The Redesign of Interfaces between Passenger Processes
Improving Passenger Processes through Collaboration, Cooperation, and Communication between KLM and other Stakeholders at Schiphol

29 May 2007

F.M. BOULAND
1054651
TU Delft; Faculty of Technology, Policy and Management
Master: Systems Engineering, Policy Analysis and Management
Section: Transport Policy and Logistics’ Organisation

COMMITTEE:
Professor: Prof. Dr. G.P. van Wee
1st Supervisor: Drs. J.H.R. van Duin
2nd Supervisor: Drs. M. Leijten
External Supervisor: Drs. L. van Gils
# Table of contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1</td>
<td>Background of the research project</td>
<td>1.1</td>
</tr>
<tr>
<td>1.2</td>
<td>Research objectives and research question</td>
<td>1.2</td>
</tr>
<tr>
<td>1.3</td>
<td>Demarcation</td>
<td>1.3</td>
</tr>
<tr>
<td>1.4</td>
<td>Scientific background</td>
<td>1.4</td>
</tr>
<tr>
<td>1.5</td>
<td>Research approach</td>
<td>1.5</td>
</tr>
<tr>
<td>1.6</td>
<td>Outline of the report</td>
<td>1.6</td>
</tr>
<tr>
<td>2</td>
<td>Stakeholder-analysis</td>
<td>2</td>
</tr>
<tr>
<td>2.1</td>
<td>Description of stakeholders</td>
<td>2.1</td>
</tr>
<tr>
<td>2.2</td>
<td>Four characteristics of interorganisational networks</td>
<td>2.2</td>
</tr>
<tr>
<td>2.3</td>
<td>Criticality and dedication of stakeholders</td>
<td>2.3</td>
</tr>
<tr>
<td>2.4</td>
<td>Conclusion</td>
<td>2.4</td>
</tr>
<tr>
<td>3</td>
<td>Description of passenger processes and interfaces</td>
<td>3</td>
</tr>
<tr>
<td>3.1</td>
<td>Models used for describing passenger processes</td>
<td>3.1</td>
</tr>
<tr>
<td>3.2</td>
<td>Overview of passenger flows and processes at Schiphol</td>
<td>3.2</td>
</tr>
<tr>
<td>3.3</td>
<td>Departure process</td>
<td>3.3</td>
</tr>
<tr>
<td>3.4</td>
<td>Arrival processes</td>
<td>3.4</td>
</tr>
<tr>
<td>3.5</td>
<td>Transfer processes</td>
<td>3.5</td>
</tr>
<tr>
<td>3.6</td>
<td>Conclusion</td>
<td>3.6</td>
</tr>
<tr>
<td>4</td>
<td>Determination of bottlenecks and focus of redesign</td>
<td>4</td>
</tr>
<tr>
<td>4.1</td>
<td>List of bottlenecks</td>
<td>4.1</td>
</tr>
<tr>
<td>4.2</td>
<td>Consequences of bottlenecks</td>
<td>4.2</td>
</tr>
<tr>
<td>4.3</td>
<td>Reflection on bottlenecks</td>
<td>4.3</td>
</tr>
<tr>
<td>4.4</td>
<td>Conclusion and focus of redesign</td>
<td>4.4</td>
</tr>
<tr>
<td>5</td>
<td>Joint design process</td>
<td>5</td>
</tr>
<tr>
<td>5.1</td>
<td>About the design process</td>
<td>5.1</td>
</tr>
<tr>
<td>5.2</td>
<td>Joint conceptualisation of problem situation</td>
<td>5.2</td>
</tr>
<tr>
<td>5.3</td>
<td>Joint programme of requirements</td>
<td>5.3</td>
</tr>
<tr>
<td>5.4</td>
<td>Generation of ‘quick-wins’</td>
<td>5.4</td>
</tr>
<tr>
<td>5.5</td>
<td>Ideas without internal or joint support</td>
<td>5.5</td>
</tr>
<tr>
<td>5.6</td>
<td>Suggestions for implementation of quick-wins</td>
<td>5.6</td>
</tr>
<tr>
<td>5.7</td>
<td>Conclusion</td>
<td>5.7</td>
</tr>
<tr>
<td>6</td>
<td>Evaluation of ‘quick-wins’</td>
<td>6</td>
</tr>
<tr>
<td>6.1</td>
<td>Use of simulation</td>
<td>6.1</td>
</tr>
<tr>
<td>6.2</td>
<td>Model 1: Notification of incidents to the airline</td>
<td>6.2</td>
</tr>
<tr>
<td>6.3</td>
<td>Model 2: Joint information provision to prepare passengers for controls</td>
<td>6.3</td>
</tr>
<tr>
<td>6.4</td>
<td>Reflection on results of simulation study</td>
<td>6.4</td>
</tr>
<tr>
<td>6.5</td>
<td>Qualitative evaluation of quick-wins</td>
<td>6.5</td>
</tr>
<tr>
<td>6.6</td>
<td>Conclusion</td>
<td>6.6</td>
</tr>
<tr>
<td>7</td>
<td>Conclusions and recommendations</td>
<td>7</td>
</tr>
<tr>
<td>7.1</td>
<td>Products of this research project</td>
<td>7.1</td>
</tr>
<tr>
<td>7.2</td>
<td>‘Lessons learned’ for the design of interfaces between passenger processes</td>
<td>7.2</td>
</tr>
<tr>
<td>7.3</td>
<td>Further recommendations to KLM for the improvement of passenger processes</td>
<td>7.3</td>
</tr>
<tr>
<td>7.4</td>
<td>Reflection on the research project</td>
<td>7.4</td>
</tr>
</tbody>
</table>
The redesign of interfaces between passenger processes

