

The Impact of Coordination and Relationships in an Outsourcing Environment: The Airline Departure Process

by

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B.S. Industrial Engineering
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Submitted to the Engineering Systems Division in Partial Fulfillment of the
Requirements for the Degree of

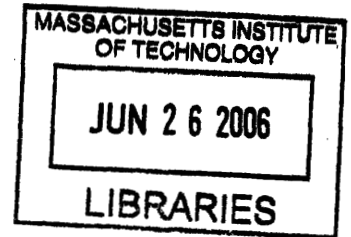
Master of Engineering in Logistics

at the

Massachusetts Institute of Technology

June 2006

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Abstract

Complicated business processes, like the airline departure process, that involve multiple job functions and even multiple companies need high levels of cross-functional coordination for successful completion. A study of the airline departure process at four stations of Icelandair showed that relationships and communication do impact performance. High levels of relationships and communication can have a positive impact on both efficiency and quality of the flight departure process at the same time.

The design of systems of coordination and control and the approach to outsourcing of job functions or processes can impact levels of relationships and communication. Product offering and strategic importance of individual stations should decide how relationships with 3rd party service providers are constructed.

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Acknowledgements

I am extremely thankful to the many people that helped in the production of this document. First of all I would like to thank the Icelandair station managers: Ástþór Ingason, Manager Stations Icelandair Headquarters, Angie Condon at London Heathrow, Einar Hannesson from IGS at Keflavík International Airport, Harry Hengenveld at Amsterdam Schiphol, Jóhannes Thorberg at Boston Logan and Mark Snowdon at Copenhagen Kastrup. Through interviews, data gathering and allowing me to sit in on a station managers meeting these people helped me understand the complex flight departure process. I thank Ásdís Eva Hannesdóttir, Director Customer Relations Icelandair, Dagur Egonsson and Elísabet Halldórsdóttir, Icelandair IT for their help in gathering and deciphering data. I am grateful to Jón Karl Ólafsson, CEO Icelandair and Una Eyþórsdóttir, Director Human Resources Icelandair, for their support to this project.

For the supervision and guidance of the thesis writing process I thank Dr. R. John Hansman, Professor of Aeronautics and Astronautics and Dr. Christopher Caplice, Director of the Master of Engineering in Logistics Program.

Finally, I thank my wife and daughter, Rúna Rut and Sandra, for being my support and inspiration as well as my family for all their support through the years.

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1 Introduction

Coordination through relationships and communication is necessary for the successful completion of a variety of processes. The importance of coordination is elevated as the number of people involved in the process, its complexity and time pressure increases. The airline flight departure process is a good example of a process requiring high levels of coordination. The process is highly regulated and planned although it is seldom carried out according to plan because of the high variability in operations due to weather, malfunctioning equipment or other delay causes. Usually there are twelve different job functions involved in the process which is most often performed under intense time pressures in ever changing and unforeseeable environment. It also has inherent obstacles to communication between job functions, for example separated physical locations, organizational hierarchy and traditions. In this type of environment the quality and quantity of communication and relationships between the different job functions is important not only to carry out the procedures on a day to day basis, but also to improve these procedures to achieve increased efficiency and quality.

The flight departure process creates a lower bound on the minimum turn-around time of a flight. The most capital intensive assets of airlines are the airplanes. Keeping high utilization levels of these assets is therefore essential. Turn-around-time is the time from the moment an aircraft has landed and been connected to the airport gate until it is ready to depart again. One of the methods airlines use to increase utilization of its fleet is to minimize turn-around times (Nichols, Sala, 2000). It has been suggested that a decrease of one minute on average in the ground turn-around

time would result in savings or increased revenues of \$36.5 to \$64.0 per departure on average in the US Airline Industry. (Gittell, 1995, pp.152). Based on these numbers, for an airline like Icelandair with 10,296 departures per year this would translate into savings of \$375,804 to \$658,944 annually.

The flight departure process is important for every airline. Repeated over and over again each day (10,296 departures were performed in scheduled passengers operations at Icelandair in the year of 2005 which translates to 198 departures on average per week or 28 per day), it is the beginning of the service offered to the customer and in today's environment of increasingly automated internet sales it is often the first time the customer comes into direct contact with the airline during its service offering. The perceived service level in the departure process can therefore be an import differentiator in the airline's product offering.

Airline yields, the average fare paid by a passenger per mile flown, have decreased quite dramatically in the past five years or by approximately 23.8% in the US airline industry (15.1 cents per mile in Feb 2000 down to 11.5 cents per mile in Aug 2005 (Hansman, 2005)). This has created an intense pressure for the airlines to constantly lower their operating costs. To achieve this goal airlines have tried the following strategies in the airline departure process: automation of passenger handling in the form of kiosk check-in, increasing specialization in job design to lower staffing levels and outsourcing of ground handling.

The traditional viewpoint is that there is an inherent tradeoff between efficiency and quality of the service offered. As airlines squeeze more and more costs out of their processes the quality of their services is bound to degrade. This would be observed by passengers in worse on-time-

performance, longer waiting times, more lost baggage and other inconveniences so often encountered by travelers.

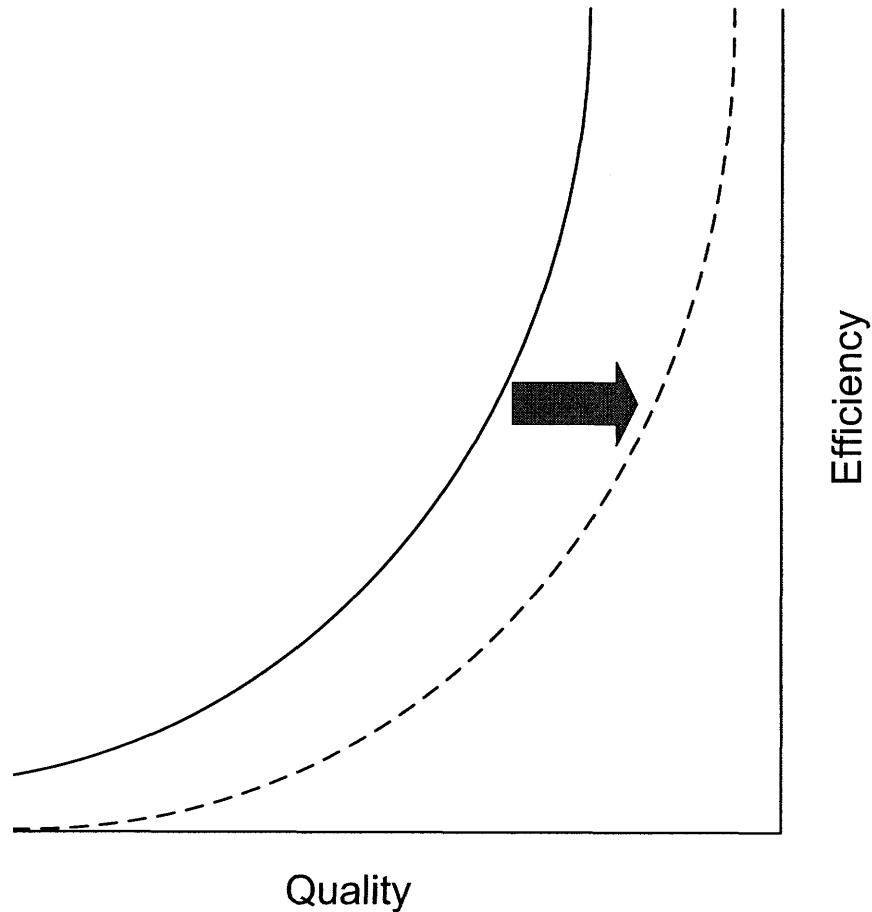


Figure 1-1 Trade-off between cost and quality and effects of a shift in the trade-off boundary
This prompts the question: Does the efficiency - quality tradeoff hold in all cases or are there methods to shift this barrier achieving simultaneous improvements in efficiency and quality? It has been suggested that Southwest Airlines have achieved such a paradigm change with its focus on relationships and coordination. (Gittell, 2003) What effects do relationships and communication have on performance in the flight departure process? What effects, if any, does

outsourcing have on relationships, communication and consequently the performance of the flight departure process?

To answer these questions a framework developed in (Gittell, 2003) will be used to analyze four Icelandair stations. The foundation of this framework in the literature is described in chapter 1.3 and the model itself is described in chapter 1.4. Chapter 1.1 will define the flight departure process and chapter 1.2 will introduce Icelandair and its operating environment.

1.1 Definition of the Flight Departure Process

The flight departure process creates a lower bound on the minimum turn-around time of a flight. A turn-around includes disembarking and embarking passengers, refueling, unloading and loading baggage, freight and mail, cleaning the airplane, performing security checks and maintenance. During the turn-around the airplane is not utilized to create revenue. As such, any improvement in efficiency of this process can be very valuable to airlines because it provides opportunity for higher utilization of the airline's fleet, which is the most capital intensive asset of the airline. The process is highly regulated, complex and usually requires coordination and cooperation of at least twelve different job functions.

The flight departure process is perceived as successful from the passenger's perspective if the passenger and his baggage depart and arrive safely, on time (Berdy, 2000) without any unnecessary problems. In the same way the process is successful from the airline's perspective if the aforementioned passenger success criteria is achieved cost effectively. (Gittell, 1995, pp.30)

1.1.1 The Flight Departure Process at Icelandair

The flight departure process at Icelandair involves twelve job functions: Ticketing Agents, Gate Agents, Baggage Transfer Agents, Ramp Agents, Operations Agents, Pilots, Flight Attendants, Mechanics, Caterers, Cabin Cleaners, Fuelers and Cargo Agents. The primary locations of these job functions are shown in figure 1-2.

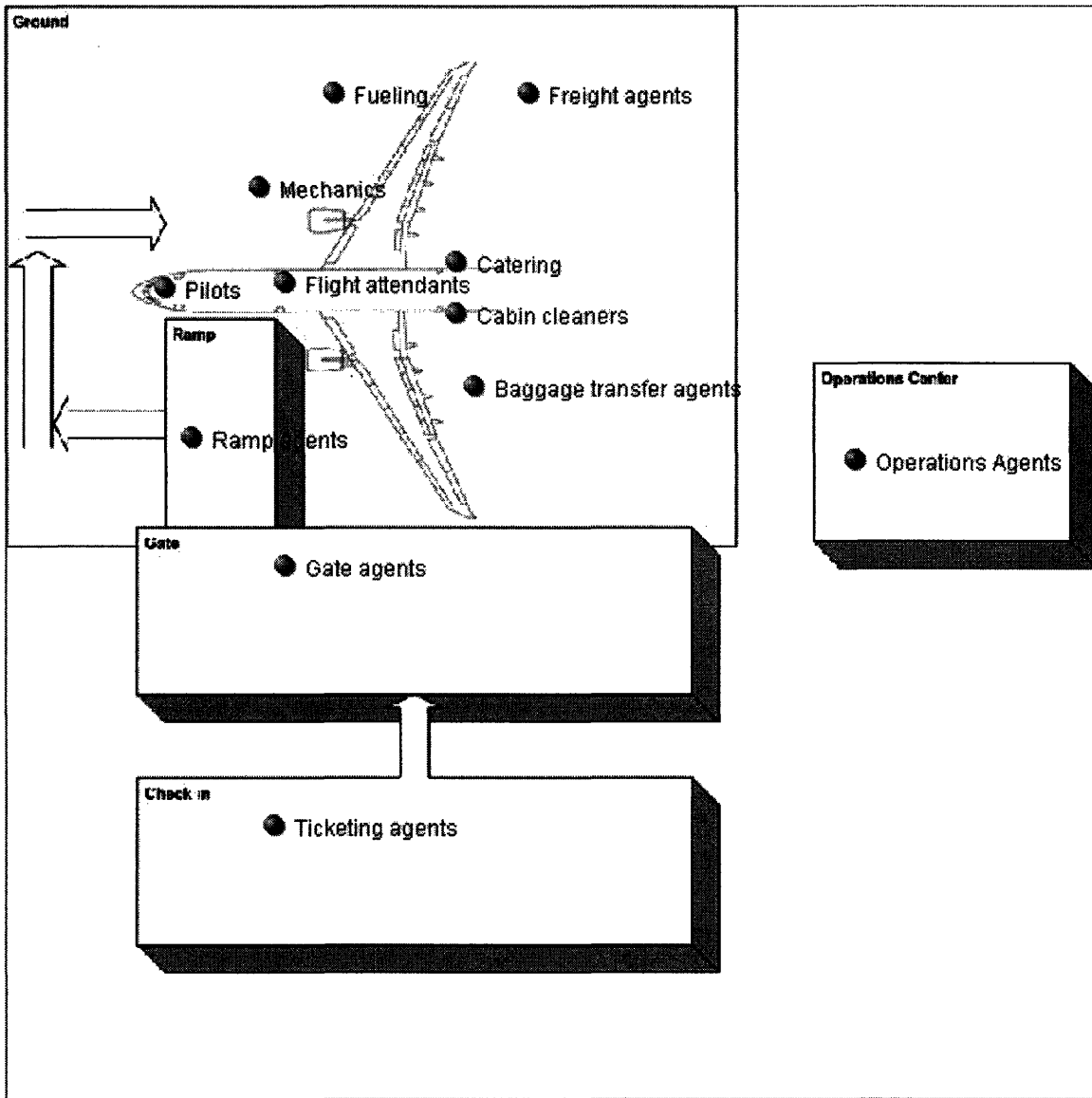


Figure 1-2 Primary job locations of job functions involved in the flight departure process

The process is formally described at a high level in Icelandair's Ground Operations Manual. The main stages of the process are preparing the plane for departure and loading it. The main steps of these stages are described in the table below, which is adopted from a table presented in an MIT doctoral thesis (Gittell, 1995, pp.31).

