compared to other modes that can facilitate some of the same service elements (i.e. car which provides ample room for baggage), passengers are less likely to choose the service.
- 2. If the fastest mode is known, possibilities of integrating a remote CI and BD service with that mode, can be explored.
- 3. If reliability of a mode from the location to the airport is known, the suitability of that mode for a remote CI and BD service can be decided on. For instance, if a certain road to the airport is congested at certain times, service schedule need to take this into account.

This means an assessment of current services and modes from the location to the airport has to be made. The fastest mode should preferably be chosen as the service mode. If this is not possible, it must be made sure, the mode with the (slightly) higher travel time has more service elements offered than the competing mode with the lower travel time. In this way passengers can at least outweigh the relative loss in travel time, with a relative increase in quality due to the presence of extra service elements. But if the time difference is too large, the service elements offered cannot outweigh the loss in time compared to a faster mode.

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For the choice between a car and a train, this "balancing act" has been formulated (also already in section 2.1): "People who wish to cover a long distance can choose whether they travel by car or train, opting for that mode of transportation which they feel offers the best quality in relation to the investment of the three budgets, money, time and effort" (Hagen, 2011). The travel time components of the air traveller, without a remote CI and BD service, are visualized in Figure 10 below:



Figure 10: Travel time components of the air traveller (Goswami, 2011)

The travel time components that are of importance for this step are only T1 - T5. Since the remote CI and BD service also should provide (at least) baggage CI at the offsite location. Preferably a remote CI and BD service is equally fast/faster, than the total travel time (T1-T5), the potential service user used to have.

Now a transport mode and a potential amount of service users (and their baggage) have been determined. It must be determined if both can be combined in a logistically feasible way. This is determined in the next step.

4.3 Step 3: Estimated logistical feasibility

The next step in the determination of the location feasibility is, to estimate if the amount of potential service users and the mode chosen, can be combined in a logistically feasible way. To illustrate, what is meant by logistical feasibility an example is given below.

For instance, if there is a group of one million potential service users per year at a certain location, this roughly comes down to around the 2000 and 3000 passengers a day. This would be around the 83 to 124 passengers per hour. If the fastest travel time (and mode), between the location and the airport would be 10 minutes by train, this would mean that one train would be able to provide a service to the airport twice an hour (including 5 minutes of dwell time at both stations to load and unload passengers and baggage) for all passengers. This would be estimated as feasible.

Another example is given next. For instance, there is an estimate of 6000 passengers/hour, checkingin 5000 pieces of baggage/hour and the fastest way of travel to the airport is travelling via the road in 25 minutes. Furthermore, the maximum capacity of a truck is 100 pieces of baggage and the maximum capacity of a bus is also 100 passengers. This would mean 50 trucks and 60 busses are needed to provide a once per hour service to the airport. 110 vehicles and drivers have to be paid for and in the worst case a passenger must wait for 59 minutes. Other modes to the airport then become faster. This would be unfeasible.

In the above described example, it can be chosen to determine (as an attempt to make the service logistically feasible) the logistical process first, and then estimating how many passengers and baggage can be transported. Looking at the case above, it is stated (i.e.) that 6 busses and 6 trucks providing a twice per hour service, is minimally feasible from a logistics point of view. Than 6 busses of 100 passengers and 6 trucks of 100 pieces of baggage can be dealt with per hour. This means, a decrease of around 5500 passengers and baggage per hour, from the potential amount of service users, is needed to make the service logistically feasible. From the potential service users, a maximum potential "niche" market of 600 passengers/hour can be chosen. However, in order to

finance the service with only 600 passengers/hour might become a problem. It is also possible to alter the transportation mode, instead of trying to determine the logistical feasibility with the same mode. Factors that determine the estimated logistical feasibility are therefore:

- Estimation of the number of passengers and baggage per hour
- Estimation of the vehicle capacity
- Estimation of the amount of vehicle trips per hour
- Estimation of the amount of vehicles needed
- Estimation of the maximum waiting time for passengers

If the service is "tuned" for estimated logistical feasibility and all above indicated elements have been set, the next step in the estimation of the location's feasibility, is the estimation of the amount of space needed for the service. Also the availability of space at the beginning and the end of the service needs to be assessed. This is done in the next step and section.

4.4 Step 4: Estimated need for - and availability of space

The next step in estimating the feasibility of the location is the assessment of the space needed for the offsite facility and the service. Also the availability of the space at the location and at Schiphol must be assessed. If there is no space available/or stakeholders are not willing to accommodate the service, the location will not be feasible. The space elements that need to be assessed are:

- Parking spaces (if busses/trucks are used)
- Availability of space for an offsite facility at location.
- Space for baggage handling process at Schiphol

Looking at Hagen's pyramid of customer needs, it is now estimated what safety (general safety records of the chosen mode), reliability (mode records on trajectory and travel time), speed (mode and travel time) and ease (the availability passenger and baggage check-in at the offsite facility) is set for the service. This is done in an estimated feasible logistical way and the estimation of space has been found sufficient for the service. However, now a cost estimation has to be done. In this way an estimation can be made for the cost per service user or per piece of baggage.

4.5 Step 5: Estimation of service costs

The final step in the estimation of the feasibility of the location for a remote CI and BD service is the estimation of the costs. In step 1 in section 4.1, costs have already been considered. By choosing a location where much potential service users are located, the chance of low costs per baggage or service user is higher. Throughout this chapter, several elements of a potential remote CI and BD service have been discussed. However, as was stated before, most of the costs are associated with the service employees. At this point, only costs for employees needed for the logistical process is known. Previous steps should give clarity on the estimated amount and frequency of transport vehicles needed. Also, previous steps can indicate some elements needed, related to fixed cost. The purpose of this step is not to give an estimation of the exact costs of the service, but merely to judge if costs that can be estimated up to this point, are not already too high for the potential group of service users for a certain location. A list of costs that *could* be known at this point is given below.

- costs per vehicle (if a train is the chosen mode for the service, costs for a completely new train should be taken into account. This is advised, due to the example of the Vienna CAT service. There a complete new train design is used for the service.)
- cost per driver of the vehicle.
- estimated costs for the offsite facility itself.
- Estimated costs for facilitating a smooth baggage handling process (this is very mode dependent) It should also embed costs for adjustments needed at the airport.

Remote check-in and baggage drop-off

These total (intermediate) estimated service costs, can then be divided over the total amount of potential service users per year. Now an indication can be given on what the estimated service cost per service user is, when only one year is considered. To formulate a precise financial construction is not the aim of this step. This step can only estimate a relative costs ratio. What the business case will be in the end, if the service is created should not be decided here. This relative cost ratio can be used in order to choose between multiple remote CI and BD service options.

If the service location, after step 5, is still found to be feasible, the possibilities for a remote CI and BD service should be explored in terms of stakeholders, technology, passenger types and legal issues . Therefore the second part of the framework will discuss these issues.

5. Remote check-in & baggage drop-off location design choices

Once the location has been estimated to be feasible for a remote CI and BD service, location design choices (the second part of the framework) have to be made. These choices are necessary for the design of a remote CI and BD service. The airport should realize that most of these location design choices are interrelated with - and influence service and costs. Before the airport should approach the stakeholders that are associated with these choices, the airport can, with the insights in these choices, decide on what (future) stakeholders to approach best. Making the right combination of choices first, could make the process for the service design more effective. If certain choice options prove not to be possible, the effects on the service design can directly be seen. For the service, cooperation with airlines, handlers and (if applicable) a third party baggage transport operating company is needed. Approaching them, while having decided on these choices, will be discussed in each individual section. 5.1 will discuss combinations of airlines, handlers and Departure Control Systems (DCS's). 5.2 will provide an overview of CI and BD technologies. Furthermore, in section 5.3 types of passengers allowed are considered. Finally, section 5.4 discusses the baggage transport operating party.

5.1 Airlines, Handlers and DCS's

Each airline (85 at Schiphol) is connected to 1 of the 5 handlers (baggage handling companies) operating at Schiphol. The airline contracts these handlers. These handlers provide employees that check-in passengers and their baggage at the airport on behalf of the airline. They also take care of the transportation of baggage from the airport's Baggage Handling System (BHS) to the airplane, and the other way around. The airlines at Schiphol have different systems they use to process an airline's airport management operation. This includes managing the information required for airport check-in and printing boarding cards, cargo load control and aircraft checks (Wikipedia, 2012). These systems are called Departure Control Systems (DCS). At Schiphol around 22 DSC's are used amongst the 85 airlines operating from Schiphol. 1 handler's employees, are therefore able to use several DCS's connected to the airlines they are contracted by.

The key thought behind this section, is the determination of the amount of employees and baggage drop points needed to make the service design as *efficient* as possible. Most efficient would be to make a service where each passenger is able to CI and BD at any desk, irrespective of the airline he/she flies with. This is called a **Common Use** (CU) baggage CI. However, airlines are not willing to participate in CU (yet). Several reasons have been stated for this. First, airlines lose the specific airline branding possibility towards the passenger, associated with a dedicated airline desk. Second, they have to share sensitive data with other airlines/handlers. And third, the integration of this data and the different DSC's will cost money (van der Lee, 2012).

To be able to offer the service to as many passengers as possible without CU, the right airlines should be chosen to participate in the remote CI and BD service. To do this, a best configuration between the airline's and handlers must be made. Furthermore, it is useful to mention, that so called "home carrier" airlines or airlines with a large amount of passengers departing from Schiphol, have more interest in-, and are more willing to invest in a remote CI and BD service. Kenya Airways, for instance, will not so fast invest in a service, operated from P3 at Schiphol. They only have around [###¹¹ O/D (origin - destination) passengers flying to/at Schiphol every year. KLM, EasyYet, Transavia and ArkeFly are the four airlines with the most O/D passengers at Schiphol (Schiphol, 2012). The choice that has to be made for a location where a remote CI and BD is intended, is what airlines will passengers be able to CI (at least their baggage) with. This choice should be based on an estimation of the amount of airline passengers with baggage travelling from that location to Schiphol. If 1 airlines provides for sufficient service users from a location, the service can be set-up in the most effective way. However, if more airlines are needed to enlarge the share of potential service users from a certain location, a careful choice has to be made. Below Table 14 is given, that shows the 4 largest O/D passenger airlines, with their estimated amount of passengers and baggage, DCS and handler (Schiphol, 2012).

¹¹ Number not included due to confidentiality of the data

 Table 14: largest O/D passenger airlines with DCS and Handler

"table not included due to confidentiality of the data".

From this table, it becomes visible, that (in general) the best chance of a cost effective remote CI and BD service without using a CU configuration at the location is to offer passengers, flying with KLM and Transavia, a baggage check-in at a location. These airlines have the greatest share in O/D passengers and baggage (bax/pax is the, by Schiphol, estimated baggage factor), have the same DCS and handler. Another key choice that has to be made, is the type of CI and BD technology that is used in the service. The next chapter will discuss this choice.

5.2 Check-in and Baggage drop-off technology use

A variety of options are available in the area of CI and BD. A choice for CI and BD technology influences service costs and the quality of service. A choice for a technology is a trade-off between fixed costs and operational costs (TO4). An SSDOP costs [$\in \in^{12}$], but requires only 1 employee per 3 SSDOP's and a conventional CI and BD desk costs $\in 2000$, but requires an employee.

Independent of CI and BD technology, the CI and BD elements in the process need to perform their functions. In Appendix A the functional process of CI and BD for the departing passenger (from flight booking to BD) is described. This will provide insight in, what actually happens (and is required for) during booking, passenger CI and baggage BD. This is useful in determining what technologies have to be able to do, in order to fulfil these functions. Below the options for CI and BD are visualized in Figure 11.



Figure 11: Check-in and baggage drop-off technologies

Added to the options visualized in the picture above, are some mobile applications that *could* be used for CI and BD purposes. These are the mobile label printer, the mobile weighing device, the handheld passport scanner and mobile payment device. These functional technologies are visualized in Figure 12 below. These four technologies could be combined in order to fulfil the functions of a BD outside the terminal. However, a connection from these devices to the airline's DCS is, then, required.¹³

¹² Number not included due to confidentiality of the data



Figure 12: Mobile functional check-in and baggage drop-off technologies

As we have seen in the description of the City Airport Train (CAT) in chapter 2, the desk CI and BD is preferred amongst passengers (CAT, 2011). However, airlines are seeking ways to cut down on costs for employees, needed for CI and BD. Also the process time at a CI desk is lowered if passengers have already checked-in themselves and only need to drop their baggage. But even the BD can be done by passengers themselves nowadays. The Self Service Drop-Off Point (SSDOP) is a machine that can be operated by passengers themselves in order to facilitate a BD. A description of the possibilities and process steps of the SSDOP can be found in Appendix C. A Self Service Check-In (SSCI) point is a point where passengers are able to CI themselves, with the use of a valid identification document (i.e. passport).

The choice for a technology, will depend on the trade-offs that will be made between operational costs and fixed cost. Also passengers still appreciate a conventional CI and BD desk best (CAT, 2011). This could also be the basis of a technology choice.

5.3 Types of passengers allowed

Not only different CI and BD technologies can be used, but also different types of passengers can be distinguished. For a remote CI and BD service, choices can be made in allowing several types of passengers to make use of the service. This section discusses these passenger types.

The allowance of certain CI and BD passenger types in the service will influence service cost and service process time. If all types of passengers are allowed at the offsite facility to CI and BD, also all facilities need to be provided. However, it can be beneficial to allow only 1 group of passengers with the same CI and BD *characteristics* in order to optimize the process. This can make the service more efficient. On the other hand, the quality of the service can be increased if passengers with all CI and BD characteristics can make use of the service. Either way, a good communication towards the passenger is required, in order to only make the users *intended* for the service, *actually* use the service. For instance, it can be chosen to only let passengers drop their baggage at the offsite facility. Then, check-in should already have been done at home. It will, however, become hard for Schiphol to estimate how many passengers with specific characteristics would make use of the service.

Six type of passenger categories (that influence the need for technology at the offsite location) can be distinguished using several CI and BD characteristics. Each category (Cat.1 – Cat.6) has its own box, visualized below in Table 15. Passenger characteristics used to form the categories are: home checked-in passengers, passengers with odd-size baggage and passengers with overweight baggage.

Cat.1	Cat.2	Cat.3	Cat.4	Cat.5	Cat.6
All	All passengers,	All passengers,	Only home	Only home	Only home checked-
passengers	except odd-size	except odd-size baggage	checked-in passengers	checked-in passengers	in passengers without overweight
	baggage	and overweight		without odd-	baggage and odd-size
		baggage		size baggage	baggage

Table 15: Types of passengers allowed

Remote check-in and baggage drop-off

Facilities needed, associated with the passenger characteristics are discussed next. For odd-size baggage a separate BD point must be created. The dimension of this BD point should be larger and an extra employee is needed to handle this type of baggage. Also in the transportation to the airport extra space must be created/reserved. Then, policy concerning overweight of baggage is airline specific. Extra payment for extra baggage weight is sometimes required. Therefore, at the offsite facility payment infrastructure should be present, to allow for this passenger characteristic. Passengers often don't know, beforehand, if their baggage is overweight. Therefore, could this be seen as something the airlines require. Furthermore, if passengers are checked-in at home, the process time at the BD point in the offsite facility would be less. Seat assignment can be left out of the process then.

Another passenger characteristic that can be added to the above presented 6 categories is *time* related. Passengers travelling in *airline peak hours* or in non-peak hours, could be distinguished. Depending on the different amount of airlines participating in a remote CI and BD service, it can be more effective to only operate the facility during the busiest hours. However, the service quality is then reduced, because passengers might experience "hassle", if they have to find out when they can make use of the service. This also requires good communication towards the passengers.

A final key choice that can be made in the setting-up of a remote CI and BD service, is to decide who the baggage operating party will be. The final section of this chapter discusses this, more, legal issue.

5.4 Baggage transport operating party

Dependent on the chosen mode of transportation (discussed in chapter 4), it might be already known what the baggage transportation operating party will be. For instance, with the train as chosen mode, the railway company is automatically seen as the baggage transport operating party. However, the airlines still need to be convinced of the capability of the operating party to transport baggage in a safe and secured way. As stated before in chapter 3, the airlines are responsible for baggage from their passengers, from the moment these passengers drop their baggage at an airline's BD point, until the moment these passengers pick-up their baggage at their destination airport. This means that the airline needs to make sure, their baggage after it has been dropped at an airline desk (van der Lee, 2012). While the baggage is being transported, no actual baggage handling is needed. For loading and unloading this, however is needed. But the airline must be sure baggage is not manipulated in any way, while it is being transported.

Normally, the baggage handlers take care of baggage and its transport to the airplane after it has been given at a desk. The airlines trust these handlers with their baggage and fixed contracts exist between the airlines and handlers. The airline, in the normal baggage process, needs to delegate baggage responsibility to only one party. The handler has the liability of the baggage. When a different baggage transport operating party is needed, also an extra party with baggage liability is needed. An extra link in the chain is added and therefore baggage liability becomes more complex to determine for the airline. Handling companies should be approached to also transport the baggage from a remote location, to the airport. However, in an interview with Aviapartner (a Schiphol handler), it became clear that the handlers are not eager to operate outside their airport operating area (Hendriks, 2012). Furthermore, if several airlines with several handlers are opted as remote CI and BD service participants, how will the baggage transport be organized? Which handler will also transport baggage of baggage belonging to another handler? There is a lot of competition between the handlers at Schiphol. They have no cost margins and therefore risks, associated with baggage handling away from the airport, are not easily accepted (Hendriks, 2012). However, handlers should be approach to participate. If they can earn money with it, they are more willing to participate. This leads to trust of baggage handling and will be beneficial for the airline.

Given the issues discussed above, several options (option 1 - 5) visualized in Table 16 exist, when it comes to choosing a baggage transport operating party. The baggage transport should in any case be secure, in order to convince an airline to participate in a remote CI and BD service.

Table 16: Baggage transport operating party options

Option 1	Option 2	Option 3	Option 4	Option 5
1 Schiphol operating Airline handler (also on behalf of other handlers if applicable)	Schiphol Airport handler (BOS) on behalf of other handlers	external transporting company contracted by/cooperation with airport	external transporting company contracted by airline	external transporting company contracted by handler

Part one of this section has provided for a sequential method in deciding on a location's feasibility, taken into account issues related to general service customer needs in an order of importance. The second part of this section has indicated location design choices, that need to be considered when designing a remote CI and BD service. The final part of this section, chapter 6, will apply the framework, discussed in chapters 4 and 5, on the services Schiphol indicated for research.

6. Functional Process

The third part of the framework, decides on the "best" functional process order, to embody a design of a remote CI and BD service in. To decide on what functional process order is best, mainly requirements from chapter 3 are used. First, the functional process elements of a remote CI and BD service are discussed in section 6.1. Here, the functional process elements of the baggage process and the functional process elements of the passenger process are discussed. Then in section 6.2, those functional process elements are combined to construct three functional process elements *order* options. These three options represent all functional process possibilities. From these options one is chosen to be "best" for remote CI and BD services. Then finally, this best option is further elaborated upon and worked out in a detailed functional process.

6.1 Functional process elements

In section 2.1, a definition on remote CI and BD services is given. This definition is the following: *"Airport offsite passenger service facilities provide a variety of services to departing air passengers including baggage check-in, issuance of boarding passes, and transportation to the airport"* (Goswami et al, 2011). This means baggage CI and passenger transportation to the airport's terminal should be provided for.