Lessons learned from a joint design process at Amsterdam Airport Schiphol

Frank Bouland, BSc.
Delft University of Technology
Faculty of Technology, Policy and Management

Proposed journal: Journal of Air Transport Management
Body text: 6010 words
Abstract: 185 words
Key-words: Airport Design, Passenger Processes, Interorganisational Networks.

Abstract
Currently, most stakeholders that operate passenger processes at airport terminals work in a rather isolated manner. Little research has been performed that deals with the design of operational interfaces between these processes and with the theories, models, and tools that can be used for this. As a result, there is insufficient insight into whether passenger processes can be improved through collaboration, cooperation and communication between the different operators. During a study for KLM, a useful design approach has been identified and applied for redesigning interfaces between passenger processes: valuable products have been delivered, satisfaction has been created amongst the involved stakeholders, and lessons have been learned that add practical value to the suggested approach. To overcome limitations relating to changes in legislation, the fragmentation of expertise, and the exchange of sensitive or private information, joint improvements should be sought in ‘quick-wins’. When based on a joint conceptualisation and programme of requirements, such quick-wins increase mutual understanding and trust, and therewith provide an incentive for further cooperation. The design approach and lessons learned may be applied by airport-decision makers involved with the (re)design of passenger processes.

1 Introduction
To accommodate the strong growth in international passenger traffic [IATA, 2006] and to meet customer relationship objectives, airport decision-makers are constantly rethinking and redesigning the passenger-related processes that take place at airports. The decisions faced are highly complicated since (i) they deal with several types of entities (i.e. passengers, baggage, and aircraft), (ii) they are bound to infrastructural limitations (the physical capacity of the airport), (iii) they interface with other ongoing (re)design efforts, (iv) they have to comply with (often changing) rules and regulations imposed by the government, and (v) they may affect the visit costs the airlines pay to the airport. Moreover, many different airport stakeholders are involved in the design of passenger processes. This makes the decision-making about the redesign of these processes even more complex.
The involvement of these many parties in the design of passenger processes is amongst others a result of the fact that multiple parties are responsible for the operation of the different passenger processes at airports: from the terminal’s entrance to that of the aircraft (or vice versa), each passenger encounters a number of commercial parties and authorities. These may include (amongst others) airlines/operators, the (military) police, customs, and security-controllers. To illustrate this notion, an overview of the different passenger processes and their operators at Amsterdam Airport Schiphol is given in Figure 1.

The performance of the passenger processes operated by these parties could be measured in terms of objectives such as throughput, timeliness, reliability, flexibility and customer satisfaction. This performance depends to a large extent on the performance of the processes operated by others. Moreover, the performance largely depends on collaboration, cooperation, and communication of different operators at the interfaces between the different processes. The redesign of passenger processes is therefore not only a matter of improving the passenger processes operated by the distinct parties. Merely, there is a demand for a redesign of the interfaces between processes operated by different parties.

The term ‘interface’ is used here to clearly differentiate between the redesign of passenger processes and the redesign of interfaces between passenger processes. In this paper, the ‘interface between passenger processes’ is defined as the point of interconnection between various processes undergone by the same passenger, whereas the focus lies on those interfaces that involve more than one operator. In our definition, interfaces exist only when multiple processes can be undergone by the same passenger. Thus, only those passenger processes that are part of the same passenger flow (departure, arrival or transfer) share an interface with each other, according to our definition. A redesign of an interface between passenger processes would comprise a redesign of the point of interconnection between various passenger processes. This may be realised through collaboration, cooperation, and/or communication between different operators of passenger processes at the terminal. Collaboration is distinguished from cooperation in that cooperative work ‘is accomplished by the division of labour among participants, as an activity where each person is responsible for a portion of the problem solving’, whereas collaboration involves the ‘mutual engagement of participants in a coordinated effort to solve the problem together [Roschelle and Teasley, in: Dillenbourg et al., 1995]. A redesign of interfaces between passenger processes may thus focus on the integration of tasks of different operators (collaboration), the (re)distribution of tasks between different operators (cooperation), and/or communication between different operators.
Figure 1: Processes and their operators