Table 1-1 Icelandair's Flight Departure Process

The Flight Departure Process

(Based on (Gittell, 1995,pp.31-35) and adapted to Icelandair)

Stage A: Prepare the plane for departure

Task	Performed by	Coordination with
Connect ramp to aircraft, open door and help passengers disembark. Log in flight.	Gate Agent	Flight Attendants
Assist passengers with special needs.	Gate Agent	Flight Attendants, Ramp Agents
Clean plane, check headsets and magazines.	Cabin Cleaners	Gate Agent, (Flight Attendants)
Load food onto plane	Caterers	Ramp agents, Gate agents
Empty bathrooms	Ramp Agents?	
Check weather, flight conditions and determine fuel amount needed	Operations Agents	Operations Center
Refuel	Fuelers	Operations Agent
Do maintenance check, determine whether problem exists, whether and how to correct it	Mechanics	Pilots, upline and downline station mechanics, operations agent.
Security Check	Flight Attendants	Gate Agent
Check cockpit to determine whether all equipment is operable.	Pilots	

Stage B: Load the plane for departure

Task	Performed by	Coordination with
Confirm reservations, sell tickets, ask preferences, accept and enter baggage, check passports. Decide how to reroute passengers and baggage if problems occur, whether to hold plane for late passenger.	Ticketing Agents	Gate Agents, Baggage Transfer Agents
Accept mail and freight	Cargo Agents	Shippers, Baggage Transfer Agents, Operations Agent
Sort and load baggage, decide how to load for best fit.	Baggage Transfer Agents	Cargo Agents, Operations Agents
Sort and load freight and mail.	Cargo Agents	Baggage Transfer Agents, Operations Agents
Check passenger seating, assure adequate seats, decide whether to add freight or standby passengers.	Gate Agents	Ticket Agents, Cargo Agents and Operations Agent.
Check number of passengers boarded, call in to operations agents.	Gate Agents	Flight Attendants, Operations Agents
Compute weight and balance of freight, mail, passengers and fuel.	Operations Agent	Gate Agents, Cargo Agents, Baggage Transfer Agents and Pilots.
Answer passenger questions, assist passengers with special needs	Gate Agents	Ticket and Gate Agents, at departure station and downline station.
US dest. only Check passports at pre-boarding gate	Gate Agents	
Board passengers. Decide when to load and in what order, if any. Decide whether carryon luggage is excessive.	Gate Agents, Flight Attendants	Flight Attendants, Pilots
Welcome passengers on board, seat them, assist them, adjust seating, help passengers store luggage.	Flight Attendants	
Serve refreshments to Business Class Passengers	Flight Attendants	
Give weather, load and fuel information to captain	Gate Agents	Operations Agent, Pilots
Close doors to plane, make sure ladders and belt loaders are removed from plane, dispatch flight.	Gate Agents	Ramp Agents, Pilots
Signal readiness to tower	Pilots	
Turn on full engines	Pilots	
Guide plane away from gate	Ramp Agents	Pilots, Control Tower
Taxi to runway, takeoff	Captain, co-pilot	Control Tower
Determine whether there was a delay, assign delay reasons, report	Gate Agents	All departments

The sequence of the stages is described in figure 1-3. The figure is a so called Petri Net. Petri nets contain “Places” and “Transitions”. “Places” are indicated as lines and transitions as circles. All transitions leading into a place have to be concluded before the transitions following that place can be started.

The sequencing of stages makes different job functions heavily dependent on one another. For example gate agents are not able to commence passenger boarding without security checks being complete. The security checks are performed by the flight crew and if they are delayed it puts added pressure on the gate agents. This in turn can create adversarial relationships if the level of communication and knowledge about other job functions does not exist.

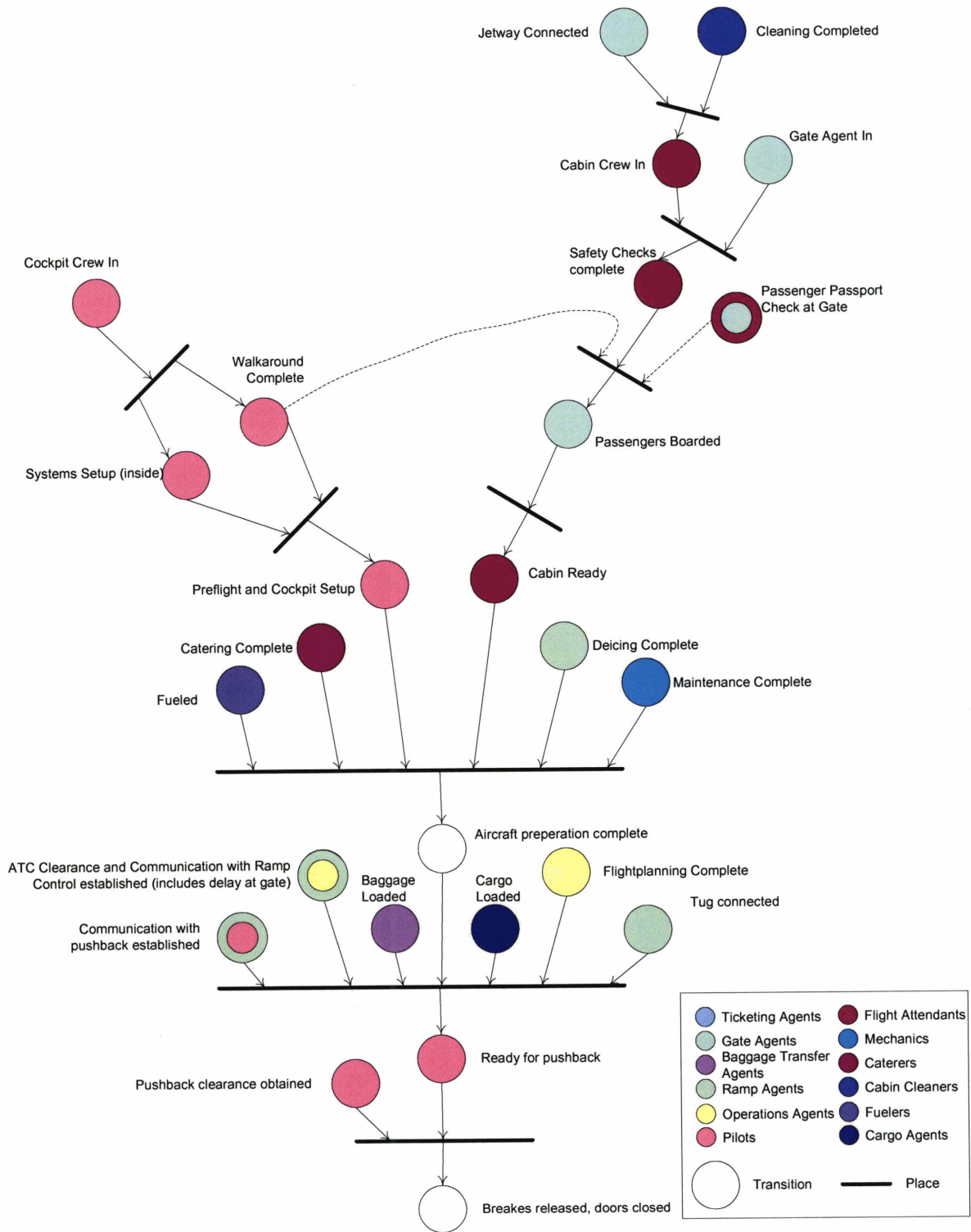


Figure 1-3 Petri Net Diagram of the Flight Departure Process with primary responsibilities and involvement of each job function highlighted

1.2 About Icelandair

Icelandair is an international airline with a single hub in Keflavik International Airport in Iceland. It focuses on three distinct markets in its operation: the market serving people wanting to travel from Iceland to Europe or North-America; the market serving people who want to visit Iceland; and the North-Atlantic market of people traveling from North-America to Europe and vice versa via the hub in Iceland. Serving the North-Atlantic via market is enabled by Iceland's geographic position and the fact that most Northern-Atlantic flights fly very close to Iceland if not directly over it. The schedule displacement of the passenger compared to choosing a non-stop North-Atlantic flight therefore mainly consists of the connecting time in Iceland.

Icelandair outsources many of its departure process job functions, some by choice and others by necessity. With one flight per day or less into many cities, it would be uneconomical for Icelandair to keep its own ground handling staff at all of the 20+ airports it flies to. On the other hand at its hub airport in Keflavik, Icelandair decided in 2001 to spin off its ground handling, maintenance and other ground operations into independent sister companies. This was done to assign clearer accountability, control costs better and to be able to offer the services of the companies in a credible way to other airlines serving Keflavik. This vertical disintegration creates challenges such as misalignment of goals in the passenger servicing processes, the passenger has a lot of face to face contact with non-Icelandair employees while consuming their product and the confusion amidst the partner companies employees as to when they are supposed to be representing Icelandair and when their own company.

In this study information was gathered on four different stations in Icelandair's route network: the hub station in Keflavik, Iceland (KEF) and the spoke stations at London Heathrow, United

Kingdom (LHR), Copenhagen Kastrup, Denmark (CPH) and Boston Logan, USA (BOS). The names of these stations will be abbreviated to their three letter airline codes listed in brackets in the previous sentence.

1.2.1 Hub

Most legacy airlines have structured their network as a hub and spoke system. This means that their network is formed around one or more hubs and their flights scheduled so that they meet at the same or similar time at the hub to accommodate connecting passenger traffic. This results in the ability of an airline like Icelandair to serve 118 distinct origin and destination markets (O-D markets) with only 44 flight legs per day. (Icelandair has 16 European Destinations and 6 North-American Destinations from its Keflavik hub. This means it serves 22 O-D markets with non-stop flights from Iceland and another 96 O-D markets with one-stop service in Keflavik.) By doing this traffic is consolidated into the 44 flights making service into lower demand markets feasible.

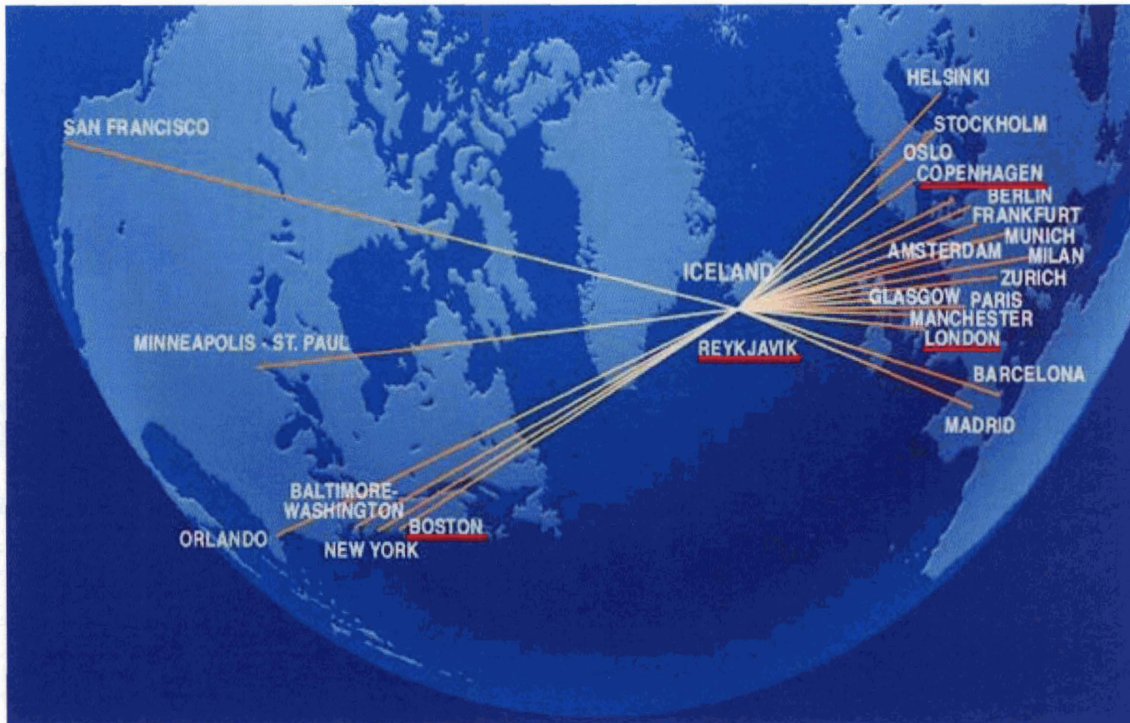


Figure 1-4 Icelandair's Route Network and stations involved in the research highlighted, Source: Icelandair.com

The network airline creates banks at its hub where many flights connect at the same time. This is done to minimize connecting times for the passengers, thereby minimizing their schedule displacement of having to connect at the hub (Nichols, Sala, 2000). The connecting time plays a big part in determining the attractiveness of the connecting product compared to a non-stop product potentially offered by other airlines. This creates operational inefficiencies. The hub airport is highly utilized during the bank times but underutilized outside the bank times. In Icelandair's case flights depart from N-America late in the evening landing in Keflavík Iceland between 6am and 7am, when the morning bank at Keflavík airport starts. The flights from Iceland to Europe then leave from 7:30am to 9am, when the 3 hour morning bank ends. The second bank starts around 2:30pm when the first flights from Europe arrive back in Keflavík and ends around 5pm when the last flights to North-America depart from Keflavík. At the spoke

airports near to the hub there are usually excessive turn-around-times planned to minimize the connecting times at the hub and on the other hand the turn-around-times will have to be kept to a minimum at the spoke cities far from the hub. This creates different inefficiencies – low utilization of aircraft because of long turn-around times at the near stations and higher ground operations costs and quality problems due to the fast turn-around needed at the stations further away.