Functional process elements baggage (bax):

When providing for baggage check-in (**B1**) at the offsite facility, also baggage transportation (**B2**) to the airport must be provided for. Furthermore, it can be chosen to put the baggage directly in a transportation vehicle after it has been "dropped" at the BD point. Or it can be temporarily stored in a temporarily baggage storage room (**B3 optional**). When transporting the baggage to the airport, it must be chosen whether to deliver the baggage directly to the plane, or take it to a point where it can be entered into the Baggage Handling System (BHS) (**B4 optional**). Either way, the baggage must be screened (**B5**) by Explosive Detection Systems (EDS) for bombs, before it enters the plane (**B6**). In Figure 13 below, B1-B6 are presented. The order of these functional process elements of baggage are of no concern yet.

B1	B2	B3(optional!)	B4(optional!)	B5	B6			
Bax "Check-In"	Bax Transport off-terminal	Bax temporary storage off-terminal	Bax BHS entry point	Bax screening	Bax in plane			
Figure 13: Functional process elements baggage								

Functional process elements passenger (pax):

When viewing the passenger's process in a remote CI and BD service, the process from booking until plan embarkation is viewed upon. The difference with the functional baggage process, presented above, is the fact that the functional passenger process has a fixed order. Even if the passenger makes use of a remote CI and BD service, this order is fixed. For instance, it is not possible to CI, if a ticket has not been booked. The passenger's process starts with flight booking (**P1**), then the passenger has to CI him – or herself (**P2**). This can be done at home, or at the offsite facility. A passenger CI in the terminal is not considered here, because a *remote* (off-terminal) CI and BD service functional process design is made. After passenger CI, the passenger has to CI baggage (**P3**). It is assumed that all passengers making use of a remote CI and BD service, all carry at least haul baggage. From the offsite location, passenger transport (**P4**) to the airport is the next functional process step. Whether passenger and baggage are combined in the same transport vehicle is of no concern here. Next, the passenger arrives at the departure hall (**P5**), where he/she can go straight through to security (**P6**), the gate (if approved by security) (**P7**) and into the plane (**P8**). Below, Figure 14 shows this functional process elements for passengers.

P1	P2	P3	P4	P5	P6	P7	P8
fixed first	fixed second	fixed third	fixed fourth	fixed fifth	fixed sixth	fixed seventh	fixed eighth
Booking	Pax Check-In	Bax "Check-In"	Pax Transport off-terminal	Departure Hall arrival	Security	Gate	Pax in plane

Figure 14: Functional process elements passengers

6.2 Functional process elements order option choice

Both the passenger functional process and the baggage functional process are here combined into three options that cover all possible functional process elements orders. However, a fixed order for the first three functional process elements ($P1 \rightarrow P2 \rightarrow P3/B1$), in all three options have to be maintained (see 6.1). This is so, because a passenger must first book his flight before he/she is able to check in him- or herself, which is again required before checking in a person's baggage. The baggage CI functional process element is seen in both the passenger- and the baggage functional process. After P3/B1, only the baggage functional process is considered in the options, because it is assumed that the passengers all go to the transportation vehicle after baggage check-in.

The first option that is presented is called: "*Baggage direct in plane*". The second option is called: "*Screening before BHS entry*" and the third option is called: "*Normal BHS process*". For these options several rules exist. <u>Rule 1</u>: Each option can vary on B2 (baggage transport), after P3/B1 (fixed baggage CI). This means that baggage transport (of some kind) is needed, *after* baggage CI for *each* option. This can, for instance, be done via a (small) moving belt. Then, <u>rule 2</u>: B2 can be put *between* all functional process elements from *there* on. <u>Rule 3</u>: The variable/optional baggage process elements order options are discussed.

Option 1: "Baggage direct in plane"

It can be chosen to transport the baggage directly from the offsite facility to the plane. This means that baggage screening has to be done at the offsite facility, or at the gate of Schiphol's security Restricted Area (SRA). Either way, extra EDS screening devices are required. It can be chosen to make use of a temporary storage room. Figure 15 below, shows the functional process of option1.



Figure 15: Option 1 Baggage direct in plane

Several reasons exist, for *not* choosing this option as the "best" functional process order option. These reasons are listed below:

- The EDS systems are very expensive and will greatly increase total service cost.
- After the offsite screening, the baggage process must be 100% "bomb secured". This will lead to a further increase in costs.
- If a truck is loaded with all kinds of baggage (even from 1 airline), how will the truck driver know, which baggage needs to go in what plane? This will also lead to extra cost.
- The driver needs clearance for SRA (Security Restricted Area). This requires a declaration of good behaviour from the government and a special SRA training (van der Lee)
- The driver and truck need to be checked at the SRA gate. The extra time needed for this, forces, the time a passenger needs to be present at the offsite facility before flight departure, to go up. This decreases service quality.

Remote check-in and baggage drop-off

Option 2: "Screening before BHS entry"

It can be chosen to do the baggage screening at the offsite facility first and enter the baggage in the BHS after. In this way the baggage assignment and transport to the correct planes is provided for. The baggage can skip screening in the BHS, that is normally done there too. Here, it can also be chosen to make use of a temporary baggage storage room. Figure 16 below, shows the functional process order of option 2.

fixed first P1	fixed second P2	fixed third P3/B1	variable fourth B5, B3	<i>fixed fifth B4</i>	fixed sixth B6	
	Dev Cheede In		Bax screening	bax BHS	Den in glang	
Flight Booking	Рах Спеск-In	вах "Спеск-іп"	Bax temporary	entry point	Bax in plane	
			terminal			

Figure 16: Option 2 Screening before BHS entry

Two, out of the five, same reasons from option1 exist for this option, to *not* choose this option as the "best" functional process order option. These reasons are listed below:

- The EDS systems are very expensive and will greatly increase total service cost.
- After the offsite screening, the baggage process must be 100% "bomb secured". This will lead to a further increase in costs.

Option 3: "Normal BHS process"

It can be chosen to maintain all functions of the BHS. Screening, and baggage assignment and transport to the correct planes are left to the BHS process. This is also what happens if baggage is checked in at a terminal CI desk. Here it can also be chosen to make use of a temporary storage room. Figure 17 below, shows the functional process order of option 3.

fixed first	fixed second	fixed third	optional fourth	fixed fifth	fixed sixth	fixed seventh
P1	P2	P3/B1	B3	B4	B5	B6
Flight Booking	Pax Check-In	Bax "Check-In"	Bax temporary storage off- terminal	bax BHS entry point	Bax screening	Bax in plane

Figure 17: Option 3 Normal BHS process

Several reasons exist, counteracting the reasons presented in the other two options, to choose this option as the "best" functional process element order option to embody a remote CI and BD service in. These reasons are listed below:

- Screening is done with existing devices, so no extra fixed costs.
- Baggage security after baggage CI does not have to be "bomb secure".
- Baggage assignment and transport to right planes are provided for from the BHS.

Although, the operation of the BHS will also cost money, this is seen as a fixed variable, because these costs are already paid for by the airlines and handlers in the "harbour costs". One choice, still remains. This is the choice of making use of a temporary storage room or not. For logistical feasibility reasons, it is argued that the use of a temporary storage room after check-in is needed. A temporary baggage storage room, allows for "batch sizing" of the baggage transport vehicle. If no temporary storage room is used, baggage must directly go into a baggage transport vehicle. If the vehicle is full, it can leave immediately, but a next vehicle must directly be available to allow the next pieces of baggage to be checked-in. The temporary storage room, allows for the baggage transport vehicle, to leave at fixed times and allows for baggage to be check-in at all times, without needing to have a baggage transport vehicle directly available when the previous baggage transport vehicle has left. Therefore, it is chosen to make use of a temporary storage room in the functional remote CI and BD process.

6.3 Detailed functional process

With the choice of a high level functional remote CI and BD process, a more detailed functional process can be made. In this way, the service design can be embodied in a detailed design. In the first place, this is needed to estimate the amount-, sort – and functions of *resources* required for a remote CI and BD process. Secondly, this is needed to estimate the amount- ,sort – and functions of *persons* required for a remote CI and BD service. Then, also with the detailed functional process insight can be generated in the amount of "transfer points" that can be expected. Insight in this is useful for determining the security resources and persons of the process. Furthermore, both required resources and persons determine the *costs* of a remote CI and BD service.

The part that is being zoomed in on from the, in 6.2 chosen, functional process, is from the passenger Cl (P2) through to the Baggage BHS entry point (B4). Thus, the sequence that is viewed upon is: $P2 \rightarrow P3/B1 \rightarrow B3 \rightarrow B4$. The flight booking is done by the passengers themselves and is left out of the detailed functional process. Once the baggage is entered into the BHS, the baggage cannot be influenced by the remote Cl and BD service design anymore. Therefore "baggage screening" (B5) and "baggage in plane" (B6) are also left out in the detailed functional process. The detailed functional process is split into three parts, but must be seen as one sequence. The individual parts must be read from left to right, following the several detailed functional process elements order.

The detailed functional process is derived from the remote CI and BD process that was used in the P3 pilot. By looking at it in a functional way, this process can (and should, for security and "Arbo¹⁵" reasons) be applied for most of the remote CI and BD service designs. Since the P3 process was proved to be secure and logistically completely under control (van der Lee, 2012), this functional process can be applied. The 3 process parts with the "Functional process elements", "Detailed functional process elements" and "Baggage action/location" (left in Figure 18, Figure 19 and Figure 20) are discussed and visualised below. For the complete detailed functional design Appendix D must be viewed upon.

Part 1: From "Bag entry" to "Bag storage 1"

Basically, in this part the baggage goes from a BD point to a temporary storage room. The baggage is entered into the "system" at the "Bag Entry" during "Bax check-in". From there on, the baggage needs to be transported with "Bag Transport 1" to the "Temporary storage room", where a transfer "From Bax check-in to temporary storage room" at "Bag transfer point 1" has to be done. Then at the "Temporary storage room", the baggage is stored in "Bag storage 1" Below in Figure 18, part 1 of the detailed functional process is visualized.



Figure 18: Part 1, From "Bag entry" to Bag storage 1"

¹⁵ The "Arbo" rules are rules for the protection of employees. In this case the baggage employees need to be protected from having to carry baggage for long times over long distances. The "Arbo" rules with not be elaborated further on

Remote check-in and baggage drop-off

Part 2: From "Bag transport 2" to "Bag transport 3"

In this part, basically, the baggage is transported from the temporary storage room to a transport vehicle and the transport vehicle is transporting the baggage (to a BHS baggage entry point). The baggage is transported with "Bag Transport 2" to "Bag transfer point 2", where a transfer of baggage takes place at "Bag transfer point 2" transferring the baggage "From temporary storage room to transport vehicle". In the "Transport vehicle" the baggage is stored at Bag Storage 2. Then the baggage is transported with "Bag Transport 3". Below In Figure 19, part 2 is visualised.



Figure 19: Part 2, From "Bag transport 2" to "Bag transport 3"

Part 3: From "Bag transfer point 3" to "bag exit"

In the final part of the detailed functional process, basically, the baggage is transported from the transport vehicle to the BHS. At "*Bag transfer point 3*" the baggage is transferred "*From transport vehicle to BHS entry point*" and the baggage is transported with "*Bag Transport 4*" towards the "*BHS*". Figure 20 below, visualizes the final part of the detailed functional process.



Figure 20: Part 3, From "Bag transport 2" to "Bag transport 3"

For each detailed functional process element, resources and persons are required. These resources and persons are required to execute certain functions, in order for the remote CI and BD process to be *secured*. Furthermore, process person requirements are needed in order for those persons to be able to fulfil their required functions. In Appendix D it can be seen, what the resources, persons, functions and requirements are at for each detailed functional process element and how these are related to the functional process. The functions shown in Appendix D, needed for a remote CI and BD service are derived from the P3 pilot process. These are related to the following requirements in chapter 3: 1A, 1C3, 1C4, 2A1 and 3 and can mainly be translated to make sure a secured and trustful process is guaranteed.

Part 3: <u>Remote Check-in and baggage drop-off service</u> <u>design</u>

7. Framework Application

In this chapter, the framework parts, described in chapters 4 and 5 will be applied. Before applying the framework, first the five services Schiphol has indicated for research on remote CI and BD, will shortly be introduced in section 7.1. Then section 7.2, is devoted to the determination of the amount of baggage, passengers carry with them in general. These general findings in this section are partly used to determine the amount of baggage that can be expected from the five service locations that are being researched. In section 7.3, each of the five services will be appointed to a specific service location. With the introduction of the services, the general baggage determinants and the assigned locations to the services, the framework can now be applied. The service locations are appointed in order to be able to estimate baggage amounts, estimate the logistical feasibility, estimate the availability of- and need for space and estimate the cost (per bag), related to the five services (according to chapter 4).

For the determination of the costs also elements from chapter 6 are used. For instance, the type and amount of resources that are needed can be estimated with the help of chapter 6. Although the detailed design, discussed in chapter 6, is to be applied after the location design choices (from chapter 5) have been made, the cost per bag if *all potential users participate* in the service, are estimated with the help of chapter 6. Then, when the location design choices have been made, the amount of potential users might alter and the detailed design still needs to/can be made. Finally, in section 7.4 the location design choices (from chapter 5) of the locations that are estimated to be *feasible* are being addressed.

7.1 Framework input services

As input for the framework, Schiphol has asked to research five services and its possibilities concerning remote CI and BD. These five services are: A service for *cruise passengers*, a service for *hotel passengers*, a service for *train passengers*, a service for *baggage home pick-up* and a service for passengers parking their car at the *long term parking lot (P3)* at Schiphol. Below these services are visualized in Figure 21.



Figure 21: Services visualization

Furthermore, the visualization suggests the intention to bundle the (remotely handled) baggage streams towards a central point of entry at a terminal at Schiphol. In chapter 6 it is argued to enter baggage in the BHS before screening the baggage and loading the baggage into the plane. Such a central entry point will therefore have to be connected to the BHS. Furthermore, this entry point must be connected to all parts of the BHS to allow for all baggage (needed to be transported to all gates) to be entered there. Such a central entry point can be beneficial, but will depend on the feasibility of the individual services (and their assigned locations). The total amount of baggage, costs and the amount and type of the vehicles used for the (feasible) services, will eventually determine if such a point is beneficial. These elements determine the logistical complexity concerned with the

entry of baggage, the size of the entry point needed and therefore an investment that needs to be done. If the investment in such a point is outweighed by the benefits, such a point is useful. At this point this cannot be determined. After the application of the framework more clarity can be given on this matter. Before the framework is applied, the next section discusses general (baggage) market considerations that are used for applying the framework in section 7.3.

7.2 General baggage considerations

The possible remote baggage drop-off services that are discussed, only involve a service for departing passengers. Arriving passengers need to get a special label at their departing airports, in order to let handlers of the arrival airport know, that their baggage is handled in a different way. If such a service would exist, it would require the simultaneous help of a lot of airports and airlines. For departing passengers, only one airport is involved and a service would be more easy to set up. Furthermore it is assumed, that the added value of being "freed" from baggage earlier, for departing passengers is higher, then for passengers returning from their trip. Stress levels, for passengers starting their trip, are assumed to be higher, then those of passengers returning home. This will not be proven in this research or elaborated on further.

"It is important to understand the potential market for public mode airport access services and the extent to which that market is constrained by the need for multiple bags"(TCRP Report, 2002). To know the amount of baggage that can be expected in the market for remote baggage drop-off is key. Based on this, business cases can be built and remote baggage drop-off services can be created. Therefore, below it is discussed what factors influence the amount of baggage carried on a trip by a passenger. These factors and their percentages are than coupled, to Schiphol specific - and other relevant data on departing passengers in section 7.3.

7.2.1 Air Trip Duration

The amount of baggage, in general, is largely influenced by the *duration* of the trip of passengers. In its turn, the duration of the trip, is largely influenced by the *purpose* of the trip. A distinguishment is made between business and non-business travellers. If one looks at the duration of trips, in Table 17, the following appears:

Duration	Business	Non-Business
0 nights to 3 nights away from home	62,10%	34,60%
4 nights to 6 nights away from home	26,80%	39%
8 or more nights away from home	11,10%	26,30%

Table 17: Duration of airline passenger trips by purpose (American Travel Survey, 2002)

From the table it becomes clear, that when looking at the purpose of the trip, 62% of the business traveller is away for 3 nights or less and 38% of the business traveller is away 4 nights or more. From the business travellers only 11% is away for longer than 1 week. Furthermore, when looking at the leisure travellers, 35% is away 3 nights or less and 66% is away 4 nights or more. From the leisure traveller 26% is away for longer than 1 week. It can be concluded, that the non-business traveller emerges as a major challenge for (off-terminal) baggage handling (TCRP Report, 2002). This is so, because the non-business traveller carries more haul baggage than the business traveller. However, both groups are considered to be equally important for the success of remote CI and BD services. The reason for this is the fact that the non-business traveller could be seen as the supplier of sufficient baggage volume to a remote CI and BD service. And the business traveller can be seen as the group willing to pay more for a service. Therefore, at this point, no reason exists to exclude one of the groups from remote CI and BD services.

Christiaan Noordzij Remote check-in and baggage drop-off 7.2.2 Market by airport ground access mode

In the airport ground access of the total of: 14,7 million departing O/D passengers, there are 4 categories to be distinguished. Departing O/D passengers arrive at the airport by means of a passenger drop-off car (3,9 million, 27%), a parked car (1,8 million, 12%) and other forms of cars (taxi's, rental cars and KLM charter cars: 3,1 million, 20%). Then there is the public transportation category (train and bus), that accounts for 5,9 million (41%) of the departing O/D passengers arriving at the airport (Schiphol Passenger Profile, 2011). This is visualized below in Figure 22.



Figure 22: Departing O/D passengers by pre-transport mode

These percentages are used to estimate the amount of potential departing airplane passengers, that could make use of a remote CI and BD service via a means of transportation. This is useful for estimating the amount of baggage that can be expected for a remote baggage drop-off service. How this is done will be explained in the next section, where the location feasibility of the services discussed in section 7.1, are estimated.

7.3 Estimated location feasibility

Each of the services Schiphol wants to have researched, have to be given a service *location*. Only then it becomes possible to apply the framework. In this section, the service location feasibility will be estimated. It is chosen to research five out of the four services Schiphol has indicated for research. A service for cruise passengers will not be elaborated on.

When considering a service for cruise ship passengers, the Passenger Terminal Amsterdam is chosen as the service location. A detailed research has already been done on the:"Handling of cruise passengers and their baggage from Passenger Terminal Amsterdam to Amsterdam Schiphol Airport"(Leunissen, 2010). This research has already worked out a complete process design for a remote CI and BD service. This research cannot complement on that research. The concept that was developed by Leunissen, facilitated on-board (the cruise ship) CI and a serviced baggage drop-off at Schiphol (Leunissen, 2010). That research was fully dedicated to a PTA (Passenger Terminal Amsterdam) remote CI and BD design. This research provides a general framework and does also give insight in design. However Leunissen did this design in a much more elaborated way. Therefore it is decided not to design another PTA service.

For estimating the total service costs per service location discussed in this chapter, it is chosen to calculate the costs for a conventional CI and BD desk. From chapter 5 it is learned that the technology for CI and BD is to be chosen after the application of the first part of the framework however. This is needed to come to a realistic estimation of the total costs and it is therefore chosen to calculate with a conventional CI and BD desk.

In section 7.3.1 the feasibility of a remote CI and BD service for train passengers is discussed. Section 7.3.2 discusses the feasibility of a P3 parking lot remote CI and BD service. Then section 7.3.3 will

estimate the feasibility of a remote CI and BD service for Hotels. And finally section 7.3.4 will discuss the feasibility of a baggage home pick-up service.

7.3.1 Train service locations

When considering a train service for remote CI and BD, the four major train stations in the Randstad and the central station in Groningen will be compared with the use of the framework (part 1, location feasibility). The train service locations that are being compared are the central stations in the cities of: *Amsterdam, Rotterdam, Den Hague, Utrecht and Groningen*. The comparison of these five cities allows for insight in the influence of: distance, time, speed, cost and the amount of potential departing passengers, on service location feasibility.