Processes
1. Check-in
2. Baggage drop-off
3. Boarding pass control
4. Airport-security control
5a. Border control on exit
5b. Border control on departure
6. Customs control
7. KLM-Security control
8. Boarding
9. Baggage reclaim
This paper describes the design approach applied and the lessons learned during a study on possibilities for improvement of passenger processes by redesigning the interfaces between these processes. This study was commissioned by KLM Royal Dutch Airlines (KLM) and focused on the passenger processes carried out at KLM’s home base, Amsterdam Airport Schiphol (Schiphol). While carrying out this assignment, lessons have been learned about the possibilities and impossibilities of designing interfaces between passenger processes and about the theories, models, and tools that can be used for this. By examining these ‘lessons learned’, airport-stakeholders have early insight into the possibilities and impossibilities for operational collaboration, cooperation, and communication and into the practical value of the applied theories, models, and tools. These ‘lessons-learned’ therefore form the main subject of this paper. Lessons are especially of interest for designers of international airports, as these most often deal with similar governmental authorities such as border control authorities and customs.

The paper is divided into three chapters. Chapter 2 deals with the question in how far attention has been paid to interfaces between passenger processes in current literature. In Chapter 3, the design approach and the accompanying theories, models and tools that have been applied for the study at Schiphol, are elaborated. The lessons learned from carrying out this project and applying the different theories, models, and tools in practice are the subject of Chapter 4. The paper ends with a conclusion on the usefulness of the applied approach for the study carried out at Schiphol and for performing similar studies.

2 Scientific background

Ample attention has been paid in literature to the redesign of airport processes. These have been applied to a variety of different (sub)processes at the airport, both at the terminal [see below] and on the airfield [e.g. Cheng, 1998; Hall and Peterson, 2002; Ignaccolo, 2003; Miller and Dougherty, 2004; Herrero, 2005]. Several studies have also been performed that study the flow of baggage [e.g. Jacobson et al., 2004; Abdelghany et al., 2006] or cargo [Van der Heijden et al., 2002; Versteegt et al., 2003]. Studies that deal with passenger processes, most often focus on one of the specific processes at the terminal. These may for example be check-in [Chun, 1999; Joustra & Van Dijk, 2002; Casado et al., 2005], security control [Chung and Nyakman, 1996; Pendergraft et al., 2004; Koch, 2004; Wilson, 2005], immigration [Littler and Whitaker, 1997], and boarding [Van Landeghem & Beuselinck, 2002]. Some other researchers have studied the total of passenger processes at airport terminals [e.g. Takakuwa & Oyama, 2003; Roanes-Lozano et al., 2004; Hafizogullari et al., 2002].

However, the studies mentioned above pay little attention to the fact that different parties are responsible for operating different processes at the terminal. This is remarkable, since collaboration in logistic networks is considered to be an important ingredient to the success of such networks [Coyle et al. 2003]. Since the introduction of ‘systems thinking’ [Bertalanffy, 1968], the classical approach to seeing organisations as machine-like entities has been abandoned and many scientific approaches to interorganisational collaboration have developed. Of approaches that focus on process integration, the most important may be supply chain management. In literature on supply chain management, much attention is paid to possible gains of ‘the cooperative, collaborative approach’ [Coyle et al. 2003, page 24-25] and ‘cross-functional integration’ is considered to be a key-factor for successful supply chain management [Lambert &
Cooper, 2000]. Cousins [2002] and Trienekens & Beulens [2001] give extensive literature reviews on approaches to (thinking of) relationships from different perspectives.

In literature studied on the design of passenger processes at airports for this research paper, only Babeliowsky [1997] actively involves multiple stakeholders into the design process, as he recognises that the airport is an interorganisational logistic network. He defines such networks as ‘logistic systems, of which the processes are carried out by actors from two or more organisations having no joint executive.’ By paying more attention to the coordination of the activities of all organisations in the network, the chance of sub-optimisation of processes within these networks can be reduced. Babeliowsky has therefore developed a design approach for the design of such interorganisational networks. This design approach is tested at three cases at Schiphol, amongst which one deals with the development of the passenger handling for the period 1994-2003. However, only two stakeholders are involved actively in the design project described: Schiphol (the commissioner of his project) and the Royal Marechaussee. Moreover, the ‘interorganisational aspect’ of Babeliowsky’s research is limited to the (joint) design process. The objectives of the design project and the solutions suggested have little or nothing to do with collaboration, cooperation or communication during the operation of passenger processes. Predominantly, solutions concern expansion of the airport’s capacity and the redesign of distinct processes.