Low cost carriers are aware of the advantages and disadvantages of hub and spoke operations and have made the strategic decision to focus on serving high demand O-D markets with point to point, otherwise called direct, non-stop operations. This does not mean that low cost carriers do not serve any connecting traffic – it simply means that they do not go out of their way to accommodate it. By doing this they are able to achieve a higher utilization both from their aircrafts, crews and ground operations personnel and equipment by distributing operations more equally over the day (debanking) and being able to fly more flights per day by getting the airplane back in the air as soon as the turn-around has been achieved in the minimum time possible. At the same time they are mostly foregoing the benefits of consolidating traffic from many O-D markets on to their flights limiting their operations to relatively high demand O-D markets.

1.2.2 Pacing stations

Pacing stations are the stations that are located in the network and schedule of the airline so that their minimum turn-around-time puts a boundary on the airlines' schedule. As an example in Icelandair's network Minneapolis is the city furthest away from the hub in Keflavík in the westbound bank. (Icelandair also flies to San Francisco and Orlando, which are further away, but

those cities are too far away to make it back to KEF in time for the eastbound bank so the plane has to stay overnight in these cities.) The flying time to Minneapolis plus the minimum turn-around-time therefore put a boundary on the possibility of scheduling flights into Icelandair's banks. Any reduction of minimum turn-around-times at pacing stations creates flexibility for higher utilization of Icelandair's fleet.

1.2.3 Nonpacing Stations

Nonpacing stations are the stations that do have excessive time to turn around the airplane because of their location near to the hub station in the network, relative to other stations. At non-pacing stations efficiency improvement through staff reduction is preferred to shortening of turn-around-times, because these stations already have slack built into their turn-around times.

1.3 Literature review

Gittell and Weiss (Gittell, Weiss, 2004) reviewed the two bodies of literature that are aimed at helping us explain how to effectively integrate work across organizational units and organizations.

1.3.1 Organizational Theory

The first, Organizational Design, describes how cross-functional routines or protocols, cross-utilization, information systems, boundary spanners or liaisons and cross-functional meetings have been shown to be effective cross-unit coordination mechanisms. They also list control mechanisms such as shared incentives, shared performance measures and supervision as effective management tools. The paper goes on to describe how more recent activities have widened the scope of research to mechanisms that integrate organizational activities across

organizations. Amongst these mechanisms are: cross-organizational liaisons like product managers, shared information systems, shared staff, shared supervision, training and accounting systems, shared incentive systems and shared selection systems. Many of these mechanisms that have been shown to be effective integrating job functions within organizations are believed to be applicable in a similar way to integrate job functions across organizations. This has however not been researched extensively.

1.3.2 Network Theory

The other body of literature, Network Theory, looks at the relationships among interacting units and makes the assumption that individuals are interdependent and their relationships influence the decisions of how to allocate and transfer resources. These relationships can create a structure distinct from the formal organizational structure and possibly reinforce or negate the effects of the formal structure. The research which exists on network theory has primarily focused on networks within and amongst communities, and therefore less on networks within or amongst organizations.

The term relational coordination will be used to quantify the strength of relationships or interdependence between the job units that participate in the flight departure process. This terminology was used by Jody Hoffer Gittels research on the departure process at Southwest Airlines, Continental Airlines, United Airlines and American Airlines (Gittell, 2003.) In her research, Gittell shows that there is a positive correlation between higher relational coordination at a station and positive results in both quality and efficiency performance measures. None of the job functions in the departure process of the airlines in this research was outsourced, so this was a purely intra-organizational study.

1.3.3 Outsourcing of logistics functions

The literature on outsourcing of logistics functions has traditionally focused on logistics activities such as transportation, distribution, warehousing, inventory management, order processing and material handling of manufacturing companies or companies handling with physical products. The principles of this literature can however easily be applied and adapted for use in a logistical service offering setting like the airline departure process.

In general companies have three options in offering logistical functions, like the airline departure process. They can provide the function in-house, they can own subsidiaries that they have set up or acquired who perform the function, or they can outsource the function and buy the service. Companies generally only consider functions that are not part of their core competencies or primary sources of revenue for outsourcing. Economies of scale and scope as well as specialized knowledge and technology play a relatively bigger part in the outsourcing decision for smaller companies because they are unable to address those issues sufficiently in-house (Razzaque, Sheng, 1998).

When companies make the decision to outsource they are usually looking to benefit from one or more of the following effects: cost reduction, superior quality, flexibility, focus, leverage and diversification (Jennings, 2002). If the efficiency and quality improvements gained from outsourcing are greater than the costs and risks concerning issues like reliability of service, switching costs, increased coordination costs, loss of knowledge and ability to return to in-house operations the company should consider outsourcing the function. Successful outsourcing requires it to be an informed decision based on detailed analyses lead by strong management that is able to quickly respond to strategic opportunities and threats (Lankford, Parsa, 1999).

Outsourcing arrangements differ in their scope from short term transaction based outsourcing with a weak relationship between the vendor and buyer to a long term strategic alliance building on a strong relationship and integration between the vendor and buyer focused on them winning in the marketplace together. Research on outsourcing in the IT industry has shown three types of outsourcing: *transactional*: simple well defined transactions outsourced with little or no involvement from the buyer needed, *co-sourcing*: buyer and vendor work together on a project with different responsibilities, and *strategic partnerships*: vendor takes over a broader range of functions and handles them as a whole for the buyer (Ross, Beath, 2005).

Successful partnerships tend to exhibit five principles: Business is concentrated on relatively few partners, partners carry out joint improvements, they have formal systems to measuring partners' performance, they employ a two-way feedback system and thrive on communication, and partner performance decides level of business (Gooley, 1994).

1.4 Coordination and control in the flight departure process

The framework used to analyze effects of relationships and coordination at four Icelandair stations was developed in "Crossfunctional Coordination and Control: Influencing Employee Behavior and Process Outcomes through Organization Design in the Airline Industry" (Gittel, 1995) and the results and further work was also published in "The Southwest Airlines Way: Using the Power of Relationships to Achieve High Performance" (Gittel, 2003).

The framework, pictured in figure 1-5, describes how there are three main factors that determine the outcome or observable performance of the flight departure process:

- Product Complexity and Station Characteristics
- Coordination Behavior
- Systems of Coordination and Control

It also describes the dynamics of how the coordination and control systems in place influence the cognitive frame, which encompasses the level of shared goals, knowledge and respect between job functions. The cognitive frame influences the coordination behavior and a higher level of coordination behavior can also reinforce the cognitive frame.

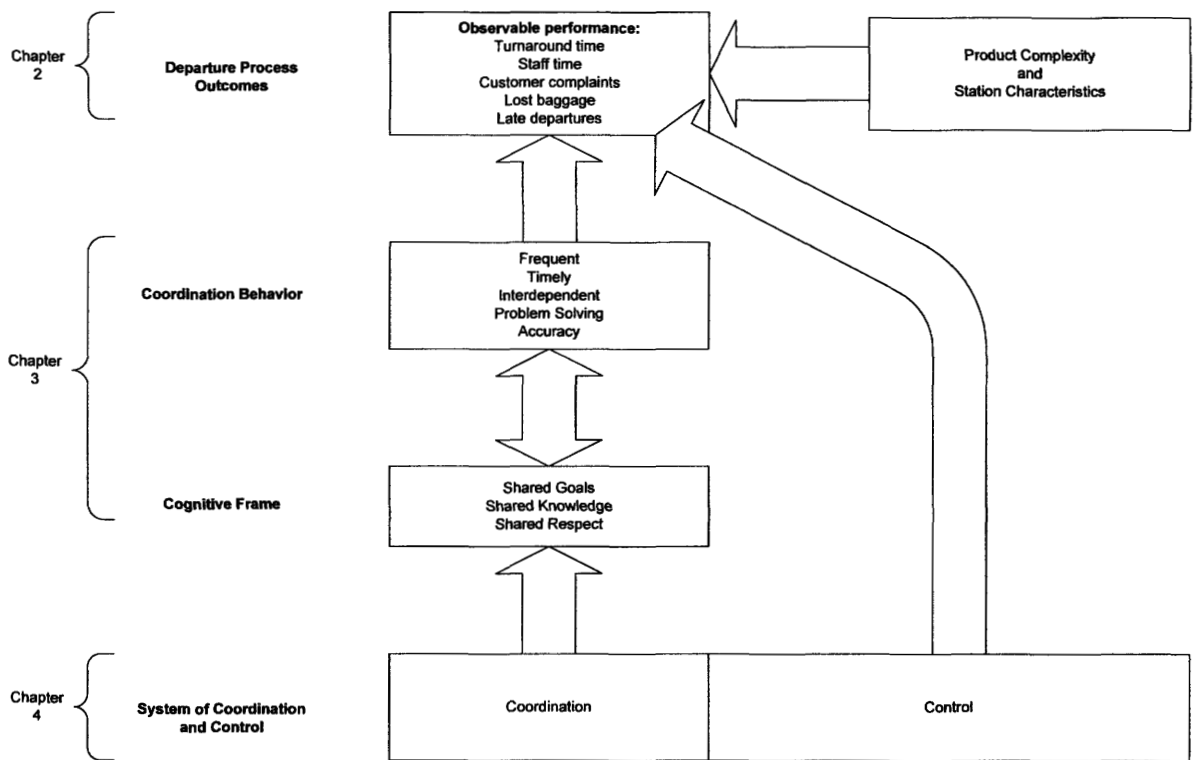


Figure 1-5 Model of the effects of coordination and control in the flight departure process. (Adapted from Gittell, 1995, pp. 113)

This document is structured according to the framework as described in figure 1-5. Data on performance, product complexity and station characteristics was collected, primarily from Icelandair's own information systems. This data is described in detail in chapter 2.

To analyze the cognitive frame and coordination behavior at work in the flight departure process a survey was performed amongst five of the job functions involved in the flight departure process from all the four stations. The survey is described in detail in chapter 3.

Systems of coordination and control in Icelandair's flight departure process were analyzed by structured interviews with station managers at the four different stations as well as their supervisor, manager stations, who is located at Icelandair headquarters. The structured interviews are described in detail in chapter 4.

Chapter 5 discusses the different methods of sourcing the job functions employed at the four different Icelandair stations and the effects outsourcing has on relationships and coordination.

Chapter 6 summarizes the observations, conclusions and recommendations made in this thesis and makes recommendations on related future research.

The purpose of this thesis is to study the effects of intra- and inter-organizational communication and relationships on the performance of the flight departure process as well as the effects outsourcing has on communication and relationships. Some of the characteristics of the Icelandair stations that will be studied are quite different. As an example at some stations Icelandair has almost completely outsourced the job functions involved in the flight departure process while at others they are in majority operated by Icelandair. Some stations have supervisors called station managers - others do not. Some of the stations are very time

constrained like the hub station in Keflavík and the stations that are farthest away from the hub, while others like the Boston station have the luxury of a three hour turn-around-time because it is near to Keflavík compared to the other North-American stations. Do these characteristics warrant different management methods and organizational behaviors at the different stations? What effects, if any, does outsourcing have on relationships, communication and consequently the performance of the flight departure process?

2 Performance in the Flight Departure Process

The purpose of this chapter is to define performance measurements of the four stations in the study as well as data on the station characteristics and there specific product.

2.1 Data and Methodology

To measure the performance of the flight departure process at Icelandair information was gathered on four different stations in its route network: the hub in Keflavík, Iceland (KEF) and the spoke stations at London Heathrow, United Kingdom (LHR), Copenhagen Kastrup, Denmark (CPH) and Boston Logan, USA (BOS). This information can be split into three categories: performance data, product data and station characteristic data.

The performance and product data measurements are based on measures used in a research on relational coordination in the flight departure process (Gittell, 1995; Gittell, 2003). Authorities in Europe make much lower requirements on submission of operational data from airlines than the US Government. This means that almost all of the performance and product measurements had to be gathered from Icelandair itself, instead of being able to extract the data from a single Form 41 database like in the US.