The four major train stations in the Randstad are chosen because it is expected that a sufficiently large baggage stream can be expected from those stations to the airport. Therefore the chance of accomplishing the desired quality and capacity gains, Schiphol aims for with the use of remote CI and BD, is thought to be biggest. Groningen is added to the research in order to estimate the effects of distance and costs in combination with the amount of expected baggage, on a train locations feasibility.

To estimate the service location feasibility of the five train stations, the five steps from the framework part in chapter 4 will be walked through. The estimation of the steps for train services is done in the following way:

Step1: amount of potential Schiphol departing O/D passengers

- Foreign business and non- business O/D travellers, with baggage (4 nights or more), by plane to (and from) Schiphol (from: Amsterdam, Rotterdam, Den Hague, Utrecht, Groningen). Added to that the amount of
- Dutch departing O/D Schiphol passengers with baggage (0,8 baggage/passenger) (Amsterdam, Rotterdam, Den Hague, Utrecht and Groningen)

Step2: location travel time assessment:

- Fastest transport mode from stations to the airport is the train.
- Fastest train transport time from locations to Schiphol.

Step3: Estimation of logistical feasibility:

- Frequency of fastest train from the locations to Schiphol.
- Maximum passenger waiting time at different stations (dependant on current frequency of fastest trains from locations to Schiphol).

Step4: Estimation of space availability and need (see section 2.2.4)

- Space for a secured extension of the BHS to a Schiphol train station platform.
- Space for the offsite facility at/close to stations of the locations.
- Space for a secured baggage connection from the offsite facility to the location train platform.

Although the space availability and need is an important factor in the estimation of a locations feasibility, it is chosen to not elaborate on this any further for the train service. This is done because there are too many insecurities and variables concerned with space availability and need for a remote CI and BD train service. Each train station is different, the extension of the BHS to the Schiphol platform can be done in various ways and the secured baggage connection from the small terminal at the station to the train station platform, will depend on the distance of that terminal to the platform.

Step5: Estimation of cost

- Price of train tickets of current fastest trains from locations to Schiphol
- Estimation of service budget, based on amount of passengers with baggage and the current fastest train service price + 10% assumed willingness to pay for the gain in quality due to the service.

Not a cost approach, but an assumed budget approach, based on the willingness to pay is used here. Since it is not know what the construction of a small terminal at a train station costs, what a secured extension of the BHS to a train platform at Schiphol costs and what a train with secured baggage compartment costs, this approach is chosen. From the Vienna case (discussed in section 2.2.4 in the 'short service description') it has become known these elements are however needed to operate a remote CI and BD train service. With the available estimated budget, it is then estimated if this budget will be enough to set-up a remote CI and BD train service. Based on this estimation it will be determined if the service (location) is feasible or not.

Below in Figure 23, a visualization of the remote CI and BD train service and the calculation steps of the estimated amount of baggage is provided. This figure provides a quick view on the most important elements of the service and its most important analysis steps.

In estimating the amount of baggage from each of the five stations to Schiphol, the same approach is used for each station. The city in which the train station is situated is looked upon first. This city analysis, shown in the picture, consists of 4 main steps in coming to the estimated amount of passengers (pax) with baggage (bax). First the total amount of Dutch and foreign O/D departing passengers is estimated. The amount of Dutch departing O/D passengers from each of the cities, could be extracted from Schiphol data. The foreign amount of departing O/D passengers from each city is based on the amount of tourists that visited each city. This data was found at the city BTC's (Bureau for Tourism and Congresses). From this larger group (largest and darkest blue circle), smaller groups (smaller and lighter blue circles) are found with steps 2, 3 and 4. Step 4 represents the estimated amount of expected passengers with baggage for the chosen service location.

This group will travel to the CI and BD point, which is close to or at the train station (green boxes in the figure). It is argued, that the service should at least be as fast as the fastest train travel alternative from each location to Schiphol. From Hagen's pyramid of customer needs (section 2.1.4) it is learned that transport customers will probably use the fastest alternative (if safe and reliable) Therefore these fastest alternatives are used. With these fastest alternatives, a travel time, a maximum passenger waiting time, a frequency and a price is linked.

The baggage and the passengers will be in the same train but separated from each other. This is done because it is assumed no extra train for baggage only will be operated for the service. Also with Vienna's CAT (City Airport Train) passengers and baggage travel with the same train (CAT, 2011). Passengers and baggage can travel with the same train on one condition: the passengers cannot be allowed to somehow get to the baggage in the train, which has already been check-in. Therefore a secured baggage compartment must be present in the train.



Figure 23: Remote check-in and baggage drop-off train service overview

Below in Table 18, the framework (part 1) steps, their outputs and their data sources are presented. The table will provide more detail on the analysis of the train service than the picture shows.

It is assumed that public transportation from all cities, except Amsterdam, can be completely assigned to the train. It is assumed, that travellers from Amsterdam, due to the relatively smaller distance to the airport compared to the other cities, will go for 20% by train. This is around 50% from 41% (public transport travellers to airport: see section 7.2.2.) The outcomes are shown in T1B. In Appendix E, step T1C is further explained.

In the calculation of the logistical feasibility, it has been assumed that 1 train will have sufficient capacity to operate the service twice an hour (Vienna case). Also a fast calculation shows that in the Amsterdam case (with the largest expected amount of potential passengers) on average around 60 passengers per hour (512.974/365/24) can be expected. This comes down to 30 passengers per train trip. Assuming that in peak hours, 5 times more passengers can be expected, 150 passengers can still be transported by one train.In Table 18 below, it can be seen, what the estimated yearly service budget for a remote CI and BD train service from the five cities to Schiphol *can* be. In row T5A of the table, the price for the fastest service to Schiphol + 10% has been given. The added 10% is the assumed price for the quality gain the passengers with baggage are willing to pay for, if the fastest train alternative to Schiphol is chosen.

Remote check-in and baggage drop-off Table 18: Framework steps, train service locations

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step nr	step output	data source/calc.	Amsterdam (Central st.)	Rotterdam (Central St.)	Den Hague (Central St.)	Utrecht (Central st.)	Groningen (Central st.)
T1A	amount of potential schiphol Dutch departing O/D passengers with baggage (*0,8 bax/pax)	Schiphol	1.318.517	450.978	471.594	410.374	108.146
T1B	T1A by train. Assumed 50% from 41% PT from Adam to Schiphol, rest of stations: all PT is assumed train(41%)	Schiphol	263.703	184.901	193.354	168.253	44.340
T1C	amount of potential Schiphol foreign departing O/D passengers with baggage by train	Appendix E	249.271	24.435	23.604	14.649	13.852
T1D	total expected amount of bags by train to Schiphol per year	Calculation (T1B + T1C)	512.974	209.336	216.958	182.902	58.192
T2A	fastest direct transport mode	NS High speed/ OV 9292	Fyra train	Fyra train	intercity train	intercity train	intercity train
T2B	(fixed) travel time fastest direct train to Schiphol	NS High speed/ OV 9292	13 min	26 min	29 min	31 min	152 min
ТЗА	frequency fastest direct train to Schiphol	NS High speed/ OV 9292	2/hr	2/hr	4/hr	4/hr	1/hr
ТЗВ	max. pax waiting time fastest direct train to Schiphol	based on frequency	29 min	29 min	14 min	14min	59 min
T5A	(One way, second class, full tariff) cost per pax with bag for fastest direct train +10 % assumed willingness to pay	NS High speed/ OV 9292	5,50€	16,00€	8,36€	8,70€	28,40€
T5B	total estimated yearly service budget based on assumed willingness to pay	T5A x T1D	2.821.359 €	3.349.376 €	1.813.768 €	1.591.247 €	1.652.648 €

All these train station locations have frequent, fast, reliable and safe train services going to Schiphol. If a remote CI and BD service is set-up at one of more of these stations, the service must at least be as fast or as frequent as the above presented alternatives (rows TB2 and T3A). If, looking at Hagen's pyramid of customer needs, this is not done the quality of the service will be expected to be too low. 63

As a consequence fewer people than needed/expected will use the service. But even when the service is offered with an equally fast and frequent service, the quality gains for passengers is expected to not be enough. Again looking at Hagen's pyramid, the "ease" (no stress, no baggage hassle) will be the next most important factor for transport passengers. This gain in "ease" will cost a lot of money and effort to set-up. Comfort and experience (the least important customer needs) can also slightly be improved. However, Dutch trains are already seen as comfortable.

From Table 18 it can be concluded that the highest expected budget for setting up such a service can be found in Rotterdam. The smallest expected budget is found in Utrecht (T5B). The service is meant for quality and terminal capacity improvements in the short term, until 2018 when the new terminal at Schiphol is expected to become operational. If construction of a service operated from Rotterdam to Schiphol would start now, then in 2 years time it could be operational. This means that from 2014 until 2018, investments in the service need to be justified. The available budget for a Rotterdam service would then be: $€3.349.376 \times 4 = €13.397.504$. This will not even be enough to buy a new train (Profnews, 2010). This will be necessary if also large amounts in comfort and travel experience need to be gained to enhance sufficient quality so passengers are willing to pay for the service. This leads to the conclusion that a remote CI and BD train service will not be (financially) feasible from any of the five locations to Schiphol.

Conclusions train remote CI and BD service:

- The quality gains of such a service are expected to be only in the field of "ease" and CI and BD desk waiting time. It is assumed that passengers are willing to pay 10%, due to this quality gain, on top of the price for the fastest train alternative from the researched stations to Schiphol.
- The expected budget for each of the researched cities and train stations are estimated to be insufficient to set up a remote CI and BD train service.
- If such a service would be made feasible for all potential passengers, 1.180.362 passengers with bags can be expected from these five train stations. And on average the price per bag is estimated to be

7.3.2 P3 service location

For the Schiphol parking passengers, the P3 parking lot is the service location. This P3 service location has been used for testing on-airport remote CI and BD services, by means of a pilot project. Data acquired from this P3 pilot project for the locations feasibility is used here.

When considering the P3 service location, several data advantages exist. Schiphol has much data that is associated with P3, since it is under the ownership of Schiphol Group. In the summer of 2012, a pilot was done in order to test the possibilities of a remote CI and BD service at P3 (see section 2.2.5). The pilot was done with 2 airlines and with limiting opening hours (see Appendix B). This strongly decreased the total amount of potential passengers. This was done to keep the costs as low as possible. This means that there is a trade-off between cost on the one hand and opening hours and amount of potential passengers on the other hand.

This framework part will however take into account all potential passengers. This is done in order to estimate the maximum quality and capacity gains for Schiphol, when operating a remote CI and BD service from P3. The logistical process that is used in the pilot will also be used in the framework, but then adjusted to the total potential amount of passengers. Only the frequency of the trucks (for baggage transport) and the frequency of the busses (for passenger transport) are used from the P3 pilot project. These are seen as the minimum frequency of transport that have to be offered to passengers. The logistical process of P3 is visualized in Appendix F. And due to the fact that passengers, who want to make use of remote CI and BD are required to arrive at P3 already at least 90 minutes before flight departure, the frequency of the trucks transporting the baggage, should not be lowered. If it would be lowered, passengers are required to arrive at P3 earlier than 90 minutes before flight departure. Below the 5 steps from chapter 4 are given and adjusted to the P3 situation:

Step 1: amount of potential Schiphol departing O/D passengers

- Total amount of passengers (and baggage) per year that park at P3

Step 2: location travel time assessment:

- Transport mode = bus for passengers and truck for baggage
- Fastest bus and truck travel time to terminal. These are the same as in the P3 pilot.

Step 3: Estimation of logistical feasibility:

- frequency for passengers and baggage
- # vehicles needed for the amount of potential Schiphol departing O/D passengers and their baggage, determined in step 1
- Maximum passenger waiting time

Step 4: Estimation of space availability and need

- Space for the offsite facility
- Space for entering baggage in BHS
- Parking spaces for busses and trucks

Step 5: Estimation of cost

- With the use of the P3 pilot costs

Figure 24, below will provides a quick view on the most important elements of the P3 service and its most important analysis steps concerned with the estimation of the amount of expected passengers with baggage. Schiphol provided for data on the total amount of potential passengers making use of P3. With the results of the P3 pilot also an estimation can be done on the amount of expected passengers *with baggage*. This step (from 1 to 2) is visualized in the figure with the blue circles. All passengers with baggage arriving at P3 will then be separated from their baggage. Also the transport to the terminal will be done separately. In the old P3 situation passengers dragged their baggage into the shuttle bus, already operating from P3. Since the busses did not have the possibility to also provide a separate baggage room during transport (even not behind the bus for parking space reasons) it was chosen to keep the passenger busses as they where, only now without baggage. This was also done to save costs, not lowering the frequency of the passenger transport (it would take extra time to load baggage into the bus) and fulfil the security requirements for baggage transport. This baggage transport must be able to be sealed somehow.



Figure 24: Remote check-in and baggage drop-off P3 overview

The steps and their passengers and baggage output (calculation/source) is given. The estimated amount of potential passengers and baggage per year is shown in P(parking)1. In P3A a different process trip time for the bus and the truck is shown. This difference exists due to the extra time for (un)loading the baggage into/from the truck. In the P3 pilot two different entry points (departure hall 1 and departure hall 2) were used, now it is assumed one entry point for all baggage can be used. With the frequency indicated in P3C, the maximum amount of passengers and baggage can be calculated and is shown in P3D. Table 19 shown below, provides insight in the passenger calculation of P3D.

P3 bus schedule: every 10 min	0	5	10	15	20	25	30	35	40	45	50	55	0
start times bus 1	0				20				40				0
start times bus 2			10				30				50		
amount of pax/hr 6x50 = 300pax	50		50		50		50		50		50		
P3 bus schedule: every 5 min	0	5	10	15	20	25	30	35	40	45	50	55	0
start times bus 1	0			15			30			45			
start times bus 2		5			20			35			50		
start times bus 3			10			25			40			55	
amount of pax $12x50 = 600$ pax	50	50	50	50	50	50	50	50	50	50	50	50	0

Table 19: P3 passenger service capacity logistics

The busses should leave every 10 minutes and therefore two busses are needed (given the process trip time in Table 21 in row P3A). The green boxes in the table represent 5 minutes of idle bus time. With two busses however, only around 300 passengers can be transported every hour (given the

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capacity in P3B). For a peak hour (assumed to be 5x busier) it is suggested to make use of 3 busses leaving every 5 minutes. In this way 600 passengers can be transported to the terminal. This will be enough for a peak hour. No slack is available however, so for reasons of service robustness a fourth bus can be added. The same line of reasoning is used in determining an appropriate amount and frequency of trucks for the baggage transport operating from P3. Table 20, below will show these.

Table 20: P3	Baggage	service	capacity	logistics
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P3 truck schedule: every 20 min	0	5	10	15	20	25	30	35	40	45	50	55	0
start times truck 1	0				20				40				0
amount of bax/hr 3x72 = 234bax	72				72				72				
P3 truck schedule: every 10 min	0	5	10	15	20	25	30	35	40	45	50	55	0
start times truck 1	0				20				40				0
start times truck 2			10				30				50		
amount of bax/hr 6x72 = 432bax	72		72		72		72		72		72		0

The transportation part of the service is estimated to be logistically feasible during peak hours. The baggage will be put into a smaller (anti theft) loading unit before it is put into the truck. This is done for security and "Arbo" reasons. The "Arbo" rules protect baggage handlers from damaging their body while lifting too heavy baggage for a too long time. It is estimated that 9 pieces of baggage can be put in one smaller loading unit and that 8 smaller loading units can be put in one truck. Below, Figure 25 shows of a loading unit and a truck that was used during the P3 pilot.





Figure 25: P3 pilot truck and loading unit

So 16 smaller loading units are estimated to be needed in peak hours. Again it would be more robust to purchase a couple more, so if loading units are broken the service can continue at maximum capacity. The amount of desks needed in the peak hour is calculated to be 11 in P3K. The waiting times presented in P3L are based on the bus and truck frequency of the peak hour. The waiting times are estimated to be sufficiently short.

The space of the building should be able to accommodate a peak hour. This means 11 desks and space for 48 passengers (every 5 minutes) need to be available. Furthermore parking spaces for 3 busses and 2 trucks need to be available.

Table 21: Framework steps, P3 service location

step nr	step output /source /calculation passengers	P3 Passengers	P3 Baggage	step output /source /calculation baggage
P1	amount of potential passengers per year	[###] ¹⁶	720.000	amount of potential bax from pilot ratio (36.000 bax / 50.000 pax)=72%
P2A	fastest direct transport mode	bus	truck	fastest direct transport mode
P2B	(fixed) travel time fastest direct bus to Schiphol	7 min	7 min	(fixed) travel time fastest direct truck to Schiphol
РЗА	process trip time bus	15 min	20 min	process trip time truck (1 BHS entry point assumed)
РЗВ	capacity bus ¹⁷	50 pax	72 bax	capacity truck (8 loading units x 9 bags)
РЗС	frequency fastest direct bus to Schiphol (as is now)	6/hr	3/hr	frequency truck to Schiphol in P3 pilot
P3D	max bus capacity per hour with P3 pilot frequency(see Table 19)	300 pax	234 bax	max truck capacity per hour (see Table 20)
P3E	estimated amount of pax/hr (=P1/365/24)	115	82	estimated amount of bax/hr (=P1/365/24)
P3F	estimated amount of pax/hr in peak(5 (assumption) x P3E)	575	410	estimated amount of bax/hr in peak (5 (assumption) x P3E)
P3G	frequency fastest direct bus to Schiphol (in peak) (see table X)	12/hr	6/hr	frequency trucks to Schiphol (in peak) (see table Y)
РЗН	max bus capacity per peak hour (see table X)	600 pax	432 bax	max truck capacity per peak hour (see table Y)
P3I	amount of busses needed (in peak hour)	3 busses	2 trucks	amount of trucks needed (in peak hour)
P3J			16	amount of loading units needed (2 x 8)
РЗК			11 desks	amount of desks needed (in peak hr) (1 desk 40bags/hr)
P3L	max. waiting time fastest direct bus to Schiphol in peak	4 min	9 min	maximum baggage storage time until truck loading can commence
P4A	pax space offsite facility needed in peak (per batch of 5 min) P3F/12	48	41	bax space offsite facility needed in peak (per batch of 10 min) P3F/12
P4B	bus parking spaces needed	3	2	truck parking spaces needed

The remote CI and BD service at P3 compared to the existing service will provide passengers a quality gain by not having to drag baggage inside the bus and not standing in a longer waiting line than in the current terminal building. Also if the busses will depart from P3 every 5 minutes in the peak, a 5 minute time gain can be made compared to the off peak frequency.

 ¹⁶ Number not included due to confidentiality of the data
 ¹⁷ This is known from the P3 pilot project participation
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Below is Table 22 for the costs of P3, if all passengers can make use of the service 24 hours a day. These costs are mainly based on P3 pilot data, but are not complete. However it gives insight in most of the elements and size of the costs. The total calculated costs are divided by all potential users, but it is unlikely they will all use the service because not all airlines are likely to participate in the beginning of the service. This is due to the fact that a common use application in not yet accepted by airlines and therefore not implementable at this moment¹⁸. This is also the reason why the estimation of the need for 11 desks will not be correct. If no common use application can be used at each desk, several participating airlines need several desks according to the size of their expected baggage streams. However, with all potential passengers given the possibility to CI and BD at P3, the table below gives a good estimation of the expected costs per passenger with haul baggage.