To conclude, it can be stated that little research has been performed that deals with the operational interfaces between these processes. As a result, there is insufficient insight in possible improvements through collaboration, cooperation and communication between airport stakeholders.

3 Design approach

This chapter deals with the design approach followed during the study that has been carried out for KLM. The main goal of this study was to come up with a redesign of one or more of the interfaces between processes operated by KLM and other stakeholders at Schiphol, so that KLM’s passenger-related objectives are better met than in the current situation. For reasons of confidentiality, and because these are too specific to be treated in this paper, parties involved and actual suggestions generated for the Schiphol-case are not covered in this paper.

As described above, Babeliowsky [1997] proposes an approach for the design of interorganisational logistic networks. Several of the theories, models, and tools used in this approach are part of the approach followed for this design project. Other theories, models, and tools used deviate from or extend on Babeliowsky’s approach. These have been derived from literature on interorganisational networks and/or on the design of passenger processes at airports.

The description of the design approach is organised around three main phases. These are: the conceptualisation of the interorganisational logistic network, the design project carried out together with selected stakeholders, and the evaluation of the proposed redesign. The chapter ends with a short conclusion on the design approach followed.
3.1 Conceptualisation: stakeholder-analysis, description of passenger processes and identification of bottlenecks

An analysis of the stakeholders involved in the network that deals with the design of passenger processes at Schiphol was the first step of the conceptualisation of the interorganisational logistic network. By studying policy documents and through interviews, the objectives, interests, and means of these stakeholders have been identified. Based on this, a distinction could be made between stakeholders that are dedicated and non-dedicated for the design of passenger processes, and those that are critical and non-critical. Non-dedicated stakeholders are stakeholders that are not directly affected by the design and are less likely to influence this, whereas criticality is related to the importance of the resources of stakeholders to the problem owner and to what extent resources of other stakeholders can replace these [Enserink et al.: 2002].

In addition, it has been determined whether the four characteristics of interorganisational networks identified by De Bruijn & Ten Heuvelhof [2000] apply to the stakeholder network. These are: pluriformity, interdependencies, closedness and dynamics. Based on the stakeholder analysis, opportunities and threats for the design processes could be identified. These insights need to be considered to interact adequately when jointly designing the interfaces between passenger processes [Babeliowsky: 1997; Pouloudi & Whitley, 1997; Enserink et al.: 2002].

A second step and third step in the internal conceptualisation consisted of a thorough study of the passenger processes that take place at Schiphol and an identification of the bottlenecks that occur in these processes. Several field trips and interviews with operators were scheduled to acquire a background understanding of the processes and interrelationships between the processes operated by different parties. By studying the passenger processes from the operator’s view, the knowledge obtained is up-to-date and real-life and in that sense more valuable than knowledge acquired from desk research. To determine the further focus of the study, bottlenecks in the present passenger process have been identified. By determining which of the current bottlenecks relate to the interfaces between processes operated by different parties and which of these bottlenecks are (most) critical for the passenger processes, an interesting focus for the redesign could be established.

3.2 Joint design project: selection of participants, joint conceptualisation, requirements setting and solution finding

For the selection of participants for the joint redesign of interfaces between passenger processes, the steps proposed by Wierda [1991] have been applied. Stakeholders should be both essential for joint action and willing to invest their time and resources [Klijn, 1994]. Together with the participants selected, a joint conceptualisation has been carried out at first. This involved the observation of passenger processes in operation, together with the group of participants. The joint conceptualisation has resulted in a jointly supported description of current processes and a joint programme of requirements for the redesign of these processes. The approach followed therewith extends on that of Babeliowsky [1997], whose joint conceptualisation consists only of a joint conceptual model and a joint problem statement. Herder & Stikkelman [2004] provide arguments and guidelines for establishing such a programme of requirements. For the generation of suggestions for improvement, group-support systems [see: De Vreede, 1995] could have been used. The design of a group-support session is however very time-consuming and arranging participation of all stakeholders in a specific location where such a system is available, was
expected to negatively affect the speed of the design process. Therefore, selected participants have been actively involved rather than invited for a group-support session.