2.1.1 Performance Data

The following performance data was observed at the four stations in the year 2005.

Table 2-1 Efficiency, Quality and Product Data for four stations

	BOS	CPH	KEF	LHR	Total	Std.
	n=12	n=12	n=12	n=12	n=48	Dev
Efficiency						
Turnaround time	180.2	88.3	76.5	67.6	100.4	41.4
Staff time	101.5	65.1	65.9	77.9	77.6	19.9
<i>Efficiency Index</i>	1.56	0.87	0.81	0.84	1.0	0.30
Quality						
Customer complaints	29.3	24.3	9.0	40.6	25.8	17.4
Lost baggage	20.8	18.7	4.3	14.0	14.5	8.8
Late departures	6.4%	21.1%	37.3%	36.1%	25.2%	14.1%
<i>Quality Index</i>	1.19	1.00	1.45	0.76	1.10	0.44
Product Complexity						
Flights per day	1.0	2.6	14.1	1.9	4.9	5.4
Average flight length	3882	2151	2752	1901	2671	734
Passengers per flight	170.2	160.9	155.5	158.5	161.3	24.3
Cargo per flight	1.27	1.18	1.41	0.88	1.19	0.37
Passenger connections to flight	6.6%	16.8%	38.2%	3.2%	16.2%	12.7%

2.1.1.1 Efficiency

Turn-around time: Turn-around time is the average scheduled time waiting at the gate, per departure, for all flights departing from the station that are not overnighing. This information was calculated from a list of all Icelandair scheduled passenger flights. If the ground time exceeded five hours it was assumed that the plane was overnighing and the time was therefore not counted towards turn-around time. *Source:* Icelandair’s Resource Management System which handles all assignments of aircrafts and crews to flights.

Turn-around time is an excellent efficiency performance indicator if the station in question is a hub or a pacing spoke station. If it is not, any efficiency gains will not be observed in the turn-around time because the plane will not depart sooner than the optimal scheduled departure time.

Another question about how appropriate turn-around-time is as an efficiency measure arose when analyzing the station data of a network airline like Icelandair. Is a quick turn-around time the result of efficiency at the stations or simply a result of scheduling? By looking at the

relationship between turn-around times and on-time-performance it is possible to see that the stations with the quickest turn-around time maybe have not yet achieved the necessary efficiency to make them happen on a consistent basis.

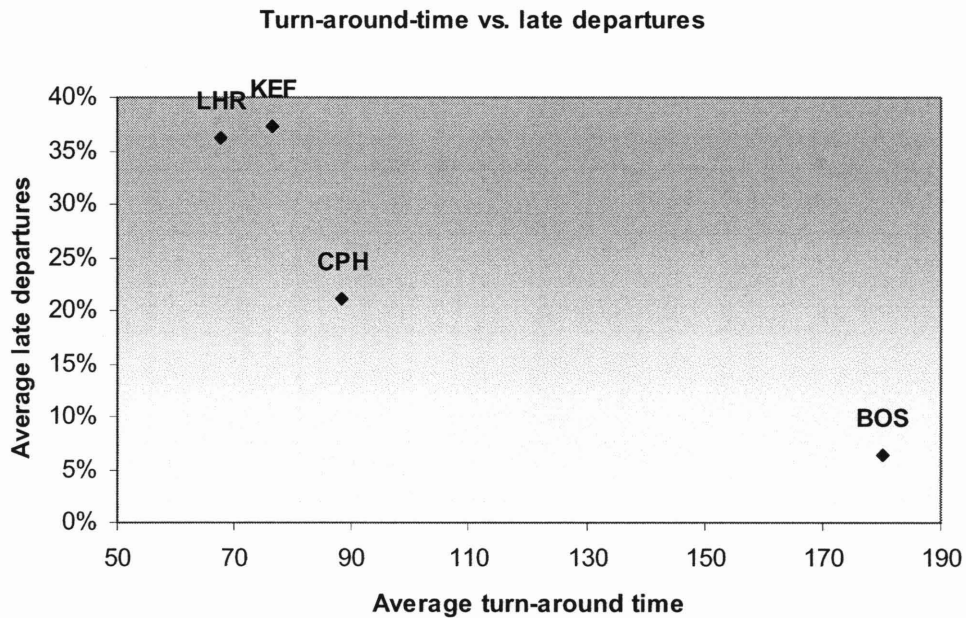


Figure 2-1 Turn-around time vs. late departures

A valid case could therefore be made that turn-around time should be classified as product or station characteristic rather than efficiency measure. This will not be done in this study on grounds of the decision of using metrics established in previous studies as mentioned above. It is however important to note the problem of this metric, because it signals a worse performance by the BOS station than it actually is.

Staff time: Staff time was gathered by counting the number of full-time-equivalent staff per 1,000 daily passengers at the stations for the following job functions: Ticketing Agents, Gate

Agents, Baggage Transfer Agents, Ramp Agents, Operations Agents and Cabin Cleaners.

Source: Icelandair station managers.

Decreasing turn-around-time by increasing staffing to the point that the efficiency gains from decreased turn-around-time have been eliminated is of no value. Therefore the staff time efficiency measure is necessary to keep an appropriate balance between turn-around-times and staffing at the stations.

Staff time is a good efficiency measurement if it can be measured consistently and attributed to specific airlines. This is easy when the airline handles the departure process itself. When the ground handling of an airline is outsourced this measurement becomes blurry because the ground handler usually handles many airlines to gain economies of scale and higher utilization. In the outsourcing case a better efficiency measurement might be the cost of ground handling at the station to the airline. When using this measurement as a key efficiency metric it is important for the airline to realize that it is not sufficient to negotiate a good deal with the ground handler to improve efficiency – it has to create the environment of trust and cooperation for the ground handler to realize the necessary efficiency gains for the contract to be sustainable.

The cost data as a performance measurement is considered more sensitive information and Icelandair was unwilling to share this sensitive information. Therefore estimated staff time will be used as described above as efficiency metric. Furthermore it is difficult to use this measurement in an international study like this because pay scales vary widely between countries. This complication actually makes any efficiency measurements between countries difficult because use of automation information technology to save on labor costs may be a good

idea in countries where labor costs are high but not worth while in countries where labor costs are low.

Efficiency Index: The two efficiency measures are combined into an index with the following formula:

$$\text{Efficiency Index} = \frac{1}{2} \left(\frac{\text{Turnaround Time}}{\text{mean(Turnaround Time)}} + \frac{\text{Staff Time}}{\text{mean(Staff Time)}} \right)$$

Shorter turn-around-times and lower staffing numbers indicate more efficiency. Therefore a lower efficiency index indicates a more efficient operation. Again, it is important to note that efficiency is underestimated by this metric in the case of the BOS station on the grounds that they have a longer turn-around-time than the other stations because of network structure.

2.1.1.2 Quality

Measuring efficiency without taking quality into account defeats the purpose of the measurement. If increased efficiency is only gained by decreased quality of service the service level eventually will fall below what the customer finds acceptable and the company will lose market share. The following metrics were chosen to represent quality of the flight departure process.

Customer complaints: Number of airport related customer complaints per 100,000 passengers.

Source: Icelandair Customer Complaints Database with manual counting done by Icelandair's Customer Relations Department. A note on customer complaints data: customer complaints data could only be secured per annum, as opposed to the rest of the performance, quality and product measures. This average number was approximated down to months by total number of incidents

recorded in the airports per month for comparable data analyses. The source of total incidents was Icelandair's SIF customer service database.

Lost baggage: Number of bags mishandled per 1,000 departure passengers. *Source:* AEA, Association of European Airlines (Sigvaldi Thorisson).

Late departures: Percentage of flights departing more than 15 minutes after scheduled departure time (SDT). **Note:** this is different from the prevailing on time measurement in the United States which is the percentage of flights arriving more than 15 minutes after scheduled arrival time at the flight down line station. Icelandair does not track that statistic. *Source:* Icelandair's Resource Management System.

Quality Index: A quality index was calculated combining the three quality measurements: customer complaints, lost baggage and late departures. This index was calculated with the following formula:

$$\text{Quality Index} = 3 \left(\frac{\text{Customer Complaints}}{\text{mean}(\text{Customer Complaints})} + \frac{\text{Lost baggage}}{\text{mean}(\text{Lost baggage})} + \frac{\text{Late departures}}{\text{mean}(\text{Late Departures})} \right)$$

A lower number of customer complaints, lost baggage and late departures indicate higher quality. The Quality Index is calculated so that a higher quality index indicates higher quality.

2.1.2 Product Complexity Data

The product data of each station shows the difference in complexity of operations at each station. Based on circumstances different levels of coordination and cooperation are required. Factors like turn-around-time, number of operations, average load of the flights and amount of cargo

have a great impact on how difficult it is to perform the flight departure process efficiently and with high quality. The following variables were chosen to represent this complexity at the different stations.

Flights per day: Number of flights departing from the station per day. *Source:* Cognos, Icelandair's Management Information System, Leg statistics cube.

Average flight length: Average flight length in kilometers of departing flights from the station. *Source:* Cognos, Icelandair's Management Information System, Leg statistics cube.

Passengers per flight: Average number of passengers per flight departing from the station. *Source:* Cognos, Icelandair's Management Information System, Leg statistics cube.

Cargo per flight: Average tons of cargo and mail carried per flight departing from the station. *Source:* Cognos, Icelandair's Management Information System, Leg statistics cube.

Passenger connections: Percentage of passengers connecting from other flights to the Icelandair flights departing from the station. *Source:* Extracted from ticketing information for the whole year of 2005.

2.1.3 Performance Data adjustment for Product Complexity

As can be seen in table 2-1 the complexity of the product offering at each station varies. Other similar studies have used a linear regression over a large sample of stations to determine the effects of product variables on performance and using the parameters to recalculate the performance variables excluding the effects of the product complexity.

This method is only appropriate when it is believed that there is a linear relationship between the product complexity and performance of the stations. In the absence of a large sample of comparable stations use of the regression method was not possible in this research. When interpreting and analyzing the data it is therefore necessary to take the product characteristics into account qualitatively.

2.1.4 Station outsourcing characteristics

The stations differ in other ways than simply the products they offer. The level to which job functions involved in the flight departure process are outsourced differs and also how many companies are involved in the flight departure process.

Table 2-2 Partner companies at the four stations

	BOS	CPH	KEF	LON
Ticketing Agents	FI	3RD	REL	FI
Gate Agents	FI	3RD	REL	3RD
Baggage Transfer Agents	FI	3RD	REL	3RD
Ramp Agents	3RD	3RD	REL	3RD
Operations Agents	FI	3RD	REL	3RD
Pilots	FI	FI	FI	FI
Flight Attendants	FI	FI	FI	FI
Mechanics	3RD	3RD	FI	3RD
Caterers	REL	REL/3RD	REL	REL
Cabin Cleaners	3RD	3RD	REL	3RD
Fuelers	3RD	3RD	3RD	3RD
Cargo Agents	3RD	3RD	REL	3RD
Job functions outsourced to 3rd party	5	9	1	8
Outsourcing to 3rd party (perc of departure Job fcts.)	41.7%	76.9%	8.3%	66.7%
Job functions outsourced to rel.comp	1	1	9	1
Job functions inhouse	6	2	2	3
Number of diff. Companies	6	7	3	7
Legend:				
FI	Job function performed by Icelandair			
REL	Job function performed by company related to Icelandair			
3RD	Job function performed by 3rd party partner company			

Job functions outsourced to 3rd party: How many of the twelve flight departure related job functions are outsourced to a company unrelated to Icelandair at the station? *Source:* Interviews.

Job functions outsourced to related companies: How many of the twelve flight departure related job functions are outsourced to a company within the Icelandair Group? *Source:* Interviews

Number of different companies: The number of different companies that were involved in the flight departure process at each station. *Source:* Interviews.

3 Relationships and Coordination in the Flight Departure Process

The purpose of this chapter is to introduce a survey done amongst employees at four Icelandair stations to measure the level of coordination behavior and the cognitive frame of the employees involved in Icelandair's flight departure process.

3.1 Data and Methodology

3.1.1 Survey Methodology

The survey used to measure the relational coordination, i.e. the cognitive frame and coordination behavior, at the four stations is based on a survey that has been used in a number of researches on relationships and coordination in the airline flight departure environment (Gittell, 1995; Gittell, 2003) as well as in the health care environment(Gittell et al, 2005). The survey is presented in Attachment A to this document.

Based on the model presented in chapter 1.4 it is interesting to measure both the cognitive frame of the job functions involved in the flight departure process as well as the coordination behavior of these job functions.

3.1.2 Survey Administration and Data

The questions in the survey were presented on a five point Likert scale. Five out of the twelve job functions involved in the flight departure process were surveyed and asked the above mentioned questions in respect to each of the twelve job functions. The job functions surveyed were: baggage transfer agents, gate agents, operations agents, ramp agents and ticketing agents. The survey was administered by Icelandair or IGS station managers at the stations in March and April of 2006. The number of answered surveys from each station is listed in table 3-1.