P5	resources + cost data	cost/year	source/explanation
P5A	parking spaces + offsite facility space	€0	already available
P5B	3 busses and 3 drivers	€0	already operating from P3
P5C	2 trucks (purchase)	€ 150.000	Marktplaats.nl
P5D	2 truck drivers (24 hours a day, €20/hour)	€ 350.400	Cost assumed same as baggage handler
P5E	2 security (24 hours/day, €35/hour)	[€€€]	P3 pilot data
P5F	11 desks (purchase, €2.000)	[€€€]	P3 pilot data
P5G	11 desk employees (24 hours/day, €25/hour)	[€€€]	P3 pilot data
P5H	16 baggage handlers(24 hours a day, €20/hour)	[€€€]	P3 pilot data
P5I	16 anti theft loading units (purchase, €200 apiece)	€ 3.200	Kruizinga.nl
P5J	costs for offsite facility (rental cost P3 pilot per year x 3 (11 desks instead of 4)(Schiphol, 2012)	[€€€] ¹⁹	P3 pilot data
P5K	total estimated cost per (1 st) year	€ 6.531.000	P5A – P5J added
P5L	total estimated cost per P3 passenger with bag	€ 9,1	€6.531.000/720.000 (pax with bax)

Table 22: Framework cost step, P3 service location

With the expected costs per passenger with baggage shown in Table 22 above, sufficient quality must be gained and perceived by the passengers in order for them to be willing to pay for the service. However, it must be noticed that, due to the existence of a frequent, reliable and fast transport mode for passengers (and their baggage) also in this case, not much extra quality can be gained from the service. When looking at the quality monitor results, presented in Appendix I, it is clear that there is a quality gain if the service is used. The perceived shorter waiting time (requirement 2A2) is appreciated with a 12% increase and the ease (requirement 2A3) of the service with a 5% increase compared to the "old" situation. Furthermore, passengers indicate, that with a price of $\xi 2$ per piece of baggage 62% still intends to use the service and with a price of $\xi 3,50$ per piece of baggage only 52% still intends to use the service. Although this intention to use the service if a certain fee would be charged was a very indicative research result, it does indicate that a price of $\xi 9,1$ would be

¹⁸ This is known from the P3 pilot project participation

¹⁹ Numbers not included due confidentiality of the data

impossible to ask of passengers. This is however logical from the perspective of the passenger. Because, the true gains for the passenger will only be a 7 minute bus drive without baggage and a slightly less departure hall desk waiting time.

Even if 9 SSDOP's (9 x [$\in \in e$]²⁰ a piece²¹) are used and costs for 6 desk employees can be saved (5 employees left x24x25x365), still $\in 2.449.000$ is needed for the CI and BD (table, row P5F and P5G). Also an alternative for the baggage transport costs could be sought. Costs for a secured conveyor belt for instance, could replace costs for baggage handlers (table, row P5H), the trucks and truck drivers (table, row P5C and P5D), security personnel (table, row P5E) and the anti theft loading units (table, row P5I). Then $\in 3.920.000$ can be saved in the first year. A conveyor belt (probably under the ground for security reasons) over a distance of 3000 m (assumed not under the runways due to sensitive infrastructure there) is expected to cost a lot more. However a research on this is recommended. For cost reasons described above, it is estimated that a service for P3 passengers will not be feasible.

Conclusion P3 remote CI and BD service

- The €9,1 per passenger with haul baggage will not be paid by passengers for a 12% perceived shorter waiting time and 5% perceived increase in "ease". This means that if the service is set-up for all potential passengers, the stakeholders should pay for most of the costs.
- With the use of SSDOP's or/and the placement of a conveyor belt, it is expected that a service for all potential passengers will not be cheaper.
- The stakeholders must ask themselves, how much cost per passenger is worth paying for, given the relatively minor quality gain per passenger.
- 720.000 passengers with baggage per year are estimated to make use of the departure hall CI and BD if the service can be made feasible for all potential passengers

7.3.3 Hotels Amsterdam and Westcord Fashion Hotel

For a Hotel service, hotels in Amsterdam are viewed upon. Amsterdam has a large expected potential amount of passengers and is not far from Schiphol. For these reasons Amsterdam is chosen as the research location for this service. The transport time to the airport is relatively low and therefore a minimum amount of small vans per hotel will be needed to facilitate a service for sufficient passengers. However it is expected such a service would still have a fairly high price per passenger with baggage. This is due to the fact that an individual hotel is expected to have only a few passengers with baggage (compared to for instance P3) needing to go to Schiphol every year, whilst the minimum resources needed to operate a service (Appendix D) are needed and is therefore expected to be relatively expensive per passenger. Therefore it is chosen to aim the analysis of a possible remote CI and BD hotel service at all 4/5 star hotels in Amsterdam. Here it is assumed passengers/hotel guests are more willing to pay a relatively larger price per bag. Since a hotel has its own unique amount of guest/year, availability of space, connection to the public transport system and distance to the airport, it is also chosen to research the possibilities of a remote CI and BD service at a single 4/5 star hotel. the *WestCord Fashion hotel* is chosen as this individual service location.

To estimate if the WestCord Fashion Hotel in Amsterdam is a feasible location for a remote CI and BD service, the five steps from the framework will be applied. The WestCord Fashion Hotel in Amsterdam has been visited by the author of this report. The most important findings from that visit can be found in Appendix G. Below the five steps from the framework are given and adjusted to the WestCord Hotel situation.

Step1: amount of potential Schiphol departing O/D passengers

Amount of potential passengers with baggage per year.

²⁰ Number not included due to confidentiality of the data

²¹ This is known from P3 pilot project participation

Step2: location travel time assessment:

- Fastest transport mode from hotel to airport.
- Fastest transport time from hotel to Schiphol.

Step3: Estimation of logistical feasibility:

- Frequency of fastest transport mode from hotel to Schiphol.
- # vehicles needed for the amount of estimated baggage, determined in step 1.
- Maximum passenger waiting time and baggage storage time at hotel (dependant on frequency of fastest transport mode from the hotel to the airport).
- Operational hours per day.

Step4: Estimation of space availability and need:

- Estimation of space in hotel lobby for # desks needed
- Estimation of space for transport mode or connection to transport mode used
- Estimated space for loading and unloading of baggage at hotel and at Schiphol
- Estimated space for baggage storage room

Step5: Estimation of cost:

- Estimation of service costs, based on the service costs of a hotel shuttle service research, done in the past.
- Estimation of cost per hotel guest with haul baggage

In Figure 26 below, a visualization is provided of a possible hotel service from Amsterdam hotels to Schiphol. Also the most important steps in the calculation of the amount of potential passengers with baggage are shown in the figure. The fastest means of transportation to the airport, for the WestCord Fashion hotel is a small van (see Table 24). For all other 4/5 star hotels this is not analysed. However, general calculation on the amount of estimated potential passengers from all 4/5 star hotels in Amsterdam are provided for in table X. This will generate a general idea on the average expected costs per 4/5 star hotel in Amsterdam, when operating a remote CI and BD service there. The service van will preferably be for transporting both passengers and baggage. Costs are expected to be too high if only baggage is transported with the van. Furthermore it is also expected that the quality gain from the service for passengers with baggage will be too low if the passengers themselves are not given the opportunity to be transported to the airport with the van too. It will therefore depend on the size of the van if this option is possible. Another remark has to be made concerning the expected amount of passengers that want to be transported to the airport with the van. Since the hotels make use of room check-out times, often hotel guest want to temporary store their baggage. This allows them to comfortably (without baggage) visit Amsterdam until they need to go to the airport to catch their flight. If these passengers are given the opportunity to check-in their baggage at the Hotel, the passengers do not need to return to the hotel, to pick-up their baggage before going to the airport. The time of operation of the service will therefore only be needed during the check-out hours. All baggage can be transported in these hours and for flights departing later then these check-out hours, passengers probably first want to visit a little more of Amsterdam before going to the airport by transport means of their own choice. However for passengers who's flight departure time is in (or just after) the check-out hours, it could be of great value to operate a service for baggage and passengers.



Figure 26: Remote check-in and baggage drop-off Hotel overview

In Table 23, below the calculations for all 4/5 star hotels are shown. H(Hotel)1A – H1E will provide A total amount of expected passengers with baggage in 4/5 star hotels in Amsterdam. The 42% from step H1C is generated as explained in steps H1F –H1I. It was assumed that the amount of beds would be the best estimate in generating a percentage, contributing to the calculation of the amount of expected passengers with baggage in 4/5 star hotels. This however, best represents the amount of passengers that can be expected from a hotel. The hotel occupation rates have not been taken into account for this calculation. But with the multiplication of the percentage, the average occupation rate will not change.

In row H3D it is indicated check-out hours are being used (as was discussed above). At the WestCord Fashion hotel the hours from 7 AM until 12 PM are used. It is assumed all 4/5 star hotels also make use of these check-out hours. Row H3F uses an assumption for the calculation of the amount of baggage during a peak hour. This is set to 5 times more than the average expected amount of bags per check-out hour. This is also consistent with the other services discussed in this chapter. For the estimation of the costs again chapter 6 is used to estimate the resources that are needed to operate a CI and BD service from hotels. A scanning device is not added to the costs. These costs are too small to take into account at this point.

Step	A and E star Hotels in Amsterdam	amount/	amount/		Source /calculation
nr.	4 and 5 star noters in Amsterdam	percentage	percentage		Source/calculation
H1A	All tourists in all accommodations	100%	4.790.909		calculation
H1B	All tourists in hotels	77%	3.689.000		NBTC
H1C	All tourists in 4 or 5 star hotel	42%	1.549.380		see explanation 42%
H1D	All tourists by plane in 4 or 5 star hotel	43%	666.233		NBTC
	All tourists by plane in 4 or 5 star hotel	51%	339 779		NBTC
H1E	with haul baggage (4 nights or longer)	51/0			
H1F	Explanation 42%	hotels	rooms	beds	
H1G	Amount of hotels/rooms/beds	370	21.748	47.692	Dienst OS Adam2009
H1H	Amount of 4 or 5 star hotels/rooms/beds	60	9.809	20.050	Dienst OS Adam2009
H1I	Percentage 4 or 5 star hotels/rooms/beds	16%	45%	42%	calculation
H3A	Estimated peak capacity	amount	unit		Source/calculation
НЗВ	Average expected amount of plane passengers with baggage per 4 or 5 star hotel in 2009	5663	Bags/year		calculation
НЗС	Average expected amount of plane baggage per 4 or 5 star hotel per day	16	Bags/day		calculation
H3D	check-out hours (from 7AM until 12PM)	5	hours/day		WestCord Hotel
H3E	Average expected amount of plane baggage per 4 or 5 star hotel per check-out hour	4	bags/hour		calculation
H3F	Estimated peak amount of leaving plane baggage per day	100	Bags/day		Assumption (H3E x5)
H3G	Estimated peak amount of leaving plane baggage per check-out hour (5x H3E)	20	bags/hour		calculation
H4+5	Resources and cost per 4 or 5 star hotel needed	cost/hour	cost/year		Source/calculation
H4+5	1 common use desk+installation	fixed costs	[€€€]		Schiphol P3 data
H4+5	1 (common use) desk employee (5 hours a day)	€ 25	[€€€]		Schiphol P3 data
H4+5	1 security person (5 hours a day)	€ 35	[€€€]		Schiphol P3 data
H4+5	1 secured storage room for 20 bags maximum	€0	€0		WestCord Hotel
H4+5	2 anti theft loading units (purchase)	fixed costs	€ 400		Kruizinga.nl
H4+5	1 baggage scanner/loading unit mover (5 hours a day)	€ 20	[€€€] ²²		Schiphol P3 data
H4+5	2 vans with 2 drivers per year for 6 hours a day	€0	€ 54.000		WestCord Hotel
H5A	Total expected cost per year per 4 or 5 star Hotel		€ 202.400		H4+5 added
H5B	Total expected handling cost per 4 or 5 star hotel bag		€ 36		202.400/5663

Table 23: Framework steps, Amsterdam 4/5 star hotel service loacation

On average one piece of baggage will cost \leq 36 for a 4/5 star hotel passenger with haul baggage departing from Schiphol. An average taxi trip from Amsterdam to Schiphol will cost around \leq 35 euro (Taxi-e, 2012). Therefore this alternative on average, can be seen as a reasonably good alternative if passenger *and* baggage transport is needed and provided for *and* a choice between a taxi and the hotel service has to be made. However a better estimation can be made when only focussing on 1 hotel. This is done and shown next.

Below in Table 24, the steps (information) source, calculation and output for calculation on the WestCord Fashion Hotel is presented. For the estimation of the amount of baggage that can be expected per year (HW1 in the table) data provided by the WestCord Fashion hotel is used (Evers,

²² Numbers not included due to confidentiality of the data 73

2012). The calculation for this amount of baggage can be found in Appendix K. Step 2 has assessed the travel possibilities from the hotel to Schiphol. 4 travel possibilities and their travel times are presented in the table (HW2A – HW2D). The fastest transport mode is a van, or any road vehicle that can accommodate baggage and passengers.

step nr.	WestCord Fashion Hotel	step output	source/ calculation
HW1	estimated baggage per year	15.334	See Appendix K
HW2A	car/van direct	10 min	OV 9292
HW2B	walk + train + walk	24 min	OV 9292
HW2C	walk + bus + walk	36 min	OV 9292
HW2D	walk + bus + tram + walk	47 min	OV 9292
HW3A	baggage per check-out hour (5hrs from:7AM -12AM)	9 bags/hr	see Appendix H (operational hours)
HW3B	assumed peak capacity	20 bags/hr	assumption
HW3C	Process trip sequence	load-drive- unload-drive	
HW3D	Process trip time (8 min: (un)load)	36 min	Assumption: 8 min and 10 min drive
HW3E	estimated desired frequency	2/hr	assumption 2/hr
HW3F	estimated amount of vans needed	2 vans	not 2/hr with 36 min/van
HW3G	van capacity needed	10 bags/van	2 vans and 20 bags
HW4A	CI desk capacity	[###] ²³	Schiphol
HW4B	amount of desks	1 needed	only 20 bags/hr max
HW4C	parking space at WestCord	2 available	WestCord
HW4D	baggage entry point Schiphol	1 empty desk	only 20 bags/hr
HW4E	parking space Schiphol close to BHS entry	1 needed	only 1 van
HW4F	baggage storage room in hotel at street level	1 for 10 bags	1 room can accommodate 10 bags
HW5A	Estimated cost per Hotel	€ 202.400	Table 23
HW5B	Estimated cost per WestCord pax with bag	€ 13,2	202.400/15.334

Table 24: Framework steps, WestCord Fashion Hotel

In Table 24, above HW3A – HW3F estimate the logistical feasibility. With a service frequency of 2 trips per hour, needing 2 vans that can accommodate 20 pieces of baggage per hour the service is estimated to be logistically feasible from this location. Also the space availability and need are estimated to be feasible. 2 parking spaces are needed for the vans. Again it would be more robust to have a third van standing by, so the service will be reliable in most cases. Also 1 desk is needed and in the lobby of the hotel space for this is available.

This is shown in Figure 27 below. However, if one desk is used all passengers from all airlines must be given the opportunity to CI and BD at that desk (Common Use). Since the amount of baggage that is expected is 20 bags per hour, the baggage entry at Schiphol can be done at an empty desk in the terminal. In the table above no calculations have been done for an estimated peak capacity. This has

²³ Number not included due to confidentiality of the data

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not been done, because in the interview with the General Manager of the WestCord Fashion Hotel that can be found in appendix X, it was said that for only 5 hours a week (on average) a peak capacity is needed. It is assumed that for these hours no extra (2) desk(s) is(/are) desired.



Figure 27:Amsterdam WestCord Fashion Hotel lobby

Behind the reception counter, shown in Figure 27 above, room can be made for the temporary storing of baggage. No extra hotel room needs to be used for this. The total estimated cost per passenger with baggage is estimated to be around the ≤ 13 . This is a very attractive price if passengers and baggage are transported, compared to a taxi trip of ≤ 35 to the airport. However the prices will probably go up, because it is unlikely that all potential passengers will make use of this service. If only baggage is transported with the service, it is not known if passengers are willing to pay this amount. However since this is a 4 star hotel, hotel guest might be willing to pay. This needs to be further researched. The hotel service is so far found feasible, especially when passengers are in need of a combined passenger and baggage transport to the airport.

Conclusions Amsterdam Hotels remote CI and BD services:

- A general estimation of the cost per passenger with bags cannot be upheld for all individual hotels in the same category (4/5 star hotels).
- The willingness to pay will depend on the need for combined baggage and passenger transport. If both are combined, the quality gains are relatively high, mostly because of the lack of direct access to public transportation from hotels. This causes a direct service to the airport to be 14 minutes faster than next fastest alternative. Speed is seen as an important need for transport customers.
- If both baggage and passenger transport can be facilitated during check-out hours, the service is estimated to be feasible.
- 339.779 4/5 star hotel guests with haul baggage are estimated as the potential group for such a service, however only a part of this group (due to flight departure times in or just after check-out hours) is in need of baggage and passenger transport at the same time.
- Further research must be done to find out how big this group is (previous point) and how much hotel guests are willing to pay (how much) for the combined service.
- 15.334 WestCord Fashion hotel guests with haul baggage are estimated as the potential group for such a service. If they all make use of the service, the service costs is estimated to be €13,2 per passenger (with haul baggage).
- Sufficient space is available for the relatively small amount that is required to operate the service.

7.3.4 Home Pick-up Amsterdam

The concept of a home pick-up service, is to pick-up multiple bags at different homes and bring them to a BHS entry point at Schiphol. Furthermore, the concept Schiphol aims for, consists of the following elements:

- The service can be booked in advance via the Schiphol website or by phone.
- The baggage can be picked up *a day in advance* at the latest.
- If the baggage is received by the transporting company, identification and verification of the flight data will take place and the baggage is taken.
- A receipt for the intake of baggage is given to the passenger, the so called claim tag.
- The baggage will be transported in a secure bus and will *directly* be loaded into the baggage handling system at Schiphol.
- The passenger is now able to directly go through to security and customs.

Schiphol has conducted a home pick-up online community research (Schiphol, 2011). In 2011 an online community was set up, to generate passenger insight in this home pick-up service concept.

The results and the research conditions of the online community research can be found in Appendix L. The main outcome, restricting logistics of the service, was the fact that passengers do not want their baggage to be picked-up a day in advance of flying. This requires passengers to be home at the time of pick-up. It will also not allow the passenger to put a toilet bag (with content)), that they want to use the next morning, in the haul baggage.

Mainly because of this, for a home pick-up service, the service location of the *area of Amsterdam* is chosen. Amsterdam is relatively close to the airport. This allows for baggage transport trip times to be relatively low and baggage can be picked-up quite fast on the day of flying. Furthermore, Amsterdam is expected to have a relatively large group of departing airplane passengers to *choose* from, in comparison to other area's in the vicinity of the airport. And a choice for a target group from all the departing passengers need to be made, because the baggage of all passengers in Amsterdam cannot be picked-up by just such a service.

The need for such a service might also exists in cities further away from Schiphol. However, it is assumed that if such a service is offered to passengers, it needs to be offered to a whole "clear" group of passengers. Otherwise communication to the passenger would become hard. For instance the business passengers in Utrecht, or the SkyTeam passengers in Den Hague. It is assumed that these (whole) groups of passengers are too large for the larger distance the transport needs to travel for. A lot of vans/cars are needed to facilitate a service for the whole group on a single day. It is assumed this would cause the service to be too expensive.

Below the steps of the first part of the framework are given and adjusted to home pick-up:

Step1: amount of potential Schiphol Dutch departing O/D passengers

- Amount of potential baggage in Amsterdam

Step2: location travel time assessment

- The total travel time of one small van, to pick-up and deliver one batch (several pieces of baggage together) of baggage.