3.3 Aftermath: evaluation of solutions, implementation

The expected effects of the suggested improvements to interfaces between passenger processes have been evaluated qualitatively and, where possible, quantitatively. For the quantitative evaluation, two simulation models have been built with which ‘what-if’ analyses could be conducted. Both the qualitative and the quantitative evaluation support the implementation of the suggestions generated in the joint design project. The implementation itself was not considered to be part of the redesign effort. However, the group of participants has jointly suggested steps to be taken for the implementation of the redesign proposals.

3.4 Conclusion on the design approach followed

The design approach followed turned out to be effective for redesigning interfaces between passenger processes at Schiphol. The joint design project has provided positive outcomes, both in terms of products that have been delivered (amongst which the suggestions for redesign), as well as in the satisfaction of the involved stakeholders. Based on this conclusion, it is suggested that airport decision-makers apply this design approach when conducting similar design projects. However, rather than strictly following the design approach proposed above, it is suggested here that airport-stakeholders additionally take into account the lessons that have been learned from the study at Schiphol. Therefore, these lessons learned will be discussed in Chapter 4.

4 Lessons learned

This research project has provided insight into how a redesign process for the interfaces between passenger processes elapses in practice. By examining the lessons learned from this project, airport-stakeholders have early insight into the possibilities and impossibilities for operational collaboration, cooperation, and communication and into the practical value of the theories, models, and tools suggested in Chapter 3.

The description of lessons learned in this chapter is organised around three subject areas. The first of these deals with the possibilities and impossibilities found for operational collaboration, cooperation, and communication between different operators at airports. Section 4.2 reflects on how the theories covered in Chapter 3 (and one additional theory) have been applied in practice and on the value of these theories for collaboratively redesigning interfaces between passenger processes. Finally, the value of different modelling techniques and tools that may be applied when (jointly) studying interfaces between passenger processes is covered.

4.1 Possibilities for improvement of interfaces between passenger processes

The design project at Schiphol has resulted in the identification of factors that limit the possibilities for redesigning interfaces between passenger processes. In addition, several opportunities for improving these interfaces have been revealed. This section describes several general notions relating to these limitations and opportunities, as identical factors are likely to apply in future design efforts at (other) airports.

A limitation of redesigning interfaces between passenger processes is that large-scale improvements of the interfaces between passenger processes are likely to involve changes in
legislation. Especially collaboration may require a redistribution of tasks and responsibilities amongst stakeholders. In case these tasks and responsibilities are mandated to certain parties by law, this redistribution is problematic. A redesign effort that requires such changes may become very lengthy and in addition dependent on politics. The different control processes at airports are for a large share carried out by governmental authorities. Such controls may include border control (immigration and possibly emigration), customs control, agriculture searching, and security control.

In addition, the different operations at the airport, whether or not mandated by law, often require the specific expertise of certain operators. Almost all processes at Schiphol are operated by personnel that has extensively been educated or trained for their tasks. Security controllers for example have expertise required for recognising suspected or dangerous goods and airline personnel has been trained to meet the airline’s customer relationship objectives. This fragmentation of expertise impedes the redistribution or integration of tasks between airport operators.

Moreover, collaboration and cooperation between parties may require the exchange of information that can not just be shared with other parties for security or privacy reasons. For example, information relating to supposed security risks (e.g. from certain passengers) may be confidential. Also, airlines may not want to share passenger-related data to other (commercial) parties, both for the privacy of their passengers and the commercial value of these data. In case passenger-specific information needs to be exchanged, the possibilities for cooperation and communication are therefore limited.

A first opportunity to help overcome the limitations mentioned above is the introduction of ‘self-service’ concepts. By installing self-service devices, the tasks of operators are replaced by tasks that are carried out by the passenger or by the device. Tasks are therefore no longer affiliated to a specific operator and do no longer require specific legal authority or expertise. However, the limitations mentioned above cannot be completely taken away by self-service devices. Passenger processes will need to be monitored by operators affiliated with these processes. In case passengers need assistance, passengers do not pass controls, technical failures occur, etc. their authority and expertise is still required. Moreover, self-service concepts are subject to the same limitations relating to information-sharing that are mentioned in the paragraph above. Another disadvantage of self-service concepts is the loss of customer contact. Especially airlines may feel a need to differentiate their (not in-flight) services through customer interaction, recognisability, and through differentiating between service levels (e.g. for high-yield versus other passengers). These goals become more difficult to achieve when their operations are replaced by automated operations. In contrast, an objective that supports the introduction of self-service concepts is the objective airlines may have to give passengers more control over their own stay at the airport.