Table 3-1 Number of Survey Answers

	Baggage transfer agents	Gate agents	Operations agents	Ramp agents	Ticketing agents	Sum
BOS	5	5	2	0	2	14
CPH	7	10	5	15	6	43
KEF	8	5	6	15	5	39
LHR	3	7	6	3	3	22
Sum	23	27	19	33	16	118

The survey population was all employees from the five job functions working Icelandair flights present during one shift in the case of LHR and BOS, two shifts during the same day in the case of CPH and two flights at the KEF station. Actual returns were good in all cases (over 90%) except BOS where only about 70% of the shift answered the questionnaire and responses from Ramp Agents at that station are missing. This might affect the results of the survey, but hopefully minimally because responses from each job function are adjusted for the number of employees in place from each job function at each station, as described in chapter 3.2.1.

3.1.3 Cognitive frame

The cognitive frame is believed to support the coordination behaviors observed by employees. It includes the extent to which goals, knowledge and respect are shared between employees and job

functions. (Gittell, 1995, pp.129) It is possible to speculate that this cognitive frame is equally important to support coordination behaviors between organizations – especially when the companies are working together on a process as integrated as the flight departure process.

To measure the status of the cognitive frame between job functions in the departure process the following questions were used:

- **Shared goals:** How much do people in each of these groups *share your goals* for flight departures?
- **Shared knowledge:** How much do people in each of these groups *know* about the work you do?
- **Shared respect:** How much do people in each of these groups *respect* the work you do?

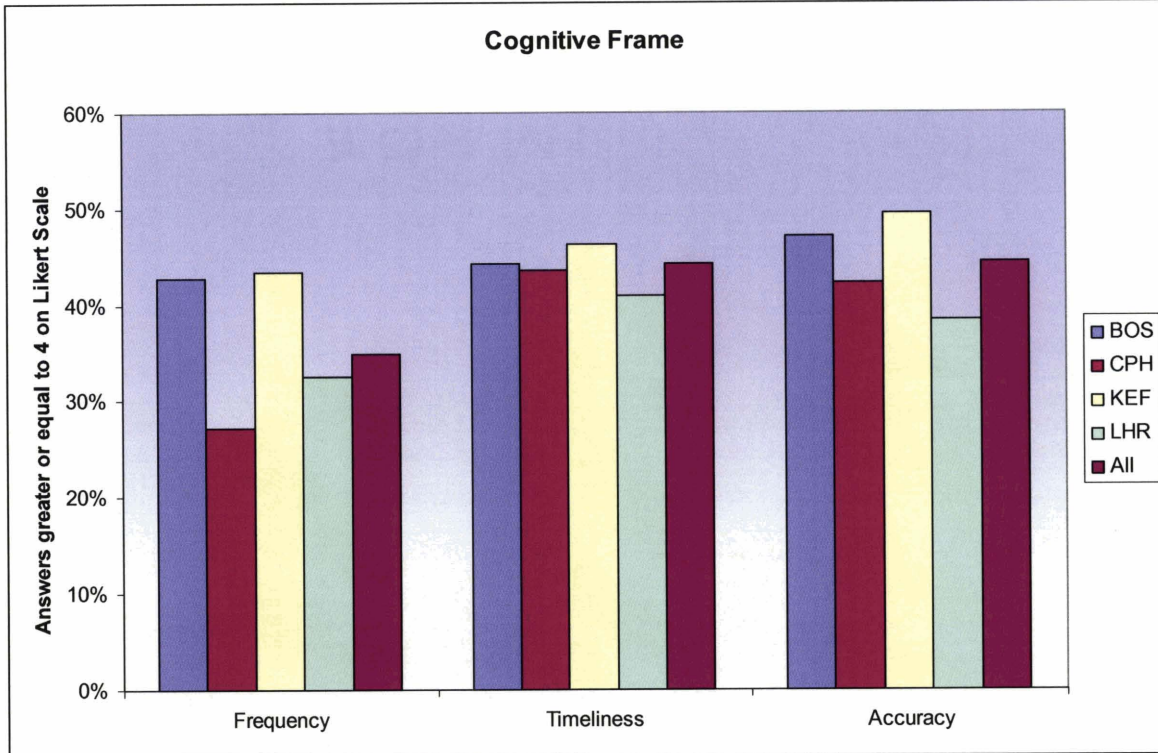


Figure 3-1 Survey results on Cognitive Frame at the four stations

3.1.4 Coordination behavior

One would expect the coordination behavior to have direct impact on the outcomes of the flight departure process through better coordination of all parties involved. This coordination behavior is believed to contain five dimensions: frequency, timeliness and accuracy of communication, interdependence amongst job functions and problem solving behavior when problems arise. To measure these dimensions the following questions were asked in the survey:

- Frequency of communication:** How *frequently* do you communicate with people in each of these groups about flight departures?
- Timeliness of communication:** When people in these groups communicate with you about flight departures, do they do so in a *timely* way?

- **Accuracy of communication:** Do people in these groups communicate with you *accurately* about flight departures?

- **Problem solving behavior:** When problems occur with flight departures, do people in these groups blame others or work with you to *solve the problem*?

- **Dependency:** How *dependant* is the outcome of your job on the people in each of these groups?

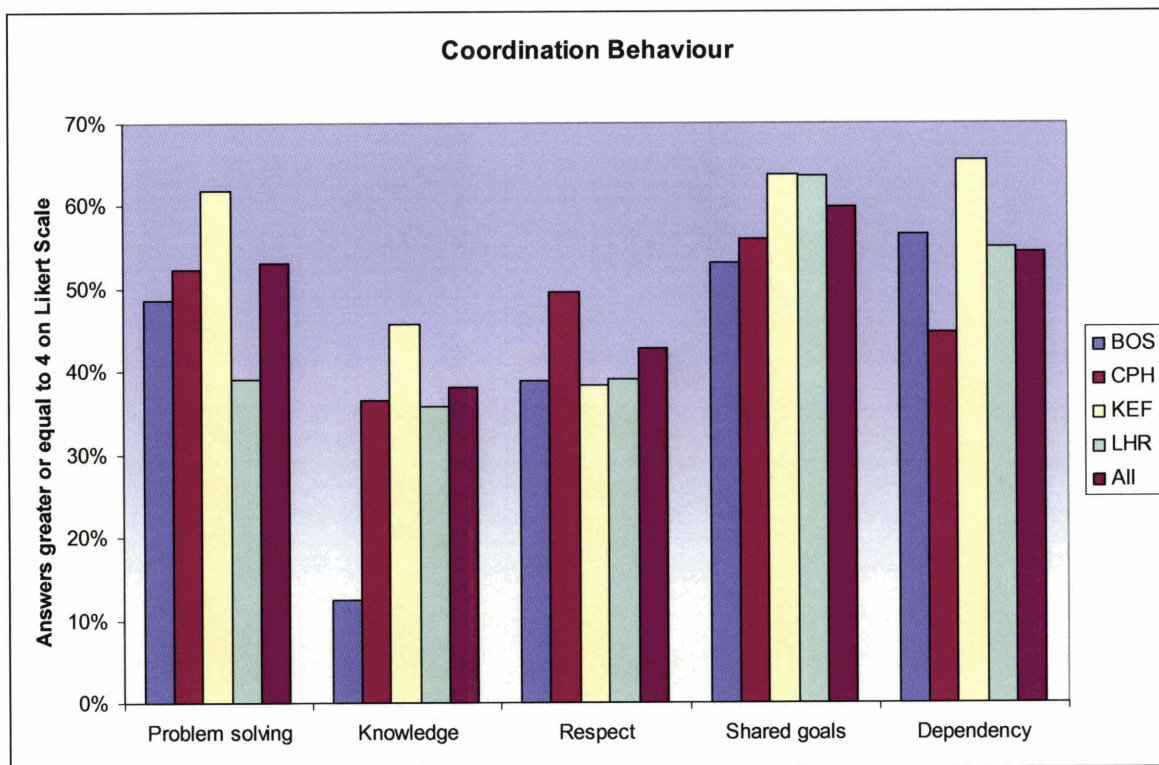


Figure 3-2 Survey results on Coordination Behavior at the four stations

3.1.5 Observed problems

One question in the survey was asked to measure the observed performance of the job functions in the departure process as it was perceived by the employees themselves without necessarily having knowledge of performance data to support this observation. This question was:

- **Observed problems:** Have you had problems in working with the people in each of these groups in the last 12 months?

3.2 Survey Results

3.2.1 Relational Coordination

The survey data is aggregated into a single index for each station, a relational coordination index, which measures both the cognitive frame and coordination behavior at each station. This index was computed by counting the number of answers from each job function which scored 4 or higher on a five point Likert scale and dividing by the total number of answers. This was done for the answers to the eight questions asked to measure the cognitive frame and coordination behavior, described in chapter 3.1. The resulting percentages were averaged per answering job function and then adjusted by the proportion of employees at each station coming from that job function. The resulting number is the relational coordination index of the station.

The relational coordination index from the surveys split the stations into two clusters. Two stations had a higher relational coordination index: the hub station in Keflavík (48.24%) and the spoke station in Boston (46.21%). The other cluster contained the spoke stations in London (35.00%) and Copenhagen (36.36%).

3.2.2 Effects of Relational Coordination on Quality

The data indicates that there is a link between higher relational coordination and quality in the flight departure process.

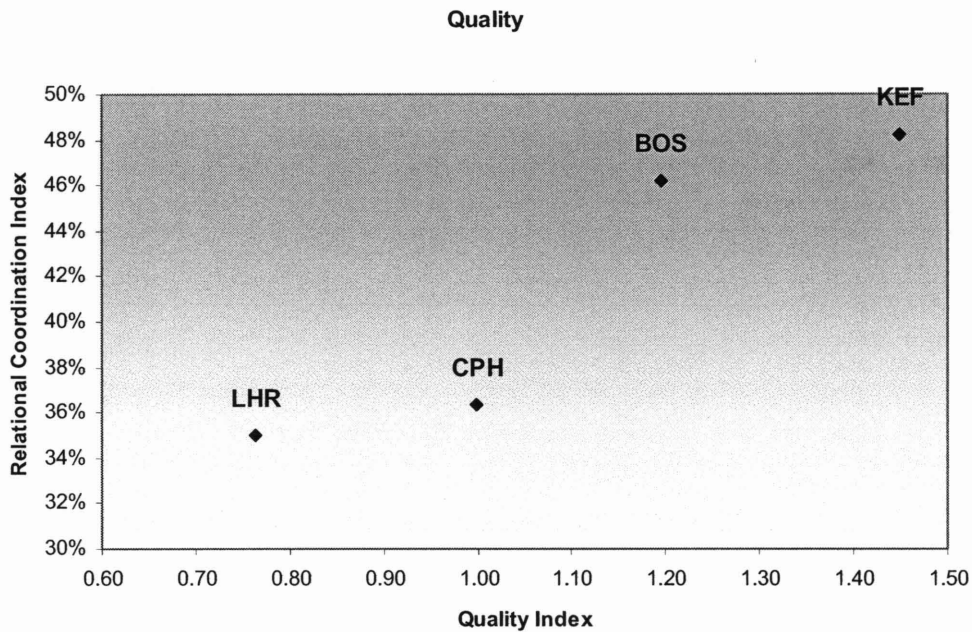


Figure 3-3 Effects of relational coordination on quality

Product complexity and structural issues of the network also play an important role when the quality at the station is measured. The hub station in KEF benefits to some extent from having a high proportion of connecting passengers which are more likely to complain or report lost baggage at their origin or destination stations. The BOS and CPH stations benefit from having longer turn-around-times than LHR and KEF, especially when it comes to measuring late departures.

3.2.3 Effects of Relational Coordination on Efficiency

From the results of previous studies (Gittell, 1995) one would expect the stations with the highest relational coordination to be the most efficient.

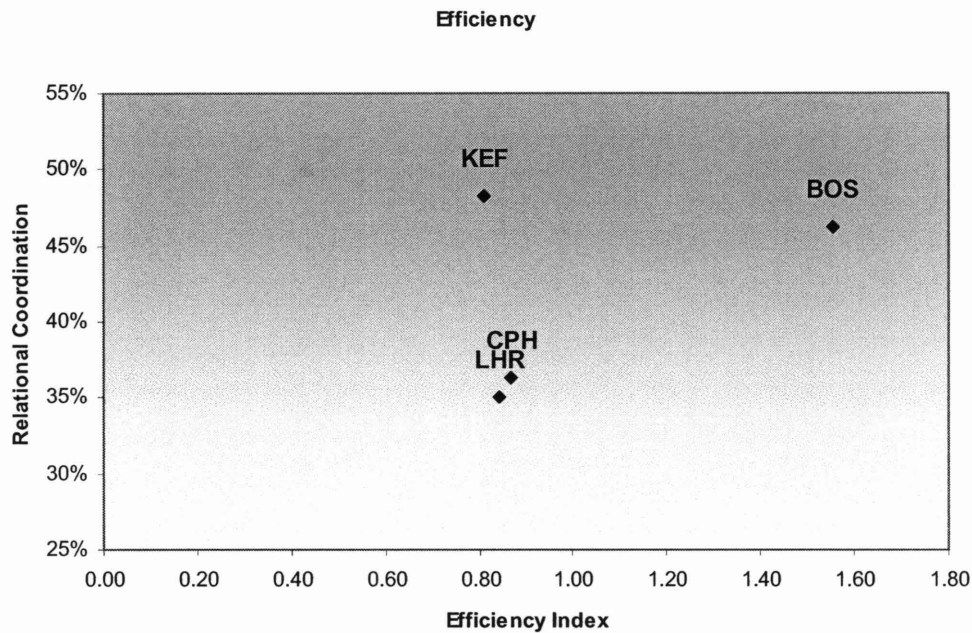


Figure 3-4 Effects of relational coordination on efficiency

This is not apparent in the data, as presented in Figure 3-4. There is very little difference in efficiency between the KEF, CPH and LHR stations while the BOS station is by far the most inefficient. It is necessary to look at the underlying product characteristics of the different stations to understand these results.