Step3: Estimation of logistical feasibility

- Frequency of one van
- # vehicles needed for the amount of potential baggage, estimated in step 1
- Pick-up hours related to flight departure times

Step4: Estimation of space availability and need

- Estimation of parking space needed at Schiphol
- Estimated space for unloading of baggage at Schiphol

Christiaan Noordzij Step5: Estimation of cost

-

Costs for the whole service and costs per bag.

In Figure 28 below, a visualization is provided of a possible home pick-up service from Amsterdam homes to Schiphol. Also the most important steps in the calculation of the amount of potential passengers with baggage are shown in the figure. Since it is expected that the service will be quite expensive, the focus group for the home pick-up service will be at all business passengers in Amsterdam. Also because passengers do not want their baggage to be picked up a day in advance, it must be known how many business passengers on average will depart at what time of the day. In the blue circles in the figure this analysis is visualized.

A conceptual difference from the other services discussed in this chapter, is the fact that the CI and BD facilities will come to the passenger instead of the passenger coming to the CI and BD facility. This is also visualized in the figure by means of the arrows pointing towards the city. Also it is chosen to research a service where 1 van picks up bags from 5 homes (this is an estimation of the optimal amount). There is an optimum that exists in choosing the right amount of bags for pick-up and making the most efficient use of the vans. It is not the purpose of this report to find this optimum. However insights and estimations are provided here when such a service needs to be set-up.

The service is meant for baggage pick-up only. No passengers will be transported with the (baggage) vans in the first place. However, if costs are too high a combined passenger – baggage home pick-up service might be much more desirable/feasible.



Figure 28: Remote check-in and baggage drop-off home pick-up overview

For an estimation of the potential amount of baggage, only Dutch departing passengers with baggage, from the agglomeration "Big Amsterdam" are considered. A home pick-up factor for this is calculated for the business and non-business category. Below, in Table 25 this is shown.

Table 25: Home pick-up factors

calculation: 58%*19%*28% *38%	(Big) Amsterdam home pick- up factor: departing business pax with bax	0,0117
<i>calculation:</i> 58%*19%*72% *66%	(Big) Amsterdam home pick- up factor: departing non- business pax with bax	0,0524

How these factors are constructed, can be seen and is also explained in Appendix I. These factors are then used to calculate the amount of potential baggage in (big) Amsterdam. Since passengers don't want their baggage to be picked-up on the day before flying, a Schiphol passenger's departure day pattern is used for further calculations. In this way it can be seen, how many vehicles are needed per departure hour. For these calculations, first an average busy day departure pattern is used. It is

Remote check-in and baggage drop-off

assumed that If a home pick-up service is not feasible on an average busy day, it is also not feasible on a busy day. This is due to the fact that more baggage needs to be handled on a busy day and thus, more, bigger or faster vans are needed. This average busy day pattern, is used in combination with the acquired factors in the table above, to estimate the potential amount of baggage per hour from (big) Amsterdam. The average busy day pattern with baggage from the area of Amsterdam is shown in Table 26, below. A distinction is made between business and non-business passengers.

				# bax		
Schiphol	Schiphol	Schiphol	Schiphol	non –	# bax	# bax
schedule-date	uala: schedule-hour	# flights	0&D nax	Δdam	∆dam	
24-7-2011	4	4	727	37	9	46
24-7-2011	5	18	3.335	172	39	211
24-7-2011	6	22	2.829	146	33	179
24-7-2011	7	27	2.222	115	26	141
24-7-2011	8	23	1.061	55	12	67
24-7-2011	9	53	3.502	181	41	222
24-7-2011	10	49	3.842	198	45	243
24-7-2011	11	26	3.273	169	38	207
24-7-2011	12	50	3.741	193	44	237
24-7-2011	13	35	3.880	200	45	246
24-7-2011	14	48	4.001	206	47	253
24-7-2011	15	31	2.845	147	33	180
24-7-2011	16	44	3.537	182	41	224
24-7-2011	17	39	3.532	182	41	224
24-7-2011	18	18	2.116	109	25	134
24-7-2011	19	28	3.521	182	41	223
24-7-2011	20	62	3.839	198	45	243
24-7-2011	21	44	3.203	165	38	203
24-7-2011	22	10	1.203	62	14	76
24-7-2011	23	3	257	13	3	16
24-7-2011	totals	634	56.466	2956	662	3574

Table 26: Average busy day departure baggage pattern

To facilitate a service for almost 3000 passengers a day, with a peak of 206 bags at 14:00 and every van picking-up 5 bags, a lot of vehicles are needed to facilitate a service for the non-business passenger (see table). Besides this, the non-business passenger is less likely to pay for such a service. And it is expected that such a service is relatively expensive compared to other services. This is likely to be the case, because this service concept is the most decentralised form of CI and BD services offered to passengers. Each home is 1 CI and BD location. Only few people and baggage can be expected from those locations, so the CI and BD facilities (a van in this case) is least efficiently used. Therefore high costs can be expected and for that reason the business passenger is more likely to pay for such a service. Also the amount of business passengers with haul baggage is smaller and therefore more likely to be logistically feasible. For these reasons the business passenger with haul baggage living in Amsterdam is chosen for further research.

First a process trip time needs to be estimated. Below in Table 27 the elements of the total process trip times for morning rush hours (in peak) and normal hours (off-peak) are shown. Per home it is estimated that 5 minutes of process time is needed to CI the bags. Then it is estimated that a 4 minute drive is needed between homes. This requires a "smart" choice of houses close to each other per van. Furthermore, baggage needs to be in the BHS at least 45 minutes prior to flight departure (Schiphol, 2012). In rush hours the maximum time to Schiphol is 45 minutes (Zonneveld, 2010).

location	SH to Adam	home 1	home 2	home 3	home 4	home 5	Adam to SH	in BHS	total
Min. in peak	45	5	9(5+4)	9(5+4)	9(5+4)	9(5+4)	45	45	176
Min. Off-peak	30	5	9(5+4)	9(5+4)	9(5+4)	9(5+4)	30	45	146

With these process trip times and Table 26 the amount of vans needed is estimated. A 20 minute "slack" time is added to each van process trip time. This allows for robustness. The result can be seen below in the Table 28. In de first column the amount of vehicles that can be reused are indicated. First the amount of vehicles is indicated, for instance: 2, and then the hour at which the vehicle is first used is put behind it between brackets (hr4). A vehicle can be reused if the end time (in column 5) is sooner than a start time (in column 4). It is assumed that rush hours are from 7AM until 9AM (fat numbers in the table). FDT, in columns 6, 7 and 8 means Flight Departure Time.

"used" vans needed/ available (from hrX)	new vans needed	process time van (-45 min) with rush hours time	start time vans	end time vans	entry at least 45 min before FDT check	amount of vans needed (5 bags / van) for FDT	FD hour (hrX)	amount of bags for pick-up
0	2(hr4)	1:50:00	01:25AM	03:15AM	0:45	2	04:00AM	9
0	8(hr5)	1:50:00	02:25AM	04:15AM	0:45	8	05:00AM	39
2(hr4)	5(hr6)	1:50:00	03:25AM	05:15AM	0:45	7	06:00AM	33
6(hr5)	0	1:50:00	04:25AM	06:15AM	0:45	6	07:00AM	26
2(hr5), 1(hr6)	0	1:50:00	05:25AM	07:15AM	0:45	3	08:00AM	12
2(hr4), 4(hr6)	3(hr9)	2:20:00	05:55AM	08:15AM	0:45	9	09:00AM	41
6(hr5)	3(hr10)	2:20:00	06:55AM	09:15AM	0:45	9	10:00AM	45
2(hr5), 1(hr6)	5(hr11)	2:20:00	07:55AM	10:15AM	0:45	8	11:00AM	38
2(hr4), 4(hr6), 3(hr5)	0	1:50:00	09:25AM	11:15AM	0:45	9	12:00PM	44
3(hr5), 3(hr9), 3(hr10)	0	1:50:00	10:25AM	12:15PM	0:45	9	13:00PM	45
2(hr5), 1(hr6), 5(hr11), 2(hr4)	0	1:50:00	11:25AM	13:15PM	0:45	10	14:00PM	47
16 vans available	0	1:50:00	12:25PM	14:15PM	0:45	7	15:00PM	33
Estimated total vans + drivers needed	26	On an average busy day						

Table 28: Home pick-up time logistics and amount of vans

As can be seen, the table stops at 15:00PM. At this point in time the service is over its peak (47 bags) and is it assumed that the service can be operated with the amount of vans needed until then. With 26 cars a service for business passengers living in Amsterdam can be logistically feasible.

However parking spaces for these vehicles must be provided for and a single dedicated baggage entry point is preferable. Entering baggage via an empty desk can be done, but for this, smaller loading units are needed to transport the bags from the car to the departure hall desk. The vehicle needs to be suitable for these loading units too.

The costs for 26 vans and 26 drivers operating from 01:25AM (time to start driving for pick-up of 04:00AM departing baggage) until around 22:00PM (estimated time the vehicles are back at Schiphol after having made their final pick-up) every day (21 hours) will be great. It is assumed that each vehicle and driver will only operate half of this time per day (10,5 hours), because they need to take breaks and are not needed all the time. It is assumed that the costs for 1 van with 1 driver per hour,

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is the same as the price for a taxi driver per hour from Amsterdam to Schiphol. The service ,in the end, needs to compete with a taxi service, that can accommodate both passengers and baggage. A one way taxi trip from Amsterdam to Schiphol, is on average €35 (taxi-e, 2012). A one way trip is assumed to be on average around 30 minutes (consistent with the off-peak travel time used for home pick-up calculations above). But since the van driver also needs to travel back, the costs per hour are the same as the taxi costs per 30min. €35 for 30 minutes for 1 van and 1 driver, will lead to an estimated annual cost of €3.487.575 (10,5hrs/day x 365days/yr x 26 vans and drivers x 35€/hr). 662 bags are picked-up with these 26 vans on an average busy day. This means 241.630 bags per year, on average can be expected for the service. This will lead to a cost of €14,43 per home pickedup bag on average, if all business passengers with haul baggage in (big) Amsterdam make use of the service, which is *lower than the taxi costs*. However, the business passenger still needs to take care of his/her own trip to the airport. Since this can be done in various ways (other than taxi) for less than €20 (€35-€14,43) the service is estimated to be feasible so far.

Conclusions Home pick-up CI and BD service:

- A home pick-up CI and BD service can work if baggage can be picked-up on the same day as the flight departure.
- In order to offer the service on the same day as flight departure to a (complete) group of passengers, it is better to choose a location relatively close to the airport, for cost and parking space reasons.
- 241.630 bags per year can be expected if all business passengers in Amsterdam make use of the service. On average this will be around 662 passengers wit haul baggage each day. And a maximum of around 50 bags per hour can be expected on an average busy day.
- €14,43 per bag is estimated if all potential passengers with haul baggage make use of the service.
- Quality benefits can be found in the areas of: ease and CI and BD desk waiting time gains. The ease is translated into the fact that passengers don't need to carry their bags to the airport. And zero waiting time is required for CI and BD.
- 26 parking spaces and a central point of entry for the bags is required at Schiphol. These have not been taken into account for the cost calculations.

7.3.5 General conclusions on location feasibility

The hotel service and the home pick-up service locations are found to be feasible after the application of framework part 1. They are feasible, because the expected quality gains are estimated to be potentially high enough for the estimated prices that have to be paid by the passengers that were chosen as the target group. *The feasibility, basically, is determined by the estimated expected passenger's willingness to pay.* The prices for the remote CI and BD Home pick-up service and the remote CI and BD WestCord service are therefore compared with taxi costs. A taxi provides transport for passengers and baggage. If both services can manage to also provide this combined transport, free passengers from baggage and waiting time in the terminal, and be cheaper than a taxi, they would have great chance of success.

If the passengers are not expected to be willing to pay for the service, it is assumed the service is not feasible. This is concluded for the train- (via a budget line of reasoning) and for the P3 remote CI and BD service. However, due to the biggest capacity gains ,that can be expected from these 2 service locations compared to the other 2 services, the *stakeholders* might decide to pay for it anyway. If they experience enough benefits from the use of a remote CI and BD service, this can be decided.

For the airlines, a benefit would be the offering of, a stress free facility and - travel towards the airport, to their passengers. It cannot be said if passengers will book a ticket with the airline because of the offering of such a service by the airline. Therefore it is unlikely the airlines will pay for the service.

The airport experiences capacity problems in the departure hall in peak hours, as was stated in chapter 1, they are most likely to pay (a part) of these remote CI and BD service costs. The hotel increases its service towards passengers and it more likely, that 4/5 star hotel guests may choose to

book a room in that hotel because of the service. Although this cannot be proven by this research, it is recommended to research this. If this can be proven, the hotel is willing to pay (a part) for the service. In the ideal situation the hotel, the airport and the passenger is willing to pay for the hotel service. For the home pick-up it is hard to tell if the airport is willing to pay for the service, due to the relative low terminal capacity gain that is expected from the service.

Below in Table 29, service locations performances in terms of price, price vs capacity gain (column 4 shows the outcome of: dividing column 2 by column 3), capacity and quality are given. The number 1 rank is seen as the best location (for that column) and the number 4 rank the worst.

individual location	price per pax with bax	amount of estimated pax with bax from location per year	capacity/ price per pax with bax per location	rank: price vs. capacity gain	rank: <u>capacity</u> gain per location per year	rank: estimated biggest <u>quality</u> improvement due to service
P3 parking lot	€ 9,10	720.000	€ 0,00001	1	1	4
WestCord Hotel Amsterdam	€ 13,20	15.334	€ 0,00086	3	4	1
1 Home (pick-up Amsterdam)	€ 14,43	1	€ 14,43	4	2	2
Rotterdam Central station	€ 16,00	209.336	€ 0,00008	2	3	3

Table 29: Service locations performances

What can be concluded from this table is, that if the individual location for remote CI and BD is smaller (less bags per CI and BD point), the price per passenger with a bag is generally higher. So, the more decentralised the remote CI and BD service is offered, the more expensive the price per passenger with bag will be. Also it can be concluded, that the (best) "price vs. capacity" is not sufficient for determining the feasibility of the service. The quality of the service is more important, because that determines the passenger's willingness to pay as was explained in chapter 3. P3 has the lowest expected quality improvement, due to the small distance to the terminal and the already existing fastest bus service. The WestCord Fashion hotel has the biggest quality improvement, due to the possibility of a combined passenger and baggage transport, and the lack of a direct public transportation connection to the airport. This makes the time benefits, due to the use of a direct connection to the airport by van, a large quality improvement for the service.

Furthermore, it can be concluded that the capacity from the individual services cannot be added to estimate the *total* amount of capacity that can be gained from all services. This has to do with the fact that if a passenger does not choose for a home pick-up of his/her bag, he/or she might go by train. This same business passenger is seen as a potential remote CI and BD service location user for (calculations of) both the home pick-up service and the train service in Amsterdam. So there is an overlap in the amount of potential passengers to be expected when adding the amounts.

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7.4 Location design choices

Two services with an *estimated* feasible service location have been extracted from the application of framework part 1 in the previous section. In this section, framework part 2 is applied. The WestCord hotel in Amsterdam and the Amsterdam home pick-up service have an estimated feasible location design if all their potential passengers with baggage make use of the service. These services with associated locations will, in this section be presented with location design choices (chapter 5). These choices are of importance for the success of a remote CI and BD service. The first location design choice: *"Airlines, Handlers, DCS's"* will also take into account the possibility of common use (CU) baggage drop-off. Although the airlines are not yet willing to participate in common use, it is expected that common use will be possible in the near future. This choice is important for the success of remote CI and BD, in order to convince airlines to participate in a remote CI and BD service (see section 5.1).

The second location design choice: "*Technology use*" has influence on the quality of the CI process, BD process, service cost and will determine the possibility of a home pick-up service (see section 5.2). The third location design choice: "*Type of passengers allowed*" has influence on the facilities that are needed at the offsite location, the communication towards passengers that is needed and therefore also determines costs (see section 5.3). The final location design choice: "*Baggage transport operating party*" will assess the liability, baggage responsibility and baggage security related to an airline's trust in a baggage transport operating party. Also a suggestion for a baggage transport vehicle is done here. The WestCord Fashion Hotel location design choices are stated in section 7.4.1 and the Home pick-up location design choices are made in section 7.4.2.

7.4.1 WestCord Fashion Hotel Amsterdam

Airline, handler, DCS choice

Before the choice in the participation of airlines and handlers in a Hotel service is made, first a fundamental difference with the P3 service must be highlighted. At P3 it is known what the airline passenger shares are and how many of those carry haul baggage with them. Furthermore, because of the presence of (mainly) Dutch departing passengers from three (mainly) Dutch airlines at P3, it is justified for those airlines to invest in a remote CI and BD at P3. However, when considering hotels (in general) in the Netherlands, very few Dutch *departing Schiphol* passengers *with baggage* (according to the assumption in this report that passengers start taking haul baggage after a trip duration of 4 nights or more) stay in Dutch hotels. Therefore the Dutch airlines will not experience benefits (if any, from remote CI and BD services in any case) from an investment in a remote CI and BD service from Hotels to Schiphol.

Another problem arises when having to choose airlines, handlers and their DCS's for a remote CI and BD service. The Hotels do not register, which airlines their guest fly with. The WestCord Fashion hotel in Amsterdam does however, register which countries their passengers come from. However, this still remains too vague to state which airlines are flown with, by hotel guests. Therefore, it is needed to conduct a research amongst hotel guests to be able to know what airlines are mainly flown with. If a large group happens to fly with a Dutch airline, this airline might be convinced of the benefits of investing in a remote CI and BD service in the WestCord hotel. Assuming there is an airline willing to invest in a Dutch remote CI and BD hotel service , it is still needed to CI as many passengers as possible with only one CI and BD desk available (see section 7.3.2). The more passengers can be checked-in at the hotel, the lower the price will be. Therefore a common use BD point is desired.

Technology use choice

A normal check –in desk will be used, because no employee reduction is possible from the use of a SSDOP instead of a normal CI and BD desk. Besides this, the SSDOP is $[\notin\notin]^{24}$ more expensive than a conventional desk ²⁵ and people still prefer to make use of a conventional desk (CAT, 2011) Both a SSDOP and a conventional CI and BD desk, need 1 employee in a 1 BD point service configuration. The employee for the SSDOP, has to be present in order to assist passengers with their BD and the employee for the CI and BD desk has to be present to facilitate the CI and BD.

Type of passenger allowed choice

The service has the best chance of success, if passengers *and* baggage can be transported during the check-out hours. For security reasons, the passengers are not allowed to be able to manipulate the baggage in anyway during the transport. This means two separate and secured spaces need to be created in one van. As a consequence it is expected, that little space is expected to be available for odd-size baggage in the vans.

Furthermore, if there is internet available in the hotel rooms of the WestCord Fashion Hotel, the hotel can choose in only facilitating a baggage drop-desk. This would slightly increase the process times at a desk and could be useful in busy times. It must be noticed, that providing a WIFI connection in each hotel room is not the same as providing a computer in each hotel room. A WIFI connection without a computer, will not allow the passenger to CI. Therefore, the Hotel, if they choose to only accept already checked-in passengers, must make sure sufficient computers are available in peak times.

All passengers are allowed, except passengers with odd size baggage. And if the CI and BD desk is too busy in peak hours, the hotel can choose to only accept already checked-in passengers at the BD desk. This is a choice the hotel can make, based on the availability of computers in the hotel.