Another opportunity is the introduction of an information and communication system that is shared between operators. In literature, the use of ICT is considered to be a key factor in the development of interorganisational relations [see amongst others: Williamson, 1997]. For the operation of passenger processes at airport terminals, information could be shared between different parties with e.g.: waiting times at the distinct processes, details about passengers of arriving and departing flights, and the status of individual passengers who are at the terminal (location, processes passed, etc.). However, for the interfaces identified during this study, an
information and communication system that is shared between operators seems to be of limited use. Flight information such as expected arrival and departure times are communicated already. Information about waiting times however seems to be useful for the airline, since this information could be used to inform those the passengers who may be affected by these waiting times. The sharing of passenger data is bound to limitations that deal with security and privacy (see above). Information about the status of passengers handled is only of use when a passenger has failed to pass certain processes. This passenger will not show up at the gate of departure and may thereby cause a delay. Information about a passenger that has passed particular processes or still needs to pass processes provides little details about the exact status of that passenger, e.g. where that passenger is and whether that passenger will show up on-time.

Based on the observations above, stakeholders involved in the design process concluded that improvements of interfaces between passenger processes should be sought in ‘quick-wins’. In this research context, such quick-wins are improvements to the interfaces between passenger processes that do not involve changes in legislation or the exchange of information that is sensitive to security or privacy aspects. In general, collaboration and cooperation between parties operating ‘similar’ tasks appears to be less complicated. These similar tasks can be grouped as tasks relating to the control of goods versus tasks relating to the control of documents. It seems more logical, and in practice more realistic, to focus on quick-wins that deal with the interfaces between processes that deal with these similar tasks.

The joint identification of a programme of requirements and of quick-wins was considered to be a first step to further cooperation at tactical and operational level. Participants of the joint design process may build on the learning experience created by this process and the positive experience may provide an incentive for further (strategic/tactical) cooperation amongst the stakeholders. Moreover, the implementation of the suggested quick-wins is likely to increase the mutual understanding at operational level and therewith have positive effects for future operations. In this sense it was preferred to ‘start small, and finish big’.

4.2 Theories to be drawn on for the design of interfaces between passenger processes

The approach followed for the redesign of interfaces between passenger processes (see Chapter 3) draws on a number of theories derived from literature. This section describes how some of these theories apply to such a redesign process in practice. Thereby, the practical value of these theories for collaboratively designing interfaces between passenger processes is substantiated. Moreover, it is expected that lessons learned from using these theories at Schiphol also apply to the interorganisational logistic networks at other airports. This section thereby provides airport-stakeholders with a first step to successfully drawing on the suggested theories for future redesign efforts.

Of the four characteristics identified by De Bruijn & Ten Heuvelhof [2000], especially interdependencies and pluriformity apply to the network of stakeholders involved with designing passenger processes at Schiphol. The interdependencies between stakeholders of the design of passenger processes deal with the economic importance of airports and the operational interdependency between these processes. Airports contribute largely to the economy of the region in which they are located. In their turn, airports are dependent on governmental restrictions (e.g. those relating to security) and on airlines and their passenger’s for the profits they generate, both in their aviation and non-aviation businesses. In the case of Schiphol, the
airport is considered to be one of the Dutch ‘mainports’ (next to the port of Rotterdam) and KLM is the airport’s ‘home carrier’ which contributes to 63% of Schiphol’s passenger traffic. In addition, airports, airlines, and other operators are interdependent for the daily operation of ‘their’ passenger processes and therefore also for the design of these processes. The pluriformity of the network is primarily visible in the scattered availability of resources. These resources include: knowledge and expertise concerning the operation of specific processes, access to information about (the environment of) these processes and political power.

The interdependencies and pluriformity that characterise the network of stakeholders create opportunities and threats for the joint design of passenger processes. Because of their interdependency, parties may be more inclined to join and cooperate in a design process initiated by one of the stakeholders. Additionally, parties are likely to take into account each other’s interests and goals, and will be reserved with trying to achieve their own goals at the costs of those of others. In contrast, the interdependencies in the network may result in a ‘lengthy gauging of positions’ and the network may become ‘very difficult to steer into action’ [De Bruijn & Ten Heuvelhof, 2000, p. 31]. Because of the pluriformity of the stakeholders, the understanding of each other’s processes, interests and objectives may be low. Additionally, the joint objectives of a design process may become very broad as parties in the pluriform group of stakeholders may each want to include their own goals in the programme of requirements. Even worse, the preconditions set in this programme may be such diverse that an effective and feasible redesign becomes impossible.

Because of the pluriformity of stakeholders that deal with passenger processes at airport terminals, a joint conceptualisation of passenger processes has shown to be of high importance when designing interfaces between these processes. Most participants in the joint design process carried out at Schiphol have extensive experience in the design of passenger processes. Despite this, the design project resulted in many new insights for these parties about each other’s operations and objectives. Based on the findings of the study carried out for this paper, it is stressed that the joint problem statement proposed by Babeliowsky [1997] should be extended to the identification of a programme of requirements that is supported by all parties involved in the design process. By establishing a joint programme of requirements, stakeholders ensure that their interests and objectives will be taken into account during the joint design process. This is supposed to be necessary to create mutually satisfactory agreements [Boehm at al., 2001] and trust and commitment to the design process.