BOS has a very long average turn-around-time. This is not caused by the stations inability to coordinate a faster turn-around, but rather is a result of Icelandair's route network. BOS is the station nearest to the KEF hub of all the west-bound destinations. Although it is the last departure from KEF in the west-bound bank it still has to wait for three hours at BOS so that its

arrival to KEF is timed correctly for it to meet with the other planes coming in to that bank. This long turn-around time is also likely to cause inefficiencies in staffing because the staff that is required to handle the arriving flight is idle while waiting for the departure process to begin.

The CPH and LHR stations have very comparable product complexities as well as relational coordination index. They do however have a significant difference in turn-around-times: CPH has an average turn-around-time of 88 minutes while LHR has only 68 minutes on average to turn the plane around. This effect on the efficiency index is however offset by the staffing requirements at the station as CPH is able to perform the flight departure process with on average 16.4% less staff than LHR.

The hub station in KEF has a considerably higher relational coordination index than the LHR and CPH stations but a very comparable efficiency rate. Having by far the highest number of operations per day should furthermore help in achieving more efficient operations as the organizational learning should be faster and utilization of staff higher. But other product complexity factors counteract these positive factors. The largest contributor to inefficiencies is caused by Icelandair's hub and spoke route network which demands that almost all operations in the KEF station take place during two bank times – a three hour morning bank time and a three hour afternoon bank time. During these bank times all of Icelandair's fleet comes into KEF and departs again. Outside of the bank times the station, staff and equipment is underutilized causing inefficiencies. Furthermore, the KEF station has the highest number of connecting passengers and the most cargo per departure in the system increasing the complexity of the product and affecting the stations efficiency.

But can the trade-off between efficiency and quality in this small sample of stations be distinguished?

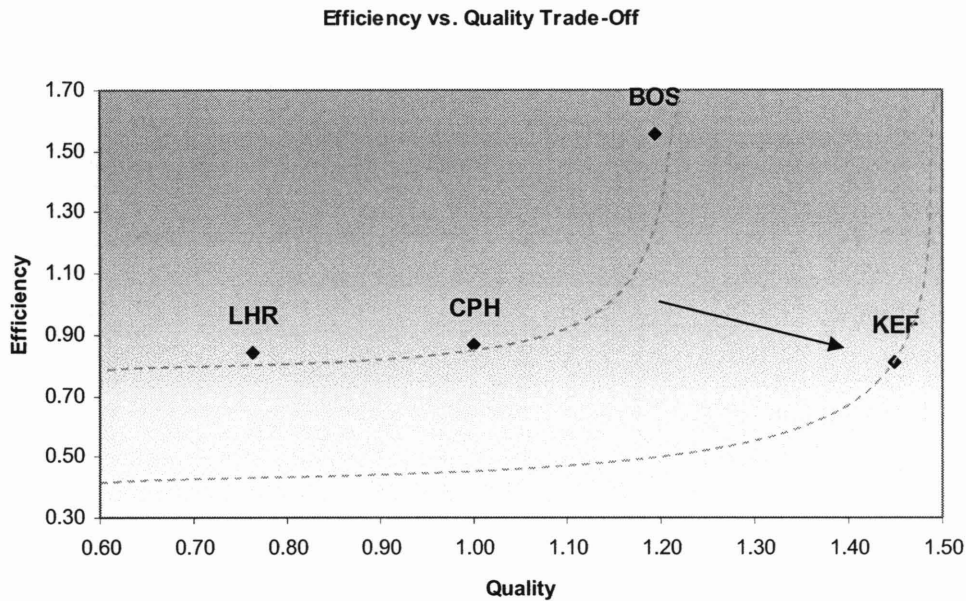


Figure 3-5 Efficiency versus quality tradeoff

The three stations: BOS, CPH and LHR do show behavior that would be expected if there actually is a trade-off between efficiency and quality. The higher the quality, the less efficient the station becomes and vice versa. The KEF station on the other hand does break out of the pattern and in that case there seems to be a complementarity between efficiency and quality. KEF is also the station that has the highest relational coordination index. Is the shift in the trade-off boundary explained by relational coordination? With this small sample it is impossible to be decisive.

Previous studies with larger sample sizes have shown that a high level of relational coordination can contribute to shifting the efficiency-quality trade-off boundary. (Gittell, 1995) But why is the KEF station able to break out of the trade-off, but not the BOS station, which has a similarly high relational coordination index?

It was evident in the interviews and observations made at the stations that the BOS departure process was quite different from that of the other stations. The long turn-around time the BOS station had was actually excessive. In such circumstances there is less pressure to perform tasks as efficiently as possible because it has no observable effects on the end result. Furthermore, you might speculate that having the long turn-around time inhibits coordinational behavior simply because it is not as important as in more time constraint circumstances. Excessive turn-around time has been compared to excessive work in progress inventory in a manufacturing environment where this inventory is used as a backup in case of defects or production stops. (Gittell, 1995) Having this backup in place takes away the incentive to coordinate and improve the processes. At the same time too short or unrealistic turn-around times, as were observed in LHR and to some extent in the KEF hub also remove incentives to coordinate and improve as they may be perceived as unobtainable. The high average percentage of late departures indicates that this has to some extent happened in these stations.

3.2.4 Relationships within stations and boundary spanners

One way of looking at the information obtained from the surveys is to visualize the strength of coordination and relationships between job functions in the flight departure process. The data used to visualize these relationships for all the stations is attached in Attachment E. This data represents the percentage of answers to the eight relational coordination questions that were rated 4 or above on a 5 point Likert scale. There is an asymmetry in this data because only five out of twelve job functions participated in the survey and therefore caution must be made when interpreting this data. The job functions surveyed were Gate Agents, Ticketing Agents, Operations Agents, Baggage Transfer Agents and Ramp Agents.

“The boundary spanner has traditionally been seen as a mechanism for collecting, filtering, translating, interpreting, and disseminating knowledge across functional boundaries. [...] An effective boundary spanner is also engaged in relationship building, developing relationships of shared goals, shared knowledge, and mutual respect among fellow employees to facilitate the coordination of work.” (Gittell, 2003)

At Icelandair, like most other airlines, the primary boundary spanner in the departure process is the Operations Agent. He ties together the different job functions and makes sure everyone has the necessary information and is in a way singing from the same hymn book for a successful departure.

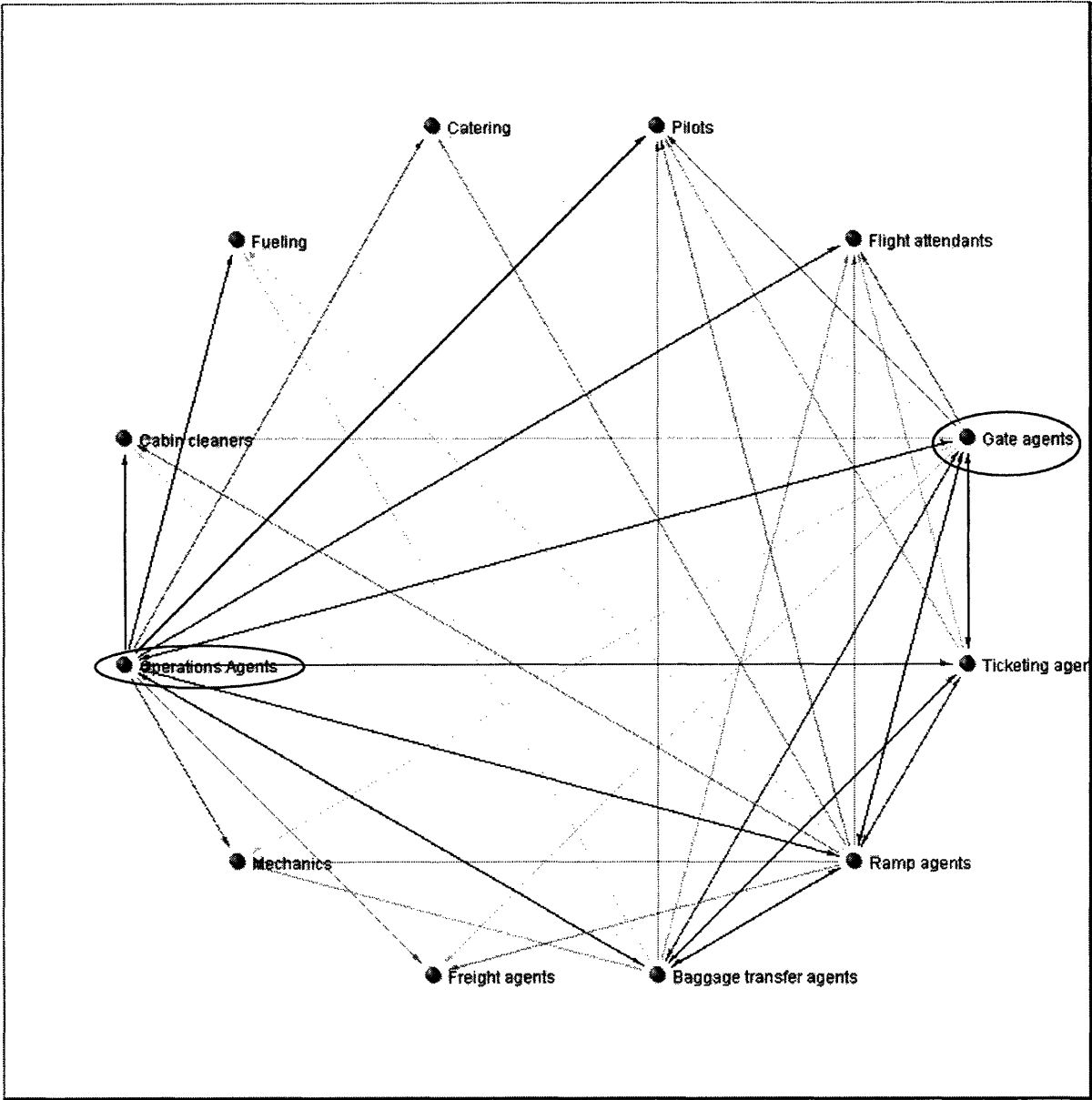


Figure 3-6 Primary boundary spanners in the flight departure process. Aggregated information from all stations, darker line indicates stronger relationship

The survey data supports the statement that the Operations Agent is the primary boundary spanner in the flight departure process, as can be seen in figure 3-6. The operations agent is however at a disadvantage because he is usually located away from all the other job functions, coordinating the flight departure process from the operations center in isolation via radio.