Baggage transport operating party choice

Any airline approved baggage transporting operating party will do. Preferably a (airline or airport (BOS)) baggage handler, due to the trust and expertise associated with these handlers. Also to be allowed to handle baggage, a baggage handling licence is required²⁶. Baggage handlers, logically, already are in the possession of such a licence. Extra cost for acquiring these licenses can be avoided if baggage handlers are used for baggage transport. But this baggage handler must be willing to, probably, handle CU baggage, or at least baggage from multiple airlines. If they are not willing to do this, a third party baggage and passenger transport operating party must be found. These do need to acquire a baggage handling licence first.

Due to the need for an unmanipulable baggage transport combined with a reasonably comfortable passenger transport to the airport from the hotel, it is advised that the baggage (and passenger) transport operating party makes use of a "bus combination". A suggestion for this, adjusted to the WestCord situation is presented below in Figure 29.

²⁴ Number not included due to confidentiality of the data

²⁵ This is known from the P3 pilot project participation

²⁶ This is known from the P3 pilot project participation



Figure 29: Suggested transport vehicle for a WestCord Fashion Hotel service

Because it is expected not all passengers want to be transported to the airport when they are also checking-out from the hotel and checking-in their baggage at a CI and BD desk in the hotel, it is assumed that 50% of the amount of bags is required in passengers seats. However further research on this will be needed to determine the amount of passenger seats needed per van.

Location design choice conclusion

Only if a common use desk can be used at the hotel and a baggage transport operating party exists that is willing to handle common use baggage, the hotel service is estimated to be feasible. This is estimated to be feasible, because Schiphol intends to implement CU on the short term²⁷. However, no calculations on this are provided by this report. Such calculations require additional data from the hotel guests. It is therefore recommended to do further research in the type of airlines, hotel guest fly with. This should be done in order to be able to know what airlines would be most willing to invest in a remote CI and BD service in this hotel. The location design choices are shown in Table 30, below

WestCord Fashion Hotel Amsterdam remote Check-in and Baggage drop-off design choices						
location design choice 1	location design choice 2	location design choice 3	location design choice 4			
Airlines, Handlers, DCS's	technology use	Passenger type	baggage transport operating party			
CU	Check - in and baggage drop-off desk	All passengers, except odd-size baggage (optional: only checked- in passengers)	Any baggage transport operating party, contracted by either the airport, airline or handler that is willing to handle CU baggage			

Table 30: WestCord Fashion Hotel remote CI and BD design choices

 $^{^{\}rm 27}$ This is known from the P3 pilot project participation 85

7.4.2 Home Pick-up Amsterdam

Airline, handler, DCS choice

With the Amsterdam Home pick-up service, only Dutch departing O/D passengers are considered. This means that home carrier airlines can see benefits in investing in a remote CI and BD service as was stated before. KLM is the biggest airline and "home carrier" flying from Schiphol , with over [###]²⁸ annual Dutch O/D passengers and 6,88 million pieces of baggage on average (see Table 14) Therefore they are opted to participate in a home-pick-up service in Amsterdam. The share of business passengers, visualised in Table 26, becomes smaller , since not all business passengers, but only the KLM business passengers living in Amsterdam can be chosen. KLM, like some airlines, has data on the location of the homes of most of their passengers²⁹. So with the use of specific airline data on the locations of the vans can be optimized. However, the BHS baggage entry at Schiphol will need to be facilitated by means of a landside (without security restrictions of airside) baggage entry point. When the KLM CI and BD terminal desks are all occupied, the possibility of an entry point of baggage is needed. The issue of a landside baggage entry point will be discussed in chapter 8.

Technology use choice

Integration of the items, visualized in Figure 30 below, is needed to perform the required functions of any CI and BD service (see requirements 3A -3E). With the integration of these items is meant, that the label printer and the handheld passport scanner should be connected to the airline's DCS. In this way the passenger's right to fly and the airlines authority to carry passengers can be confirmed on the spot. Furthermore, the mobile paying device should be connected to an airline account and the weight readings from the mobile weighing device should "manually" be read by the driver/baggage handler. If multiple airlines (or one) would take part in such a home pick-up service, it should also be known to the driver/handler what the specific airlines policies are on baggage weight and payments. The driver of the vehicle for a home pick-up service should be a licensed handler, knowledgeable on the airline's policies and functional CI and BD devices. The integration of these systems are not realised yet. Therefore a home pick-up service is not feasible yet. When these systems are connected, the logistical process for home pick up, described earlier, can be executed. However it is then recommended to conduct an airline specific niche market research in order to fine tune this logistical process. Furthermore a GPS driven automatic route finder (i.e.TomTom) should be available in each van, to ensure a time efficient logistical process, toward -, from- and in between homes.



²⁸ Number not included due to confidentiality of the data

²⁹ This is known from the P3 pilot project participations

Remote check-in and baggage drop-off

Furthermore, there are also developments in the printing of baggage labels by the passengers themselves at home. This is called: a "home printed bag tag". Two examples are provided in Figure 31 below.



Figure 31: Home printed baggage labels

It is *optional* and not required to make use of these bag tags. The labels consist of a sheet of paper with a barcode. The sheet of paper needs to be folded in the right way and put in a plastic standardized size cover. This will be the responsible of the passengers themselves. The main benefit of home printed bag-tags is the improved process speed of CI and BD.

Type of passengers allowed choice

The type of passenger that will not be allowed, will be the passenger with oversized baggage. This requires the use of small *trucks* instead of small *vans*. However, if a special home pick-up request for odd size baggage is allowed by the airline and the passenger is willing to pay for this service, it can be done. However, it is not advised by this report. Extra and larger vehicles need to be hired or purchased. The CI and BD of odd-size baggage takes more time at homes. Also there is a decreased availability of temporary parking space in Amsterdam for larger vehicles. And an increase in the amount of unloading space will be needed at Schiphol.

Also for the home pick-up service it is advised to make use of a "combination bus". A bus that combines passenger and baggage transport. If this is done, the quality level of the service is increased and the service is better and cheaper than a taxi. Below, Figure 32 shows a suggested possible home pick-up van. Since the home pick-up vans are estimated to pick-up 5 bags per trip, space for 5 bags and 5 passengers are required.



Figure 32: Suggested transport vehicle for a Home pick-up service

Baggage transport operating party choice

The home pick-up service can be done in an "airline specific" way. This means that each airline can purchase or rent vans to facilitate their airline specific niche markets. Since the drivers of the vans need to be licensed handlers, in order to be able to take in the baggage and check-in the passenger, it is logical to select the, by the airline, contracted handlers for this. As is stated before, the advantages of airline handlers operating the baggage transport are related to trust and liability. The handlers, however, need to be convinced in participating in the home pick-up service. They are not eager to operate a baggage service outside of their SRA operating area (Hendriks, 2012).Common use baggage handling will not be required, if the service is done per individual airline.

Location design choice conclusion

The service is not found feasible, due to the lack of the technical integration of the mobile functional CI and BD devices. However, when this is done, the logistical process estimated and described before, can be used and applied on an airline specific niche market. Then, it should be taken into account that the costs per passenger change, due to a different market size. Also a travel time of 30 and 45 (rush hour) minutes is chosen between Schiphol and anywhere in Amsterdam. In most cases the travel time will be less, so a more precise estimation of the logistical process is required also. Specific airline data on specific niche markets where not available for this report, therefore a more detailed design for a home pick-up service cannot be incorporated. Below in Table 31, the design choices for home pick-up are given.

Table 31: P3 remote CI and BD design choice

P3 remote Check-in and Baggage drop-off design choices						
location design choice 1	location design choice 2	location design choice 3	location design choice 4			
Airlines, Handlers, DCS's	technology use	Passenger type	baggage transport operating party			
Only Passengers from one airline (for instance KLM)	(Integrated)Mobile functional CI and BD devices	All (airline specific) Business passengers in Amsterdam, except odd-size baggage	Airline handler, contracted by the airline			

8. location service design

In this chapter a more detailed design of the expected feasible service locations are considered. Only locations that are determined to be feasible by the framework presented in this report, will be discussed here. The *5 step location feasibility* estimation from chapter 4 (also with help of chapter 6 in estimating costs) and the 4 *location design choices* from chapter 5 have been walked through by *possible* service locations that where determined in chapter 7. Only the WestCord fashion hotel service was found to be feasible. However, a common use application is needed in order to be able to facilitate a service for all passengers from one desk. Logistically this is feasible. The detailed design will be discussed in section 8.1 below.

8.1 WestCord Fashion hotel Service design

The detailed service design of the WestCord Fashion hotel in Amsterdam, is based on the framework for functional process design, presented in chapter 6. In Appendix D, it can be seen what functions and type of resources are needed for each detailed functional process element and process person. The minimum resource/person process is shown in Appendix D and a minimum of 4 employees, including one driver is needed. Since the service, described and estimated before, encompasses 2 vehicles and 2 drivers, this will be a difference from the detailed design presented in Appendix D. Furthermore, the driver will also do the handling activities at Schiphol and therefore needs to be a licensed handler. Below, the detailed functional process elements, associated with the amount and type of resources - and persons needed, and the baggage action/location are shown in Table 32.

high level		Process resource and person quantity	
functional process	Detailed functional	to perform estimated logistical	Baggage action/location
element	process element name	process	element name
	Baa entry	1desk + 1 desk employee	Check-in and baggage drop
$D2 \pm D2/B1$	bugenery		in hotel Johny
12113/01	Developeration of the		
	Baggage Transport 1	2 loading units	Transport from BD point to a
			small baggage loading unit.
	Transfer point 1	1 storage room + handler 1 + label	From baggage drop to
		scanner + sealing device	temporary storage room
B3	Bag storage 1	Handler 1	Temporary storage room
	Bag transport 2	Handler 1	Transport
	Transfer point 2	Handler 1 + 2 drivers + label scanner	From temporary storage
			room to transport vehicle
	Bag storage 2	1 handler + sealing device + label	Transport vehicle
		scanner	
	Bag transport 3	2 driver + 2 vans	Transport
	Transfer point 3	1 handler (= driver) + sealing device	From transport vehicle to
			entry point to BHS
	Bag transport 4	1 handler (= driver)	Transport
	Bag exit	1 handler (= driver) + sealing device +	Baggage Handling System
B4		label scanner	

Table 32: Detailed functional process WestCord hotel

Below in Figure 33, the process and its most important service design elements are visualized. The figure has been composed by combining the outcomes of the application of all framework parts, discussed in the previous chapters. Also pictures of the actual hotel have been used in the figure, to generate a lively understanding of the WestCord Fashion hotel remote CI and BD service environment.

WestCord Fashion Hotel



Figure 33: WestCord Fashion Hotel process visualization

Remote check-in and baggage drop-off

For the entry of baggage into the baggage handling system at Schiphol, for this logistical process and the amount of baggage, it will suffice to drop the baggage at an empty departure hall CI and BD desk. If common use BD is available at the hotel, a special departure hall desk must be chosen where all baggage can be dropped. However, entering baggage at an empty departure hall desk is not desirable, because if the terminal is crowded with passengers, sealed loading units with baggage have to find their way through check-in queues to an empty desk.

Furthermore, since passengers and baggage will be transported in the same vehicle to the airport, the baggage and the passengers are also entering the departure halls at the same time. It is expected, that this will not give a professional feeling in passengers about the service. Passengers who see their baggage being handled in front of their eyes, can get second thoughts on the trust in the process. This was also seen when odd-size baggage was handled in front of passengers in the terminal³⁰.

³⁰ This was known from the P3 pilot project participation 91

9. Roadmap for future of remote CI and BD at Schiphol

To be able to estimate the feasibility of remote CI and BD for Schiphol in the future, a technology roadmap and a Stakeholders roadmap should be addressed. In the area of technology and stakeholders, several issues for future "improvements" have come to light in this report . From a technology point of view, also developments at Schiphol will be viewed upon. However, from this report it has become clear that, only if cost issues can be resolved, concerning remote CI and BD services, such a roadmap for the future will have use. Developments in the field of technology will be discussed in section 9.1 and needed stakeholders developments are discussed in section 9.2.

9.1 Technology roadmap

When considering the entry of baggage into the BHS, it is so far opted to either drop the baggage at an empty CI and BD departure hall desk (option1), or construct a landside (dedicated) entry point for baggage dropped at a remote CI and BD location (option2). A landside entry point is a point where baggage can be dropped in a low security and high accessibility environment. The baggage entered their will then be moved to a high security environment (via a small underground moving belt) were existing EDS's can screen baggage. An airside baggage entry point, by contrast, would have the need for high security screening *at the point of entry*. This means, new ,expensive EDS screening devices need to be purchased to facilitate this high security baggage entry point. Everything that is entering airside, is entering SRA (Security Restricted Area). Everything therefore needs to be checked there.

The first option has the disadvantage of having to drop the baggage at en empty CI and BD desk in the departure hall, that is used for the specific airline's baggage handling. Airlines check-in passengers and their baggage in fixed departure halls. Transavia, for instance, can only handle baggage dropped at a CI and BD desk in departure hall 1, in the baggage cellar of departure hall 1³¹. This means that baggage has to be brought to departure hall 1 for entry into the BHS.

Soon it will be possible, however to drop baggage at any departure hall. This is due to the construction of the so called "**backbone**". The backbone is basically a moving belt system that connects all departure halls with each other. In this way baggage can be dropped at any desk in any departure hall for all airlines³². It is expected that the backbone becomes operational in 2013. Construction of the backbone have already commenced³³.

If the backbone is operational, this is very convenient for the construction of a dedicated landside entry point. Because due to the backbone, any suitable location for the entry point can be chosen. The entry of baggage is not "airline- baggage- cellar- bounded" anymore.

However an investment in such an entry point, can only be justified if sufficient remotely dropped baggage can be guaranteed. At this point only a WestCord Fashion hotel remote CI and BD of service is found feasible and it is not likely to justify such an investment. On the cost of such an entry point no further elaboration will be given.

The hotel service can however only be feasible if common use BD is used at the hotel, as was argued before. Section 9.2 will further discuss this issue of "Common Use" BD, since the stakeholders need to be *willing* to apply a common use configuration.

Finally, a technological development, that is needed for the home pick-up service, will need to consist of the integration of the four functional CI and BD devices, stated in chapter 5. The most important technological development that is meant with this integration, is the connection of the 4 functional (mobile) devices, required to facilitate remote CI and BD (label printer, boarding pass printer, baggage weighing device, payment device) with an airline's DCS. It is recommended to do research in how to connect these 4 functional devices to an airline's DCS

³¹ This was known from the P3 pilot participation

³² This was known from the P3 pilot participation

³³ This was known from the P3 pilot participation

Remote check-in and baggage drop-off

9.2 Stakeholder roadmap

When concerning airlines and the future of remote CI and BD, two things can be mentioned. The first thing that can be mentioned is that it is already technically possible to facilitate a common use BD. The SSDOP in Appendix C, can integrate software of multiple airlines in one device. Airlines, also are able via a SSDOP, to maintain their specific airline branding (Sneekes, 2012) However, for that type of common use BD, the implementation of specific airline software in the SSDOP is expensive for airlines. Common use (CU) at a conventional CI and BD desk is also possible. However, it is not clear which handling party will deliver employees for the common use desks, for such a shared service. A more important reason, for not wanting to participate in a common use CI and BD desk service is the fact that sensitive information about airline passengers and the airlines must be shared with other airlines and handlers³⁴. Airlines do not want this for reasons of losing their competitive advantage towards other airlines. However, it is expected that in 2013 common use desks will be used and tested in the departure halls³⁵.

Now, baggage handlers and the future of remote CI and BD will be addressed. Handlers, as was indicated before, will not be eager to operate (the transport of) a baggage handling service outside of their normal operating area (Hendriks, 2012). This is due to the fact that their core business is not transporting baggage outside their operating area and due to the associated risks with a relatively new way of baggage handling that is associated with remote CI and BD. Also Hendriks indicated that baggage handler do not have much money to invest. This means, that if handlers are to participate in a remote CI and BD service, a closing business case is required. However the P3 pilot has shown that a handling party (BOS) can deliver a secured, reliable and logistically feasible transport from a remote CI and BD locations towards Schiphol's terminal. In the P3 pilot, only 0,4% of the remotely handled baggage was mishandled and only 2 (out of the 36.000) bags did not make it to the plane on time (P3 pilot evaluation, 2012). This was the first step in generating trust with stakeholders in remote CI and BD services. Handlers, therefore, should see remote CI and BD more as a business opportunity instead of a risk away from their operating area.

With the "backbone" and "common use" being (expected to be) implemented in 2013 and with the successful P3 pilot, stakeholders are expected to have a more open attitude towards remote CI and BD. Due to the common use possibility, CI and BD can be done more efficient, which lowers the cost per bag. The backbone will make baggage entry in the BHS easier. However, the (true) participation of these stakeholders in remote CI and BD services will depend on the ability to find a closing business case. If the passengers are not willing to pay for the (complete) cost for a bag at a certain service location, the stakeholders should ask themselves what benefits can be gained at a certain location. The next section will discuss this issue.

³⁴ This was known from the P3 pilot project participation

³⁵ This was known from the P3 pilot project participation

9.3 Services roadmap

Table 29 has, amongst other indications, made clear what the estimated capacity rank, quality rank and price per bag vs. capacity rank of the services would be. This has indicated a best and worst service location for each of the three indicators. Table 33, below, is constructed to (only) visualize these ranks for each of the these three indicators. Why these ranks are given to the locations, is explained before.

individual location	rank: price vs. capacity gain	rank: capacity gain per (city)location per year	rank: estimated biggest quality improvement due to service	
P3 parking lot	1	1	4	
WestCord Hotel Amsterdam	3	4	1	
1 Home (pick-up) Amsterdam	4	2	2	
Rotterdam Central station	2	3	3	

Table 33: Individual location performance ranks

If all technologies (CU in 2013, backbone in 2013 and connecting 4 devices to DCS) discussed in section 9.1.1, can be used and the stakeholders are willing to participate, all services can be operated at maximum efficiency. If Schiphol and other stakeholders decide to continue with the use of remote CI and BD, it is advised to: either continue with a service that has the best rank in expected capacity, or continue with a service that has the best rank in expected quality.

The service with the expected best quality is the WestCord Hotel service (see table above). However, the expected capacity that can be gained from 4/5 star hotels in Amsterdam is lowest. But the chance of a closing business case for a Amsterdam hotel service is biggest, because passengers are more willing to pay for the high quality gain that is expected, due to the service, as was elaborated upon before. All capacity won in the departure halls will be welcome and if the chance of a closing business case is likely, a remote CI and BD service pilot (to start with) at the WestCord Fashion hotel is recommended. Also the hotels are, under the condition of a closing business case, most likely to participate. The WestCord hotel is eager on increasing the level of service towards their customers, since this will distinguish the WestCord hotel from other hotels (Evers, 2012).

The service with the expected best terminal capacity gain is the P3 service. However, this service has the lowest expected quality gain per passenger. Still, due to the relatively substantial terminal capacity gain, the airport can decide to expand and/or continue to operate a P3 service as was done in the pilot this summer. For P3 the remote CI and BD service is a unique selling point. The parking competition at and around schiphol is large and with the same parking tariffs, P3 is likely to attract more parking passengers. Therefore it is recommended to investigate, if the general parking fees can be increased such, that the intention to park at P3 will not drop.

However, still, if the airport is not willing to pay for (most of) the service costs, it is expected to be hard to continue such a service. Airlines and handlers do not experience the benefits that are required in order for them to be willing to share costs for the P3 service, as was argued before. Therefore it is recommended to research the following : What is the departure hall capacity gain due to the P3 remote CI and BD service worth for Schiphol?

10. Conclusions & Recommendations

In the past several remote check-in and baggage drop-off service have been initiated by Schiphol. In the summer of 2012 again a pilot project on remote check-in and baggage drop-off was done at the long term parking lot of Schiphol P3. Schiphol has not yet succeeded in successfully implementing a remote check-in (CI) and baggage drop-off (BD) service for the long term.