In addition, a careful selection of participants for the design process proves to be important. Participants should be both willing to invest time and resources and essential for successful outcomes [Klijn, 1994]. Because of the interdependencies described above, it is expected that airport stakeholders are likely to respond to other parties’ initiatives for joint design efforts. The necessity of participation of a specific stakeholder amongst others depends on this stakeholder’s access to resources (knowledge, data, etc.) and commitment power. Moreover, especially because redesigning interfaces between passenger processes concerns a relatively novel field of research, stakeholders may be involved to increase the learning effect of the joint design process or the trust between participants [see: Edelenbos & Klijn, 2007].

The threats caused by interdependencies and pluriformity in the type of stakeholder networks studied, may be overcome by applying notions about process management of de Bruijn et al.
[2002]. These provide several suggestions to increase the speed of decision making and therewith help deal with the ‘lengthy gauging of positions’. In addition, recommendations are offered to make sure the process has enough substantive elements. This may prevent a too broadly formulated programme of requirements. These and other notions of the work of De Bruijn et al. have not been explicitly applied in the study carried out for KLM, but are considered to be a valuable addition the design approach.

4.3 Modelling techniques and tools to be used for the design of interfaces between passenger processes

This section discusses the practical value of some of the different modelling techniques and tools that, according to Chapter 3, may be applied when (jointly) studying interfaces between passenger processes. The lessons learned from applying (or not applying) these modelling techniques and tools can be used by airport-stakeholders for selecting useful models and tools for future redesign efforts.

Especially discrete event simulation is widely used as a tool to support airport decision-making. Airports seem to be an ideal environment for simulation studies [Verbraeck and Valentin: 2002; Gongora and Ashfaq: 2006]. Simulation provides decision-makers with a tool to study the complexities of the airport environment in a non-intrusive way [Wilson: 2005]. In addition, by simulating the effects of redesigned processes (conducting ‘what if’ analyses), the chance that these processes will be implemented in the right way at the first attempt are larger [Hlupic and De Vreede: 2005]. Finally, the animation that accompanies simulation models can be used to support communication at both management and operational level [Joustra en Van Dijk: 2001].

In literature on the design of passenger processes, simulation is predominantly applied to either determine current or future bottlenecks in processes at the terminal or to study the effects of redesigned processes. The determination of future bottlenecks is not of interest when aiming to improve passenger processes by improving the current design of interfaces between passenger processes operated by different parties. In addition, studying (future or current) passenger processes with help of simulation, is labour consuming and computationally expensive [Zografos and Madas: 2006] and requires well-trained, expert users [Stamatopoulos et al.: 2004]. Therefore, the modelling process is often lengthy and costly [Hlupic and De Vreede: 2005]. Moreover, to be able to build the simulation models needed, a complete, consistent, and reliable data set is a prerequisite. The study conducted for KLM has revealed that the collection of such quantitative data is difficult: data are stored at very different places and in different formats, various methods and periods of measurement are used, or data may not be available at all. These problems internally (within airlines), but are especially apparent when gathering data from other stakeholders. In addition, bottlenecks in passenger processes are often caused by incidents that are very diverse and difficult to model. Therefore, it is preferred here to carry out the bottleneck analysis based on (joint) observations of passenger processes and on stakeholder interviews.

Such an analysis of existing bottlenecks is useful as a starting point for establishing the focus of a (joint) redesign of interfaces between passenger processes. With help of a bottleneck analysis, airport decision-makers can identify where in the passenger processes improvements can be made by such a redesign, i.e. which bottlenecks deal with operational interfaces between passenger processes. Moreover, it can be determined which of these are most interesting to focus on, in terms of (joint) objectives. To serve this function, bottlenecks should be quantified with
help of performance measures, so that the criticality of the different bottlenecks can be compared. When focusing a redesign on specific existing bottlenecks, it should be kept in mind that decreasing the criticality of one bottleneck in the passenger processes, may increase the criticality of other bottlenecks. Therefore, suggestions for improvement should be evaluated by verifying their effects on the whole of passenger processes.