3.2.5 Problems in Cooperation and Relational Coordination

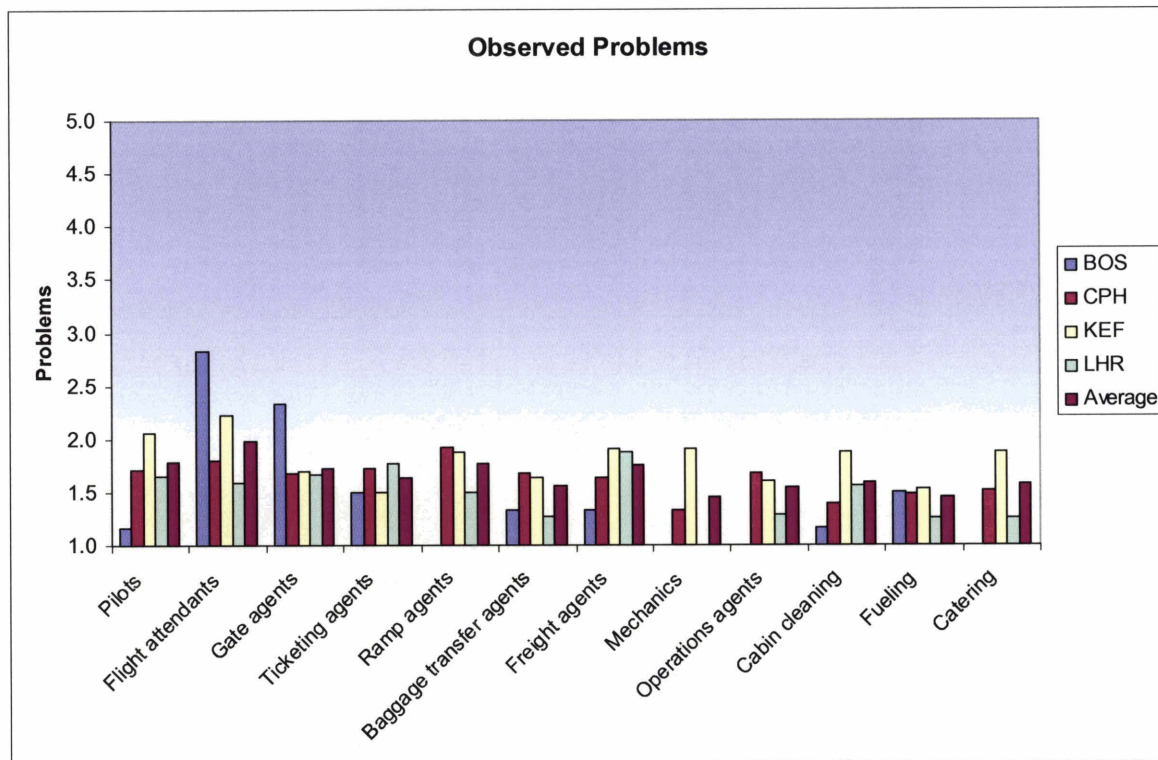


Figure 3-7 Observed problems in the flight departure process; Measured on a five point scale, 1 meaning no problems and 5 meaning many problems

The results from the question: “Have you had problems in working with the people in each of these groups in the last 12 months?” are listed in attachment F. The question was answered on a 5 point Likert scale with 1 meaning no problems and 5 many problems. When interpreting this survey it is necessary to take into account that only five out of the twelve job functions were surveyed. This can cause asymmetries in the results. Gate agents were one of the job functions surveyed and they reported on average the most problems with flight attendants. Flight attendants on the other hand were not surveyed. If they had been surveyed it is possible they would have reported a high number of observed problems with gate agents as well.

The level of problems observed was in general low. The BOS station reported some problems with flight attendants and gate agents. These reports however could be caused by isolated incidents over the twelve month period.

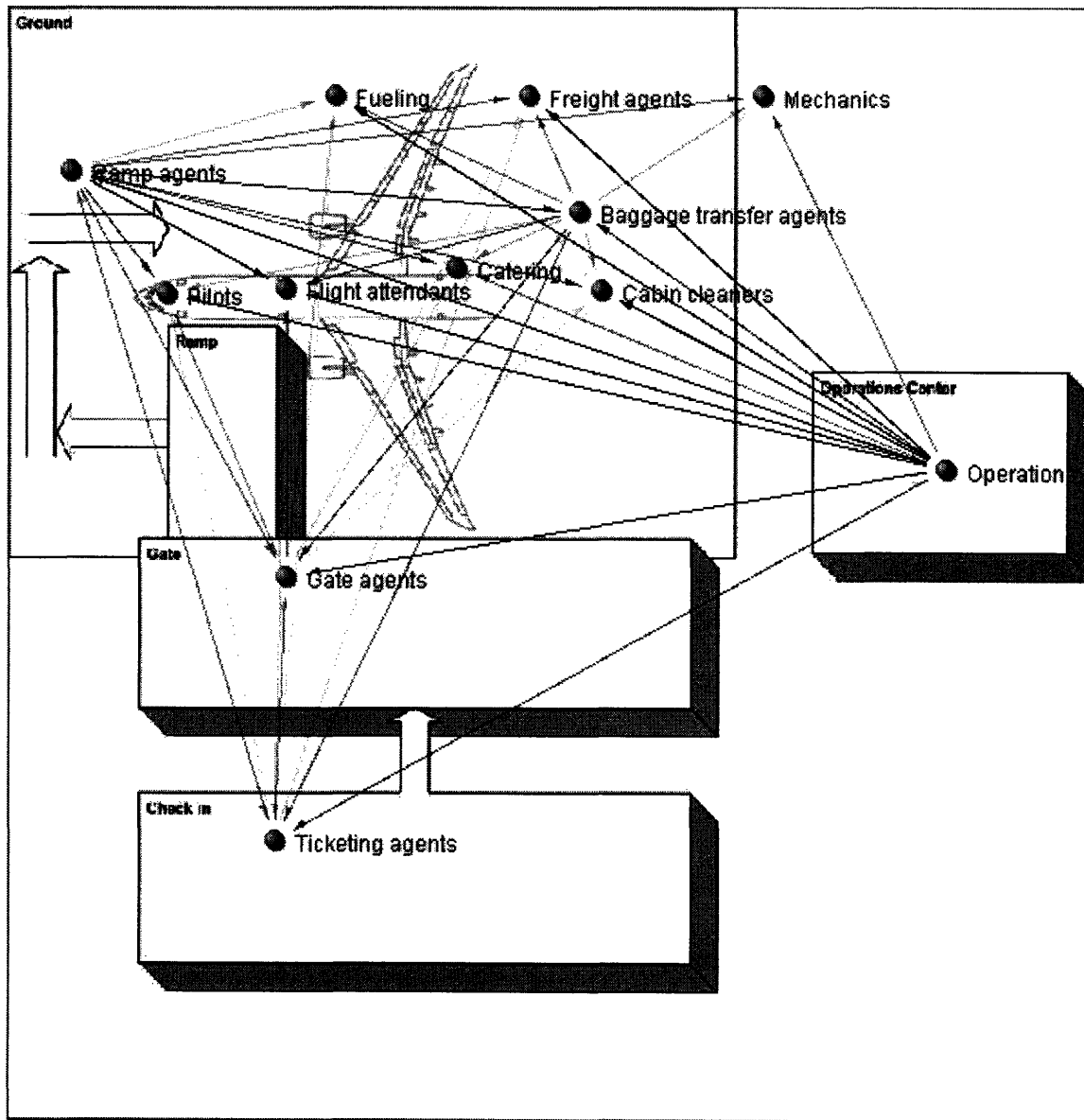


Figure 3-8 Observed problems between functions in the flight departure process, a darker line indicates more problems, data from all four stations.

Operations agents identify the most problems in the flight departure process. This is not surprising, as it is their primary role to coordinate the whole process. Figure 3-8 visualizes the problems between job functions in the flight departure process based on data from all the stations. Operations agents observe most frequently problems in their cooperation with fueling, freight agents, cabin cleaners, pilots and flight attendants. Ramp agents also identify their cooperation with flight attendants troublesome at times.

One of the biggest problems regarding the flight departure process that station management in KEF has been confronted with is the loading of freight on to the passenger planes. The primary export via airfreight from Iceland is fresh fish. The fish often arrives late at the airport from the shippers because they want to maximize the utilization of their assets. When this happens load planning and actual loading is delayed, cargo is loaded last blocking passenger baggage which results in late unloading of baggage at destination as well as delays if baggage needs to be unloaded before departure because of security rules. A high proportion of departure delays from KEF are attributed to these problems. Figure 3-9 shows the strength of relationships between job functions at the KEF station with the color of connecting lines, where a darker line means a stronger relationship. This diagram shows that the relationships of the five job functions that were surveyed with freight agents are weak compared to their relationships to other job functions.

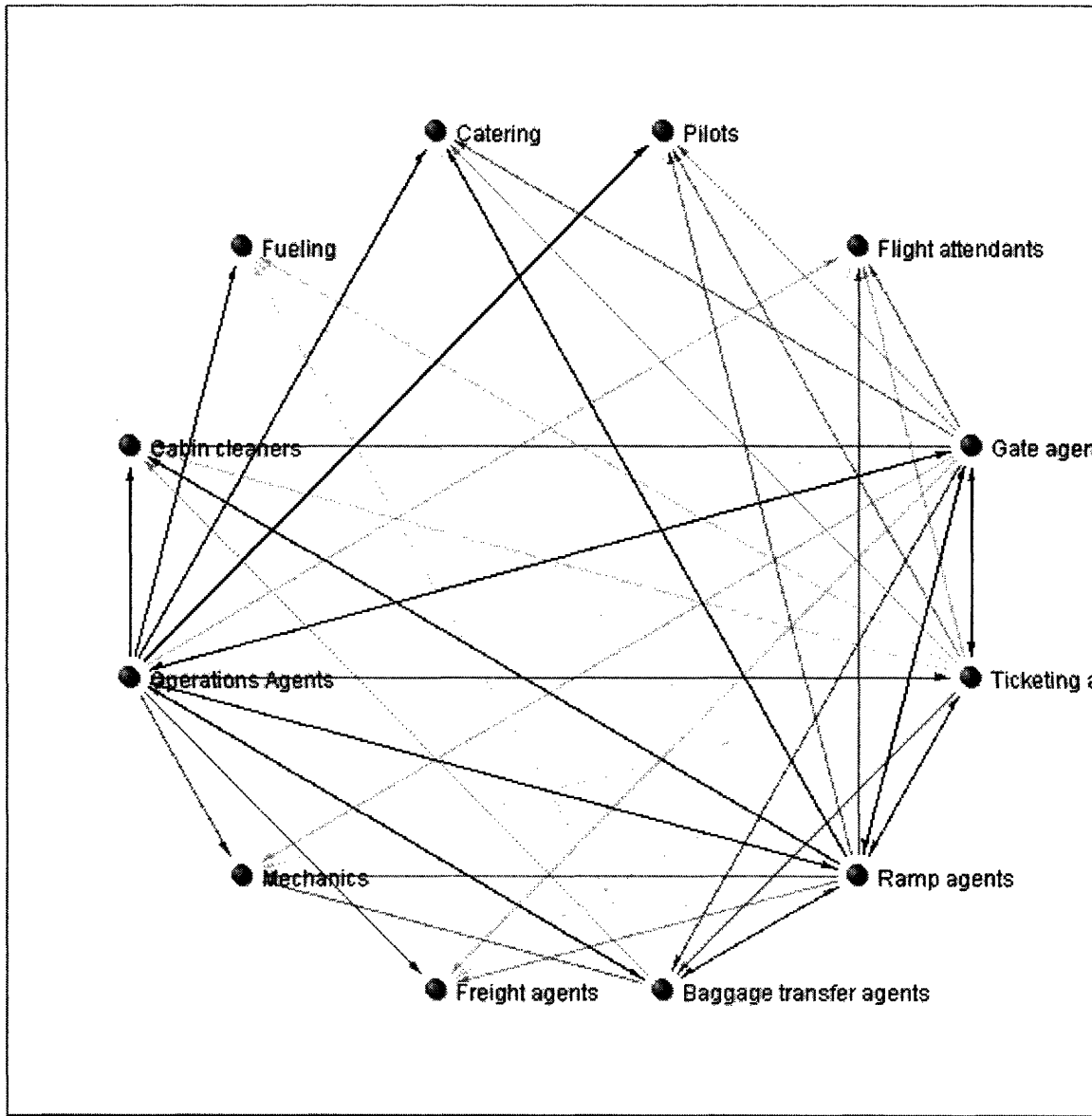


Figure 3-9 Relational coordination between job functions in KEF, a darker line indicates a stronger relationship

Figure 3-10 furthermore shows the primary job locations of the twelve job functions and the relationships between them. The operations agent job function, which usually has the primary responsibility of coordinating the flight departure process, has its weakest relationships with freight agents, mechanics and ticketing agents which do not play a big part in the latter stages of the flight departure process. Some of the interviews indicated that the cause of the operational

problems were ill-defined business processes and unclear business priorities. The trade-off between the needs of the freight business and passenger transportation business did not seem to be clearly defined, at least for front-line employees, and often front-line employees felt they had to make tactical decisions regarding this trade-off rather than it having been resolved strategically beforehand.