10.1 Conclusions

Therefore this research was initiated to answer the following question:

"How and on which locations can Schiphol accommodate remote check-in and baggage drop-off services for passengers and baggage outside the current departure halls, in order to sufficiently answer to the quality need of Schiphol departing passengers and relief sufficient terminal capacity pressure, while satisfying all stakeholders involved "

To be able to answer this question, first the criteria for success of remote CI and BD were formulated. These criteria consist of requirements acquired from: literature research on remote CI and BD, literature research on transport services and customer needs, literature research on the CI and BD functionalities and documented Schiphol experiences with remote CI and BD. Also a visit to Vienna's City Airport Train (CAT) has led to the forming of requirements. With these success criteria a framework is designed to assess a location's feasibility - and to determine a "best" functional process to accommodate a remote CI and BD service. The answer to the main question can be acquired by formulating answers to the sub-questions of this research:

A. What are the most important criteria, to successfully implement remote CI & BD services for Schiphol?

Passenger usage, airline industry cooperation and support, functionality of CI and BD and the availability of space have been identified as the most important criteria.

B. Which locations are feasible for remote CI & BD services and why?

None of the locations that are researched are found feasible *at this moment*. However, if common use can be applied and the mobile CI and BD devices (label printer, passport scanner, boarding pass printer and payment device) can be connected to the airlines DCS, an Amsterdam (WestCord) hotel service (needs common use) and an Amsterdam home pick-up service (needs mobile device connection) can be feasible. However, since the estimated quality gain, due to the lack of a direct public transportation connection, of the WestCord Fashion hotel is expected to be large this location is found feasible. Due to this large quality increase, passengers are more likely to be willing to pay for the service. And if passengers are more willing to pay for the service, the chance of a closing business case is largest. This will lead to the participation of all relevant stakeholders needed for setting-up a remote CI and BD service.

C. What location design choices have to be made in order to be able to come to a remote CI & BD service design?

Choices identified as location design choices are: the choice of the combination between airlines, handlers and their DCS's (departure control systems), the choice of technology use at the offsite facility, the choice of what passenger types are allowed to make use of the service and the choice of the baggage transport operating party. If these choices are made, service design can commence.

D. How does the service design of locations that are suitable for remote check-in and baggage drop-off, look like?

For the answering of this question, a functional process design is made, which has lead to the forming of a best functional process. The best functional process makes use of a temporary baggage storage room, before transportation of baggage and will perform baggage screening in the BHS. This functional process is best, due to the lowest cost and easiest process associated with that functional process

E. What quality and terminal capacity improvements can be expected, when the service designs of the remote CI & BD locations are feasible?

service type	service location	estimated potential amount of passengers with baggage per year (capacity)	Estimated most (1) and least (4) amount of quality gain (/passenger's willingness to pay)
train	Amsterdam central station	513.000	3
train	Rotterdam central station	209.000	3
train	Den Hague central station	217.000	3
train	Utrecht central station	183.000	3
train	Groningen central station	58.000	3
Schiphol parking	Schiphol P3 parking lot	720.000	4
hotel	Amsterdam 4/5 star hotels	334.000	1
hotel	Amsterdam WestCord Fashion Hotel	15.000	1
Home pick-up	Business Home pick-up Amsterdam	242.000	2

Table 34: Estimated quality and capacity gain from service locations when they are feasible

F. What will the future of remote CI & BD services be for Schiphol, when considering technical developments, stakeholder perspectives and the services?

For Schiphol airport, a future for remote CI and BD, apart from the technological and stakeholder perspectives can only exists if closing business cases for these services can be made. For an Amsterdam hotel service, the business case is most likely to be closing. But services for hotels need a common use BD point, which airlines are not willing to participate in yet. However in 2013 common use will be tested.

A home pick-up service, also has a good chance of having a closing business case. However, integration of the 4 mobile devices for check-in and baggage drop-off must be connected to the DCS. A P3 service is not likely to be continued, due to the lack of a closing business case. A train service will be too expensive for the budget that is estimated to be available.

10.2 Recommendations

Here, recommendations are provide for the important stakeholders and for further research.

Recommendations for the important stakeholders

- Investigate the possibilities of a pilot for a remote check-in and baggage drop-off service at a 4/5 star hotel in Amsterdam.
- If it is chosen to do a remote check-in and baggage drop-off hotel service or home pick-up service, make sure the transportation vehicle can accommodate both baggage *and* passengers.
- Discuss with airlines and handlers how and when to make common use baggage drop-off possible as soon as possible.

Recommendations for further research

Although it is concluded that a remote CI and BD is most likely to not be feasible for train services, a P3 service and a home pick-up service, only estimations are done to determine this. Therefore it is recommended to do further research in all 4 services. These are listed below:

Remote check-in and baggage drop-off train services:

- Research, what the train passengers are willing to pay for such a service. Will it be larger than 10% added to the train ticket price, as was assumed in this report? Why is the Vienna CAT a success in terms of costs?

Remote check-in and baggage drop-off P3 service:

- It is only indicated that the passengers intention to use the P3 service will drop by 50%, if a price of €3,50 per bag is asked. This should be research better to give a better estimation of the business case in the future.
- Investigate if the general P3 parking fees can be increased such, that the intention to park at P3 will not drop. This could help to finance (a part of) the remote CI and BD service at P3.
- Investigate what the departure hall capacity gain, due to the P3 remote CI and BD service, is worth for Schiphol.
- Due to the high operational costs, it should be investigated how much a secured conveyor belt from P3 to a BHS entry point would cost.

Remote check-in and baggage drop-off WestCord Fashion hotel service:

- It should be investigated, how many passengers are expected to also need transport to the airport during check-out hours, besides the baggage transport that is also provided for. This will determine the total quality gain and therefore the passengers willingness to pay.
- It should be investigated if passengers are willing to pay €13,2 just for baggage transport to Schiphol
- It should be investigated, what airlines the hotel guest fly with. This allows for a decision on the need for common use check-in and baggage drop-off in the hotel.

Remote check-in and baggage drop-off Home pick-up service:

- Investigate the possibilities for integrating a mobile label printer, a mobile boarding pass printer, a mobile baggage weighing device and a mobile passport scanner. This enables the possibility for a remote check-in and baggage drop-off home pick-up service.

10.3 Reflection

When conducting a research it is never possible to cover all the topics completely. It is therefore useful to reflect upon some data issues. It is good to reflect upon the data that was not available for this research. Airline data is much more specific when it comes down to data about passengers. This data was not available to this research, but could have contributed to the calculations that were done on the amount of business passengers living in Amsterdam. In this way it could have been known what, for instance, the amount of KLM business passengers is.

Furthermore, it was found hard to pinpoint where certain knowledge came from. Due to the fact that I was part of the P3 project team, a lot of knowledge came "along the way". This explains the large number of bottom page references, referring to knowledge acquired during my time participating in the P3 project team.

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Interviews were conducted with:

- Van de Lee, C: Schiphol baggage department
- Sneekes, E: Owner of the SSDOP company
- Hendriks, M: Manager at Aviapartner Baggage Handling
- Evers, N: General Manager WestCord Fashion Hotel Amsterdam

Appendix A: Functional Departure Process Requirements

In the Figure 34 presented below an overview is given of the check-in and baggage drop-off process. Under the presented scheme, the steps 1 - 12 in the scheme are explained in detail (SPT interest group, 2006). The (functional requirements for Check-in and Baggage Drop-off) scheme represents the "departure" part of the so called "Ideal Process Flow". This scheme also includes possible future developments. In the descriptions of the steps this can be seen. However instead of new developments also conventional ways can be used. In this way this scheme can also be used as an overview of the functional requirements of check-in and baggage drop-off (SPT Interest Group, 2006).



Figure 34: Functional departure process

Step 1 ("Booking"): A passenger may book their ticket via a variety of means – travel agent, internet, or directly with the airline. The PNR* data is generated by the reservation system upon confirmation of booking. The passenger provides API** data to the airline. The PNR and API data are automatically transmitted to government authorities. The passenger is responsible for holding/obtaining valid travel documents (passport/visa) prior to departure. The passenger shall complete an automated government authorities' declaration (per regulation) prior to departure. Additional facilitation and services

information is made available to the passenger regarding travel documents, health requirements, airport procedures and services, security regulations and government authority requirements.

*PNR stands for "Passenger Name Record" and contains the following information:

- The name of the passenger(s).
- Contact details for the travel agent or airline office. (The minimum contact information enforced by CRS (Computer Reservation System) policy is typically the 8-digit IATA (International Air Transport Authority) code of the travel agency or airline office, although there is usually at least one phone number as well, most often the agency phone number. Direct customer contact information is rarely required.)
- Ticketing details, either a ticket number or a ticketing time limit.
- Itinerary of at least one segment, which must be the same for all passengers listed.
- Name of the person providing the information. (This is usually entered in a "received from" field and recorded in the "history" or change log attached to the PNR, along with the user and office or agency ID of the airline or travel agency employee creating the PNR or entering the change. The "history" records the "received from" data separately for the initial creation of the PNR and for each subsequent change to it.)
- Most airlines host their PNR databases with a Computer Reservation System (CRS) or Global Distribution System (GDS).

**API stands for "Advanced Passenger Information" and contains the following information:

- Full name (last name, first name, middle name if applicable)
- Gender
- Date of birth
- Nationality
- Country of residence
- Travel document type (normally passport)
- Travel document number (expiry date and country of issue for passport)
- [For US travellers] Address of the first night spent in the US (not required for US nationals, legal permanent residents, or alien residents of the US entering the US)

Step 2 ("Booking"): Upon receipt of the passenger's API data and payment, the airline confirms the travel reservation and issues an e-ticket.

Step 3 ("Booking"): Government authorities receive certain API and PNR data elements at a specified time prior to departure. Government authorities will use this information to perform checks (background, security, immigration, customs, biosecurity, etc.) prior to departure and throughout the journey.

Step 4 ("Check-in"): Note: It is necessary to verify the passenger's identity at least once using a biometric (photograph, fingerprint, iris, etc.) at one of the "Authenticate ID" locations (Box 4, 9) prior to "Boarding". The specific location depends upon the check-in point (traditional, on/off-airport self-service, bag drop, transfer).

The passenger's booking data is retrieved using a machine readable- or e-passport, frequent flyer card, credit card, biometric, bar code, reservation locator, etc. A request to confirm the travel reservation is sent to airlines ("Right to Fly") and to government authorities to validate travel documents ("Authority to Carry"). Once the passenger has checked-in and has authenticated their ID using a biometric (Box 4), they may proceed to either "Drop Bag" (Box 10, with hold baggage), or "Access to Restricted Zone" (Box 15, no hold baggage).

Step 5 ("Check-in"): The airline validates the information (flight reservation, identity, ticket payment status, travel documents, airline no-fly list, etc.), and confirms the passenger's "Right to Fly".

Step 6 ("Check-in"): Using the iAPI data, the government authorities perform checks in real-time to confirm that the passenger is eligible to (a) exit the origin country and (b) arrive at the destination (or

Remote check-in and baggage drop-off

transfer) country. The passenger's identity and the validity of the travel documents are confirmed and a real-time "Authority to Carry" notification is generated by the outbound, transfer, and destination government authorities. The passenger data is sent to the government authorities for risk-based evaluation and streaming of passengers and their bags.

Step 7 ("Check-in"): The airline activates the e-token to facilitate the passenger's movement through the airport, security screening, airline facilities, and boarding of the aircraft. A temporary (or disposable) biometric (photograph, fingerprint, iris) could also be used by the e-token to automate this process.

Step 8 ("Check-in"): The passenger receives the e-token from the airline. The e-token may be received at different locations depending upon the check-in point (traditional, on/off-airport self-service, bag drop, transfer) (Box 9).

Step 9 ("Baggage drop"): If the passenger has checked-in off airport and has baggage to check-in, then the passenger proceeds directly to the "Bag Drop" area to complete "Authenticate ID" using a biometric. The passenger's booking data is retrieved. A request is made to government authorities to validate travel documents and obtain "Authority to Carry".

Step 10 ("Baggage drop"): The passenger places their hold baggage at a bag drop. The passenger confirms the number of bags and their contents. The appropriate number of bag tags is issued by the airline and attached to the baggage. Where available, the passenger can receive the bag tag from a self-service check-in kiosk that they attach to the bags themselves (self-tagging).

Step 11 ("Baggage drop"): Update baggage information for airline and airport processes (e.g. quantity, weight, etc.).

Step 12 ("Baggage drop"): Initial reading of baggage tag. Hold baggage is sorted for hold bag screening and baggage handling purposes.

Appendix B: P3 pilot visualization

"Contents of the Appendix left out due to confidentiality of the data".
Appendix C: Self Service Drop-Off Point

This appendix will explain the workings of the Self Service Drop-Off Point (SSDOP). The process steps, that passengers are required to follow are explained and supported with figures of the SSDOP process step. The SSDOP that is being used now at Schiphol airport is shown here in the Figure 35 below:



Figure 35: SSDOP

The Self Service Drop Off Point (SSDOP) can accommodate a self service bagdrop for passengers in the terminal. With this device in operation, airlines can reduce the amount of personnel behind check-in desks. However the costs for an SSDOP is $[\in \in \in]^{36}$ (Sneekes, 2012). First, when using the SSDOP, Passengers need to scan their passport. Then The SSDOP processes passport data. This passport data is connected to airline and government data. Based on airline and government data a passenger receives a green, orange or a red status. The green status means the passenger is accepted and he/she can proceed with the bagdrop process. A red status means the passenger is not accepted and he/she is not able to participate in the bagdrop process any further. The orange status is given when a person requires an additional check by personnel. When the orange status is given, a signal to personnel is given and the additional check is done.

The SSDOP system is connected to the so called "Timatic" system. This IATA (international air transportation authority) Timatic, is the industry standard used by airlines and travel agents to be compliant with border control rules and regulations (IATA, 2012). The Timatic features are listed below:

- Passport requirements and recommendations
- Visa requirements and recommendations
- Health requirements and recommendations
- Airport tax to be paid by the traveller at either departure or arrival airport
- Customs regulations relating to import/export of goods and small pets by a passenger
- Currency regulations relating to import and export by a passenger.

Timatic is a mainframe application and is accessed via airline reservation or Departure Control Systems (DCS). It can also be accessed by airlines and travel agents via most GDS systems (Global Distribution System). These GDS's are in fact Computer Reservation Systems (CRS).

³⁶ Number not included due to confidentiality of the data

In Figure 36 below the SSDOP interface display and first step of the bagdrop process is shown. **Identification**:



Figure 36: SSDOP identification

When the passenger is cleared, based on all the passenger information and the feedback of the processed information is given to the passenger, the passenger must confirm his flight data as shown in Figure 37 below. **Verification**:

BAGDROP [®] 2 Verification		
Name: Dee Firstaame: Jahn Fiight: BD281 Destrict II: Do Bars Destination: Amsterdam (Schipheil)	=	
Is the above flight data correct?	_	
=		

Figure 37: SSDOP verification

Then the weight of the bag is checked. Not all airlines have the same weight demands. The SSDOP is able to process specific airline parameters. These are incorporated in the SSDOP software. This also allows airlines to keep their specific airline branding. This process step visualization is given below in Figure 38



Figure 38: SSDOP bag acceptance

If the bag has no overweight, a label is printed directly. If the bag has overweight the SSDOP can integrate a payment function in the machine. Then after the passenger has paid, a label is printed. The passenger must then attach the label to the bag as can been seen in Figure 39 below.



Figure 39: SSDOP label attaching

When this is done, the bag can be dropped in the machine and transported to the Baggage Handling System BHS. Finally, a claim tag for the baggage is issued by the SSDOP and additional practical information for the passenger is provided, such as gate number and boarding time. This is shown in Figure 40 below.



Figure 40: SSDOP process finalization

This is the normal process and application as it happens in the terminal building today. The Royal Dutch Airlines (KLM) now have 12 SSDOP's in terminal 2. Together the SSDOP's process 50% of the KLM passengers flow, $[\#\#\#]^{37}$ passengers a month, in that terminal (Sneekes, 2012).

³⁷ Number not included due to confidentiality of the data

Appendix D: Detailed functional process

This appendix explains the detailed functional process that is derived from the P3 pilot process. By viewing that process on a functional level, a detailed functional process could be designed, which can be applied for most of the check-in and baggage drop-off services. Only for a home pick-up service this functional process cannot be applied. The detailed functional process consists of 3 parts. Each part is discussed below. The 3 parts must be seen as a whole detailed functional process. The figure related to part 2 can be put to the right of the figure related to part 1. The figure related to part 3 can be put to the right of the figure 2.

Each figure related to one of the 3 parts, consists of blue elements (top 3 rows) and green elements (bottom 5 rows). The blue elements, left of the black arrows, list the "functional process element" (top), the "detailed functional process element" (second place) and the "baggage action/location" (third place). The green elements (from top to bottom) in each figure related to a part, consist of: "Process resources", "process resources functions", "process persons", "process persons functions" and "process person requirements".

Basically, the figures shows what is minimally needed in order to facilitate a secured and "Arbo" compliant remote check-in and baggage drop-off process. By "Arbo" compliant is meant, that the process takes the realisation into account that baggage handlers are not allowed to carry lots of bags over large distances³⁸. This means for instance that loading units for baggage need to be used. The "Arbo" rules will not be further discussed in this report.

Part 1: From "Bag entry" to "Bag storage 1"

Basically, in this part the baggage goes from a baggage drop (BD) point to a temporary storage room. The baggage is entered into the "system" at the "Bag Entry" during "Bax check-in". From there on, the baggage needs to be transported with "Bag Transport 1" to the "Temporary storage room", where a transfer "From Bax check-in to temporary storage room" at "Bag transfer point 1" has to be done. Then at the "Temporary storage room", the baggage is stored in "Bag storage 1". Part 1 is visualized in Figure 41 below.



Figure 41: From "Bag entry" to "Bag storage 1" with resources and persons

The abbreviations that are used in the figure are now briefly elaborated upon: Computer system (CS), Airline Software (AS), Baggage Weighing Device (BWD), Label Printer (LP), Boarding Pass Printer (BP), Retrieve Booking information (RBI), Authenticate ID (AID), Apply Airline Baggage Policy (AABP), Handle Payment baggage Overweight (HPO), Label Baggage (LB), communicate (comm.).

³⁸ This was known from the P3 pilot project participation

Christiaan Noordzij Remote check-in and baggage drop-off Part 2: From "Bag transport 2" to "bag transport 3"

In this part, basically, the baggage is transported from the temporary storage room to a transport vehicle and the transport vehicle is transporting the baggage (to a BHS baggage entry point). The baggage is transported with "Bag Transport 2" to "Bag transfer point 2", where a transfer of baggage takes place at "Bag transfer point 2" transferring the baggage "From temporary storage room to transport vehicle". In the "Transport vehicle" the baggage is stored at Bag Storage 2. Then the baggage is transported with "Bag Transport 3". Below In Figure 42, part 2 is visualised.



Figure 42: From "Bag transport 2" to ' bag transport 3" with resources and persons

Part 3: From "Bag transfer point 3" to "Bag exit"

In the final part of the detailed functional process, basically, the baggage is transported from the transport vehicle to the BHS. At "*Bag transfer point 3*" the baggage is transferred "*From transport vehicle to BHS entry point*" and the baggage is transported with "*Bag Transport 4*" towards the "*BHS*". Figure 43 below, visualizes the final part of the detailed functional process.