Other than for determining bottlenecks, simulation may be used to quantify the effects of the suggested redesigns. In the research performed for this paper, suggestions for a redesign of passenger processes have been assessed quantitatively (with help of simulation models), as well as qualitatively (where effects were difficult to put into figures). Comparing between ‘as-is’ and ‘to-be’ situations in terms of absolute values proves to be difficult, as the performance measures used are (in reality) affected by a multitude of unstable factors, such as fluctuating passenger volumes, incidents, and disturbances due to external circumstances. These factors occur at unpredictable moments during the operation of processes and may interact and thus strengthen or diminish each other. When performing ‘what-if’ analyses on redesigned processes, the effects measured will therefore not correspond to effects that may be expected in reality. Therefore, the relative outcomes of simulation models used are in this context more valuable than absolute outcomes.

Next to simulation and bottleneck analyses, stakeholder analyses and group-support systems are useful tools for the redesign of interfaces between passenger processes. A stakeholder analysis helps airport decision-makers to identify stakeholders to be involved in a design process and to determine expected threats and opportunities of a joint design process. The most important conclusions concerning the content of the stakeholder analysis carried out for this paper have been covered in Section 4.2. Although not applied in the study carried out for this paper, it is argued that group-support systems may be beneficial to the design outcomes in terms of productivity and satisfaction of the participants. The term group-support systems is defined by Jessup & Valacich [1993, p.5] as ‘computer-based information systems to support intellectual collaborative work.’ De Vreede [1995] elaborately examines experiences with group-support systems and discusses criteria that should be appraised to determine potential benefits and risks of using these systems for a joint design process.

5 Conclusion

It is concluded that a useful design approach has been followed for the redesign of interfaces between passenger processes at Schiphol. This conclusion is substantiated by the facts that: valuable products have been delivered, satisfaction has been created amongst the involved stakeholders, and lessons have been learned that add practical value to the suggested approach. In this concluding chapter, these three aspects will be reflected on. The chapter ends with a conclusion on the usefulness of the applied approach for performing similar studies.

The design approach followed for the redesign of interfaces between passenger processes at Schiphol has provided positive outcomes in terms of the products that have been delivered. The stakeholders that participated in the design process have jointly suggested several ‘quick-wins’. Qualitative and quantitative evaluations of these quick-wins show that these have positive effects in terms of the objectives set by these participants. The quick-wins are therefore likely to be implemented at Schiphol. Next to the quick-wins, the design project has provided several other products: a stakeholder analysis, a description of passenger processes, a bottleneck analysis, and
a joint programme of requirements. Each of these may be used as input for future design processes.

In addition, the joint design process has been satisfactory to all participants and has created mutual understanding and trust between stakeholders. By having created a learning experience for the parties involved, the redesign process carried out has added value for these parties. This learning experience may be applied to other redesign efforts and the positive experience provides an incentive for further (strategical) cooperation amongst the stakeholders. In addition, in case the suggested quick-wins are implemented, mutual understanding may increase at operational level, again with positive effects for future operations.

A number of lessons have been learned from the research project performed. The possibilities for redesigning interfaces between passenger processes are limited because these are likely to deal with the need to change legislation, with the fragmentation of expertise between operators, and with the exchange of information that can not just be shared with other parties for security or privacy reasons. As these limitations can only partially be overcome by for example self-services concepts or the use of ICT, improvements of interfaces between passenger processes should be sought in ‘quick-wins’. Because of the economic importance of airports and their customers to the local economy and because of the operational interdependencies between parties operating passenger processes, governmental parties may be more inclined to constructively participate in joint design processes with the airline. Stakeholders may amongst others be involved in such a design process because of their access to resources, their commitment power, and for the stimulation of the learning effect of the process. As the group of participants in such a design process is pluriform, a joint conceptualisation of the different passenger processes has shown to be of importance. Moreover, establishing a joint programme of requirements is considered to be necessary to create mutually satisfactory agreements, trust, and commitment to this process. Airport decision-makers may furthermore apply notions on process management to prevent this programme of requirements from becoming too broad and to increase the speed of decision-making. Finally, several modelling techniques and tools prove to have a practical value for (jointly) studying interfaces between passenger processes. These include: a stakeholder analysis to identify potential participants as well as opportunities and threats for joint action; a bottleneck analysis to determine on which part(s) of the extensive logistic network a redesign effort should focus; and a quantitative method (such as simulation) to assess the effects of proposed redesigns (next to a qualitative evaluation).

It is expected that the design approach followed has to a large extent contributed to producing positive outcomes, although it is difficult to determine the individual added value of each of the theories, models, and tools that have been applied. Some of these are however assumed to be crucial for a successful redesign of interfaces between passenger processes. The design approach used for designing interfaces between passenger processes is therefore expected to be suitable for performing similar studies, both at Schiphol and at other airports. Besides using this design approach, airport decision-makers can draw on the lessons learned from applying the theories, models, and tools in practice into this new field of research.

References