Figure 43: From "Bag transfer point 3" to " Bag exit" with resources and persons

Appendix E: Framework train calculations

Below, Table 35 provides the outcomes and steps (1-8) of the calculations on the amount of passengers with baggage travelling by train to Schiphol from 5 cities in the Netherlands. From the NBTC the amount of hotels guest in the five cities could be extracted. Figures from 2009 are used, because the big research for the determination of all touristic figures in the Netherlands is done every 3 years (NBTC, 2012). Loose number for 2011 and 2012 can be found, but would not be consistent in combination with other numbers that can only be found in the big touristic research from 2009.

Row 1 is the NBTC data on the amount of hotel guests in each of the cities. But since not only hotel guests, but all tourists in all accommodations can go by train all tourists are considered. It was found that in general 77% of the tourists visiting the Netherlands are in hotels. Row 2 then shows all tourists. In 2009, in general 25% of the people visiting the Netherlands were business travellers and 75% non-business travellers. In Table 17 it is shown, that in general 38% of the business travellers carry haul baggage and 68% of the non-business travellers carry haul baggage, due to the fact that they are away for 4 nights or more (assumption). In row 3 the business traveller percentages are used to calculate the amount of business travellers and in row 4 the non-business traveller percentages are used to calculate the amount of non-business travellers.

nr.	Source/calculation	Amsterdam	Rotterdam	Den Hague	Utrecht	Groningen
1	amount of Hotel guests(77%) 2009 (NBTC)	3.689.000	294.000	284.000	141.000	200.000
2	amount of tourists (100%) 2009	4.790.909	381.818	368.831	183.117	259.740
3	Business: 25% (2009) with baggage 38% (≥4 nights)	455.136	36.273	35.039	17.396	24.675
4	Non-business: 75% (2009) with baggage 68%(≥4 nights)	2.443.364	194.727	188.104	93.390	132.468
5	to Schiphol by PT 41% (pax profile 2011) Adam = assumed 20% train, rest 41% train	579.700	94.710	91.489	45.422	64.429
6	by plane to Netherlands 43% 2009(NBTC)	249.271	40.725	39.340	19.532	27.704
7	assumption to Schiphol	100%	60%	60%	75%	50%
8	estimated bags/year to Schiphol airport via train	249.271	24.435	23.604	14.649	13.852

Table 35: Framework train calculations

In Figure 22, it can be seen that 41% of the departing O/D passengers travel by means of public transportation to Schiphol. It is assumed that when travelling to Schiphol from Rotterdam, Den Hague, Utrecht or Groningen 100% of the 41% can be assigned to train travelling. A departing passenger that

needs to travel from Groningen to Schiphol, for instance, is unlikely to take the bus. However, departing passengers that need to travel from Amsterdam to Schiphol are assumed for 50% of 41% to take the train. This is due to the relative substantial shorter distance and the good bus connection from Amsterdam to Schiphol. Row 5 shows the outcomes using these assumptions. Then, the NBTC has stated that in 2009, 43% of all tourists travelled by plain to the Netherlands. Since this was not determined yet, row 6 makes sure this is taken into account. There are more airports in the Netherlands that can be flown from. Therefore it is assumed that when staying in Amsterdam 100% will travel via Schiphol. But from all other cities this percentage is assumed lower. Since Rotterdam and Den Hague have a "Rotterdam – Den Hague airport" it is assumed 60% of the passengers will still travel via Schiphol. More passengers (75%), due to the lack of another airport close by, are assumed to travel from Utrecht to Schiphol. And passengers travelling from Groningen are assumed to depart from Schiphol for 50% due to the larger distance and the presence of German airfields close by. This results in a number, for all foreign departing O/D passengers expected to fly from Schiphol travelling from the five cities in row 8.

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Appendix F: Meeting report Marcel Hendriks

Interview Report Marcel Hendriks – Aviapartner (baggage/ramp handling) 30-01-12

Are there any thoughts at Aviapartner on offsite baggage handling processes? This means the transport of baggage to Schiphol from such an offsite facility and the entry of baggage in the baggage handling system of Schiphol?

-There have not been any thoughts on such offsite baggage handling processes for the future.

-The scope of the handlers at Schiphol are very Schiphol airside and baggage minded.

-Besides that, it would be necessary for such processes to have information on the arrival and departure of passengers. Only the airlines have this data and might not be willing to provide handlers with this data.

Looking at the worldwide trend of the development of such offsite baggage handling processes, would you see a changing role for baggage handlers in the process?

-Only if passengers are able to check-in with "common use" at these locations it might be possible.

-Then all handlers need to be involved in the hiring of an external party (TNT/DHL/?) which transports the baggage of all handlers from the offsite facility to the airport. If one handler would do this, that handler will automatically carry baggage that belongs to other handlers. Therefore it becomes difficult to calculate the exact amount of money each handler should receive. But with the involvement of an external party, afterwards one can see which baggage belongs to which handler and a more easy calculation can be made.

Do you see possibilities to jump in the market of the transportation of baggage from such an offsite facility to the airport?

-In principle the role of the baggage handler is the responsibility of the baggage at Schiphol Group. -The transportation of baggage therefore will be outsourced to an external party.

Under which circumstances will this, from the handlers' point of view, be acceptable?

-First of all the common use check-in is a must.

-Secondly, the killing competition between the five handlers at Schiphol needs to be dealt with.

-Therefore all five handlers need to be involved in the process from the beginning. Because if one handler would start a new business all others will soon follow.

-Furthermore all facilities for offsite baggage handling must be provided by the airport.

What is your opinion on the extra responsibility handlers would get when involved in the transportation of baggage from offsite facilities?

-The responsibility will become more complex, therefore the responsibility will be given to the passengers themselves. I can imagine that passengers need to sign a piece of paper, before handling over the baggage to the party which will then be taking care of the transportation of the baggage.

- It also becomes more complex because the contract validity (time a contract is valid) of several contracts do not match.

-When an external party will be involved they would not have the authority to enter airside (SRA Security Restricted Area) so this could also impose extra complexity.

When would you be willing to invest in the organization of the transportation of baggage from an offsite baggage handling facility, knowing that it must be guaranteed that baggage cannot be manipulated during the transportation?

-The airline must take responsibility in showing/promoting to the passengers that it is safe to deposit baggage at an offsite baggage handling facility.

-The responsibility for the baggage must be with the passengers as much as possible.

-Baggage handling companies have very little to invest. So it is an absolute must, that a valid business case supports the initiative. All handling companies must be involved in this from the beginning.

Appendix G: Process visualization P3 pilot

Below the process (with explanation) visualisation of the P3 pilot project is shown in Figure 44. 10 temporary parking spaces were created so passengers were able to check-in and drop baggage first, before parking the car. Passengers needed to be present at P3 90 minutes prior to flight departure. This would allow the baggage to be entered in the baggage handling system on time, so the baggage would not miss the plane. If the baggage was dropped at one of the 2 airlines (HV = Transvia and OR = ArkeFly) the baggage was put in small dedicated airline loading units. This enabled the baggage of each airline to be entered in the BHS, in the departure hall where that airline's baggage needed to be handled. VH3 is departure hall 3 and VH 1 is departure hall 2. In VH3 ArkeFly baggage was entered via an empty desk and in VH1Transavia baggage was entered via an empty desk. Figure 45, below shows the real life pictures of the same process described above.



Figure 45: P3 pilot process pictures

Appendix H: Meeting report Nico Evers

Below, the findings after a meeting with the General Manager of the Westcord Fashion hotel are presented.

Gesprek Nico Evers 6 september 2012 (General Manager WestCord Fashion Hotel Amsterdam)

Hotel specs:

- 260 kamers
- Gemiddelde bezetting [###]
- Gemiddelde verblijfsduur [###]
- Kamer bezetting gemiddeld [###]³⁹

Typen gasten:

- 40% business (zakelijk individu, zakelijke groep(mini conferentie)
- 60% leisure (leisure groep serie (vaste groepen), leisure request individu (los)
- Focus ligt voornamelijk op business gasten (daar verdienen ze meer geld aan)
- Eigenlijk willen ze [###] business en [###]⁴⁰ leisure. Er valt meer geld aan business te verdienen

Hotel samenwerkingsverbanden:

- Touroperators (vragen een alongement en er zijn prijsafspraken)
- Internet (booking.com etc.)
- Bedrijven (groepsaccomodaties/conferenties)

Geprobeerde service:

- 2x busje, 2x chauffeur
- Van 07:00uur tot 21:00uur moest deze operationeel zijn
- Geraamde kosten op 125.000 euro op jaarbasis
- Getracht samenwerkingsverband met ander hotel op te starten
- Uiteindelijk te duur.

Andere informative:

- Service niveau is onderscheidend voor Hotel
- Extra service voor pax in de vorm van een baggage afgifte punt in het hotel zou daarom goed kunnen werken.
- Voortransport bij dit hotel was veel NL met de auto en de rest met het OV
- Ze verkopen ook OV tickets bij de receptive
- Er zijn verder geen gegevens over het soort maatschappijen waar de hotel gasten mee vliegen
- Wel wordt er bijgehouden uit welk land hotelgasten komen
- Doordeweeks is het meestal tussen 7 en 10 druk
- In de weekenden is het meestal tussen 11-12 druk
- Als bijvoorbeeld de keukenhof open is zit het Hotel vol

³⁹ Numbers not included due to confidentiality of the data

⁴⁰ Numbers not included due to confidentiality of the data

Appendix I: Home pick-up factors

Below, calculations on the home pick-up factors are shown in Table 36. With these factors, calculations on the amount of business passengers (pax) - and non-business passengers with baggage, living in (big) Amsterdam, departing on an average day at Schiphol, can be calculated. Data from the "Passengers Profile 2011", from an American travel survey (2002) and an internal Schiphol document (Schiphol, 2012), have been used for the calculations.

From all the departing O/D passengers 58% is Dutch. From this 58%, 28% is a business passenger and 72% is a non-business passenger. 19% of the Dutch departing O/D passengers live in Amsterdam (Passenger profile, 2012). It is assumed that the same percentages for the Dutch business and non-business passengers can be used to estimate the amount of business and non-business passengers living in Amsterdam. The 38% and the 66%, from the American travel survey are used to determine the amount of passengers with baggage for the business and non-business passengers living in Amsterdam. It is assumed that if a passenger is away for 4 nights or more, they take haul baggage with them. 38% of business passengers and 66% of non-business passengers on average are away for 4 nights or longer (see Table 17). As a result of the multiplications of the percentages, the factors in the two bottom rows of the table were calculated.

	(Passengers = pax)	1	# departing pax on	Departure on average
data source	Schiphol in general	related %	average day at Schiphol	busy day from Schiphol
Schiphol pax	[###] departing O/D	100%	56.466	total departing pax
profile (2011)	(100%)			on average day
Schiphol pax	[###]Dutch departing O/D	58%	32750	Total Dutch
profile (2011)	(58% from 14,7 M)			departing pax
Schiphol 2012	1,6M (big) Amsterdam	19%	6223	Total Dutch departing
	departing O/D (19% of 8,5M)			pax from Amsterdam
Schiphol pax	Business Dutch O/D:	28%	1742	Total departing
profile (2011)	2,4M /			business
	[###] ⁴¹ = 28%			pax Amsterdam
Schiphol pax	Non- business Dutch O/D:	72%	4480	Total departing non-
profile (2011)	6,1M / 8,5M = 72%			business pax
				Amsterdam
American	Business with baggage	38%	662	Total departing
Travel	(≥4 nights) = 38%			business pax
survey (2002)				Amsterdam with
				baggage
American	Non- business with baggage	66%	2957	Total non-business pax
Travel	(≥4 nights) = 66%			Amsterdam with
survey (2002)				baggage
calculation:	(Big) Amsterdam home pick-			Total departing
58%*19%*28%	up factor: departing	0 0117	EACTOR	business pax living in
*38%	business pax with bax	0,0117	FACTOR	Amsterdam with
				baggage
calculation:	(Big) Amsterdam home pick-			Total non-business pax
58%*19%*72%	up factor: departing non-	0.0524	EACTOR	Amsterdam living in
*66%	business pax with bax	0,0524	FACTOR	Amsterdam with
				baggage

Table 36: Calculation Home pick-up factors

⁴¹ Numbers not included due to confidentiality of the data

Appendix J: Results quality measurement P3 drive check-in

Kwaliteitsmeting P3 drive-inchecken	P3 INCHE	CKBALIE			VERTREK	HAL BALI	E
TOTALE TEVREDENHEID CHECK- INPROCES	Totaal (n=178)	personen & bagage ingecheckt (=135)	alleen bagage ingecheckt (drop-off) (n=43)*		Totaal** (n=143)	personen & bagage ingecheckt (n=81)	alleen bagage ingecheckt (drop-off) (n=62)
Uitstekend + Goed	98%	99%	95%	Uitstekend + Goed	92%	89%	95%
VINDBAARHEID				VINDBAARHEID			
Uitstekend + Goed	94%	95%	93%	Uitstekend + Goed	86%	87%	86%
WACHTTIJD				WACHTTIJD			
Uitstekend + Goed	98%	97%	100%	Uitstekend + Goed	86%	82%	90%
VRIENDELIJKHEID PERSONEEL				VRIENDELIJKHEID PERSONEEL			
Uitstekend + Goed	94%	96%	88%	Uitstekend + Goed	98%	96%	100%
GEMAK				GEMAK			
Uitstekend + Goed	97%	99%	91%	Uitstekend + Goed	92%	92%	92%

* smalle basis voor P3 dropoff bij dagmeting, interpreteer met voorzichtigheid, betrouwbaarder resultaat na nachtmeting beschikbaar

** Totaalkolom = balie-incheck en balie drop-off. Kleine en a-typische groep SSDOP-gebruikers is buiten beschouwing gelaten.

OVERIGE RESULTATEN GEBRUIKERS P3 DRIVE INCHECKEN

	43% van de gebruikers van P3 drive inchecken was reeds voor aankomst op Schiphol bekend met de mogelijkheid van Drive- inchecken.
	56% van de gebruikers besloot tot gebruik van drive inchecken toen men erop werd gewezen door P3 personeel, de rest had dit voordien al besloten (en daarvan de meesten al thuis)
GEBRUIKERS	87% van de gebruikers zou de volgende zeker weer gebruik maken van P3 drive inchecken en 13% waarschijnlijk. Een herhalingsintentie van 100%.
	Belagrijkste voordelen van P3 drive inchecken zijn dat het gesjouw scheelt (61%) en het idee dat men korter in de rij staat (21%).
	Bij een prijs van 2 euro per stuks bagage, bedraagt de gebruiksintentie nog steeds 62% van de users, bij een bedrag van € 3,50 is dit 52%.

OVERIGE RESULTATEN NIET-GEBRUIK	KERS P3 DRIVE INCHECKEN
	47% van de niet-gebruikers zou de volgende keer zeker gebruik maken van P3 drive inchecken en 33% waarschijnlijk. Een probeerintentie van 80%.
	Belangrijkste voordeel in de ogen van de niet-gebruiker is het niet hoeven sjouwen (75%). De kortere rijen heeft men nog niet ervaren, dus dit ziet men minder vaak (11%) als belangrijk voordeel dan de gebruikers (punt van communicatie!).
NIET-GEBRUIKERS	Belangrijkste drempel voor gebruik lijkt te zijn dat sommige passagiers hun bagage zo lang mogelijk bij zich willen houden, op de tweede plaats staat gewoonte, gevolgd door een vorm van angst (waar gaat mijn bagage heen, hoe werkt het, komt het wel op tijd bij het vliegtuig) en ten laatste een uitgesproken voorkeur voor een andere manier van inchecken (SSDOP of balie). Omdat er maar weinig pax waren die drempels ervoeren, zijn de drempels niet te kwantificeren.
	Bij een prijs van 2 euro per stuks bagage, bedraagt de probeerintentie 48% van de huidige niet gebruikers, bij een bedrag van € 3,50 is dit 28%.
Niet gebruikers zijn in dit onderzoek alle passagiers die met ruimbagage via P3 reizen, buiten openingstijden van de drive-inchecken faciliteit	

Appendix K: Calculations WestCord Hotel

Below in Table 37, calculation for the WestCord Fashion Hotel are presented. The calculations shown in table X, result in a total amount of estimated amount of passengers with baggage. Calculations were made with the data that was provide by the General Manager of the WestCord Fashion hotel in Amsterdam. This data is shown in Appendix G. The calculation steps, numbers and units can be seen in the table.

The 38% and the 66%, are from an American travel survey and are used to determine the amount of passengers with baggage for the business and non-business passengers in the Hotel. It is assumed that if a passenger is away for 4 nights or more, they take haul baggage with them. 38% of business passengers and 66% of non-business passengers on average are away for 4 nights or longer (see Table 17)

step 1 calculations	number	unit
hotel info	80%	Room occupation rate
hotel info	260	Rooms in WestCord
260*80% =	208	occupied rooms
	365	days/yr
hotel info	2,1	days/room change
365/2,1 =	174	room changes/room/yr
174 * 208 =	36.152	room changes/yr
36.152/365	99	room changes/day
hotel info	1,8	guest/room
99 * 1,8	178	guest/day
40% *178	71	business guests/day
60%*178	107	non-business guests/day
178*365	65.074	guest/yr
365*71	26.030	business guests/yr
365*107	39.045	non-business guests/yr
38% longer	9.891	business guest
than 4 nights		with bag/yr
66% longer	25,769	non-business
than 4 nights		guest with bag/yr
total	35.661	bags/yr
Total by plane (43%)	15.334	Bags/yr
check-out	20	bags/ check-
between 7-12AM	20	out hour (7-12)

Table 37: Calculations WestCord Hotel

Appendix L: Online community survey

An online community survey was conducted to find out what passenger considerations would be on a baggage home pick-up service. As a result of this survey, it was decided to research the possibilities of such a service, where the baggage can be picked-up on the same day of flying. Below the most important information of this online community survey is presented.

Online community

The online community consisted of 45 people. 25 passengers are private travellers and 20 passengers are business travellers. They were spread all over the Netherlands, travel via a mixture of transport modes to the airport (train, car, taxi, dropped-off), have a MBO+ level of education, travel 1 through 15 times a year (non-frequent flyers) and all carry haul baggage during their travel. The responses (negative and positive) of the online community on the presented service are listed below.

Positive points indicated

It reduces stress, The holiday will start relaxed, baggage does not need to be carried anymore, it is easy to plan a baggage pick-up, it saves time.

Negative points indicated by passengers

Passengers need to be at home at the time of pick-up, passengers want their toilet bags in the haul baggage so the pick-up a day in advance in not desirable, will my baggage arrive on time?, will my baggage be in the right plain?, Baggage can be lost sooner, somebody else can get to my baggage and manipulate it, how much will the service cost me, somebody (extra) will know I am not at home this will increase the chance of burglary/theft

Indicated negative points, ideas for countermeasures

Seal and label:

"Bij het ophalen laten sealen zodat niemand er nog bij kan." "Sealen van de koffer op een zeer waterdichte manier" " Zodat je echt zeker weet dat er onderweg niets mee gebeurd." "Dan zou het onveilige gevoel een stuk minder zijn." " Een label aan te brengen dat de koffer verzegelt en dat voorzien is van een unieke (bar)code."

Track and Trace:

"Zodat je kunt laten zien waar je koffer in het proces is."

"Of een soort van track 'n trace app op de telefoon waarmee je constant kan zien waar je bagage zich bevindt."

"Track en trace voorziening en garantie afgeven."

"Door woorden te gebruiken zoals 'beveiligd vervoer' en 'professionaliteit' en misschien uit te leggen welke stappen jullie nemen om mijn koffer veilig te houden. En als het een tijdje heeft gedraaid, laten weten dat er nog nooit een koffer kwijt is geraakt."

Personnel:

"Zorgen dat er echt betrouwbaar personeel wordt aangenomen en geen goedkope krachten" "Lastig om dat vertrouwen te krijgen. Toon aan dat adresgegevens etc echt niet openbaar te zien zijn.