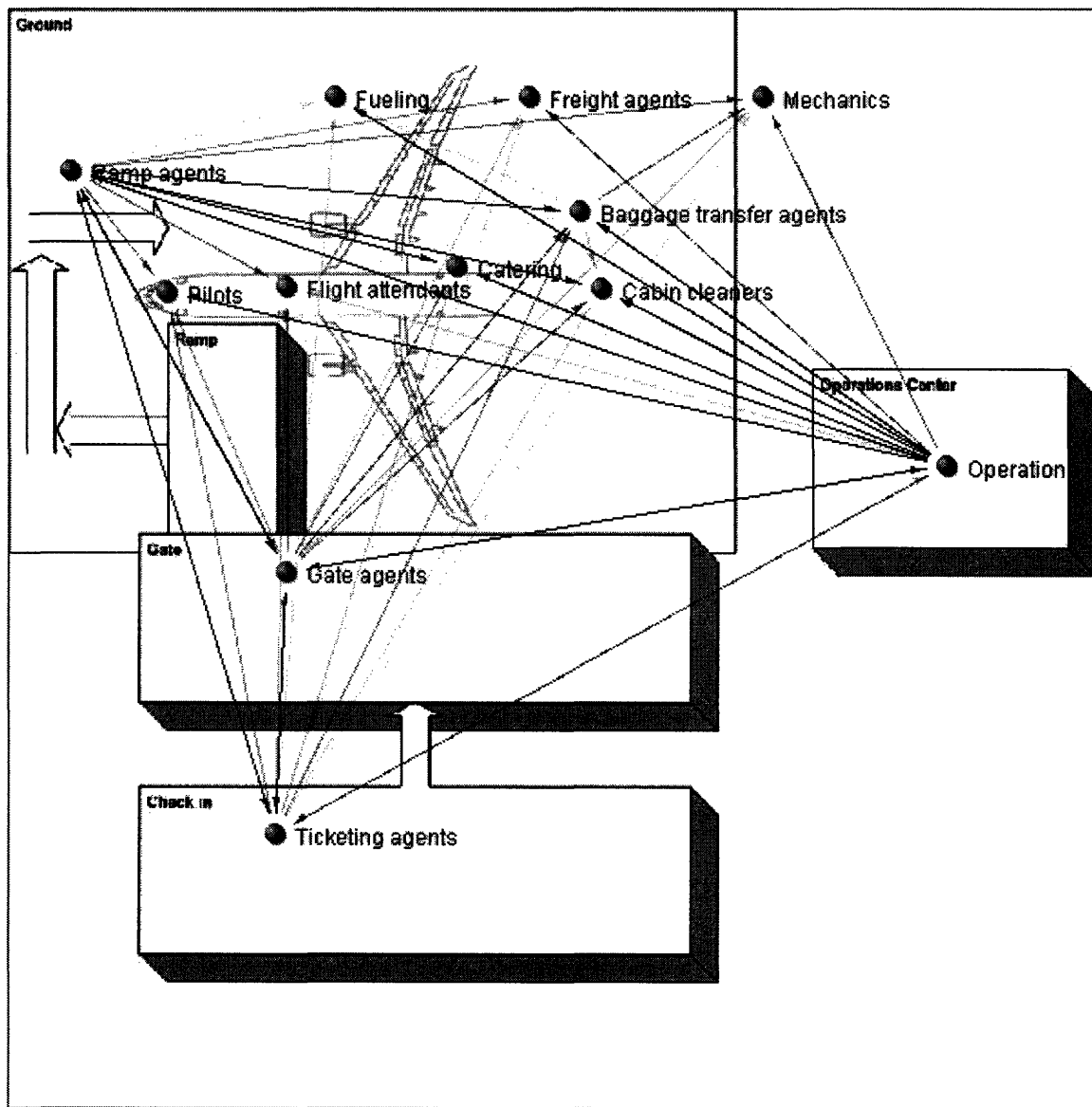


Figure 3-10 Location and strength of relational coordination between job functions in KEF, a darker line indicates a stronger relationship

It is not possible to tell from the survey results whether the lack of communication has caused the operational problems or whether they are caused by ill-defined business processes and priorities that have made the relationships deteriorate. What seems to be clear is that it is unlikely that these operational problems will be resolved as long as those relationships are not mended. This could be done by increasing frequency of communication between Operations and Freight Agents and even planning more face to face time between those job functions.

4 Systems of Coordination and Control in the Flight Departure Process

The purpose of this chapter is to describe the systems of coordination and control observed in Icelandair's flight departure process and it will describe how these systems affect relationships and coordination in the process and the observable performance of the process as well. The data was collected through structured interviews with Icelandair's Station Managers and their supervisor, Manager Stations. The questions asked in the structured interview are listed in Attachment B.

4.1 Systems of Coordination

4.1.1 Manuals and other written protocols

Written protocols in place at the stations are Icelandair's Ground Operations Manual, Icelandair's Customer Service Manual and IATA's Airport Handling Manual. Other written protocols that may be in use at the stations are: IATA Dangerous Goods Regulations, IATA Live Animals Regulations and proprietary manuals of the ground handler servicing Icelandair at the station.

The Ground Operations Manual is a detailed document listing responsibilities and standards regarding ground operations. It is written to be a robust document that does not need to be

updated frequently to reflect all the small changes that may be made to ground handling procedures. Its descriptions are therefore of a general nature.

Icelandair's Customer Service Manual is a document prepared by Icelandair's Customer Service Department. It contains procedures and standards related to the service and service level required for Icelandair's customers.

IATA's Airport Handling Manual is created by the International Air Transport Association to assist the industry in the provision of safe, effective and quality service at lower cost.

Airport regulations differ between airports. That means that rules and procedures are not exactly replicable between stations. These differences are however minor.

4.1.2 Unwritten rules and protocols

Answers from the station managers differed when asked about the importance of unwritten rules and protocols in the flight departure process at their station. Some of them said that there were no unwritten rules in place while others complained that they were much too important. At KEF for instance the unwritten rules have caused problems because of relatively high turnover of staff and many summer employees that simply do not know these unwritten rules and have little opportunity to get that knowledge transfer during their short employment. Problem is intensified in Iceland, because the country's population is small and everybody knows each other, which leads to frequent bending or breaking of rules to the benefit of the employee's friends and family.

4.1.3 Updating of rules and protocols

The stations did not seem to be very active in requesting changes to the rules and protocols to improve operations. Rather it seemed that improvements were only initiated within the station through memos or simply verbally. These changes are often not big enough to affect the written manuals. This also lead to the stations all having their own “flavor” of service within the bounds of the written rules and procedures and there was not a lot of learning evident between stations.

4.1.4 Continuous improvement processes

The KEF station had the most formalized improvement processes, due to its size and importance to the network. At the station there is a manager dedicated to quality and safety control who is responsible the improvement process. Management at the KEF airport encourages employees to contact their immediate supervisor or the Quality and Safety manager with improvement ideas which then take the matter forward by evaluating and possibly implementing the change in cooperation with the employee.

There is no direct communication between stations on their improvement processes and initiatives and the only way there is going to be learning across stations is that the improvements make it all the way into one of the written manuals. The improvements are however often not of the size or scope that they warrant changes in the manuals, but may still improve work at the stations considerably.

The other stations observed had less formal improvement processes, if any, consisting mostly of cross functional meetings and meetings with management of the ground handling companies. Continuous improvement and innovation in the flight departure process is not heavily emphasized in the station manager job description. The station managers are very focused on the

day to day operation. The fact that stations like LHR and CPH have not had a station manager for the past 2-3 years does indicate that the station manager could spend less time focusing on day to day operations and make room for analyzes of performance, improvements and innovation. To make this possible Icelandair would have to support the station managers in acquiring the necessary knowledge, capabilities and tools to perform these tasks. Many of the tools that have been used successfully in a manufacturing environment could also be used in the flight departure environment. These tools include Six Sigma, Total Quality Management (TQM), Benchmarking and Business Process Improvement (BPI). The station manager might become a facilitator and involve the ground staff and partner companies in a formal process to improve performance of the key performance indicators.

4.1.5 Information Systems in the Flight Departure Process

Information systems are used extensively in the flight departure process. Due to the level of outsourcing in Icelandair’s flight departure process the IT infrastructure is very different between stations as can be seen in table 4-1. This is due to the fact that usually the handling company Icelandair chooses at each airport has a systems infrastructure in place and the retraining involved in adding in Icelandair specific systems would be high. This diversity of information systems sometimes inhibits communication, for example when operations control in Iceland does not have access to some of the airport’s check-in systems.

Table 4-1 Information Systems used in Icelandair’s Flight Departure Process

System	BOS	CPH	KEF	LHR
Check-in	Palco Starcheck	Codecco	Palco Starcheck	Air France Check in
Reservations	Amadeus	Amadeus	Amadeus	Amadeus
Inventory	Resaid	Resaid	Resaid	Resaid
DCS, Aircraft Handling, Load Control	Palco	Codecco	Palco	Air France System
Management information system	Cognos	Cognos	Cognos/Axis	
Airport traffic system		CPH ATC	Axis	
Movement messaging		ROC		
Resource Management (Aircraft and crew info)		ATP	RM	

The primary use of information systems in the flight departure process at Icelandair is to gather information for the current days' flights and sometimes a few days ahead. Information systems are not used much by the twelve departure job function employee's or the station manager for analyses of key performance indicators over time or any kind of statistical analyses or control.

Access to management information systems, which contain some of the key performance indicators of the stations, is usually restricted to the station manager. The station managers that were interviewed commented on lack of training in these management information systems and some of them were not using them at all as a cause of that. The station managers that had used these systems the most commented on wanting to be able to track more of the key performance indicators in those systems as well as to be able to view there budget and compare it to the current financial status of the station.

Other communication methods used in the stations are cell phones and radios which connect the job functions in their different locations.

The BOS station has implemented an interesting procedure to give preflight information to the crew as they arrive for departure. It is the only station that provides the crew with this preflight information, although it is very much appreciated by the crew and speeds up preparation of the flight and provides a foundation for better customer service. The crew receives a final information sheet just before departure at all stations.

Although the crews appreciate this innovation of information sharing initiated by the BOS station it has also created friction at other airports when they have asked for the same information there and the airport staff has not been able or willing to provide it. This is a danger

of local innovation or process improvement in an environment where some of the job functions work in more than one station, like the crews.

The access for Icelandair representatives at airports to communicate with the local airport authorities differs. At LHR the Icelandair staff is required to go with all their communication with airport authorities through their handling agent but in other airports Icelandair staff has direct access to communicate and make requests with the authorities.

4.1.6 Formal reports

The LHR station sends out a proprietary daily report, called “Icelandair Daily Station Report”, which contains information about the flight departures from the station. It contains detailed information about the load of the flight, departure timing, remarks on boarding, check-in and any other incidents in the flight departure process. This report is circulated to station and customer relationship management at Icelandair head quarters as well as the Icelandair sales offices in the UK and US. The information in this report is not collected into a database where it could be further used for statistical analyses.

4.1.7 Boundary spanners or liaisons

Boundary spanners in the flight departure process were introduced in chapter 3.2.4. Besides the operations agents and gate agents already identified as the primary boundary spanners by looking at the relationships at the stations, the station managers also identified themselves as important boundary spanners in the interviews. They generally tried to communicate frequently with all of the different job functions in the process and emphasize Icelandair’s values and expected results from the process. The supervisory job function of the station manager was not included in the

relationship and coordination survey. Therefore there is no data to support or indicate how strong the effects of the station managers on relationships and communication are.

Figure 4-1 and the station manager interviews identified a third boundary spanner to be the Gate Agent who interacts with many of the job functions face to face because of his job location. The people serving as gate agents at the Icelandair stations are generally cross-utilized as ticketing agents which creates a strong connection between those job functions.

Table 4-2 Responsibility of the departure process

Responsibility	BOS	CPH	KEF	LHR
Primary	Station manager (if on duty)	Station manager (if on duty)	Operations Agent	Supervisor from Handling Agent (Air France)
Secondary	Gate Agent	Operations Agent	Gate Agent	Station manager (if on duty)
Third			Ground Manager	Ticketing and Gate staff

It is interesting to see how much the answers of the station managers differed when they were asked who is responsible for the successful completion of the flight departure process. It seems that the station managers try to hold people employed by Icelandair accountable if at all possible. This indicates that this responsibility is not clearly defined by Icelandair globally and an interview with Manager Stations confirmed that suspicion.

The staffing levels of the primary boundary spanner, the Operational Agents, at the KEF station are high compared to what is known in the industry. The Operations Agents there only supervise 2-3 flights at the same time where as it is common that operations agents at other airlines supervise up to 15 flights at the same time through extensive use of information technology. (Gittel, 2003, pp. 127) In the absence of information about staffing of the boundary spanners at

the other stations it is impossible to draw any conclusions on the effects of the high staffing levels at KEF on relationships and coordination, but other studies (Gittell, 2003, pp. 127; Gittell, 1995) have indicated a positive relationship between high boundary staffing levels and relationships and coordination.

4.1.8 Cross-utilization

Cross-utilization is a staffing method where employees from different functions, activities or departments share their workload that would otherwise require additional personnel (Baldanza, Lipkus, 2000). Cross-utilization was used to some extent at the stations, for example ticketing agents frequently switched over to a gate agent role as the departure of the flight neared.

4.1.9 Cross-functional meetings

The stations varied in their responses on their use of cross-functional meetings. KEF had the most frequent cross-functional meetings regarding on-time-performance twice a week and they have found these meetings to be a rich source of improvement ideas and projects. The newly reinstated station managers at LHR and CPH have also started to hold monthly cross-functional meetings with their ground handling partners. The station manager at LHR supplements those meetings with informal meetings over coffee with duty managers from handling company. Station manager in BOS does not hold any cross-functional meetings because he finds it hard to get everyone together because of the high number of part time employees. He relies more on informal chats with the employees. Changes in procedures are implemented by posting the updated procedure on a message board where employees must sign their names to confirm that they have read the new information. This might be perceived by the employees as arms-length management and not giving them the opportunity to comment on the changes in procedure.

4.2 Systems of Control

4.2.1 Performance Measurements

In chapter 2 performance measurements in the flight departure process were introduced. It is important to have both efficiency and quality measurements included in performance measurements.

At Icelandair the performance measurements of the flight departure process differ between stations. The hub station, KEF, has the most formalized measurement procedures and the following performance measurements are part of the partner companies', IGS, balanced scorecard:

- On-time-performance
- Check-in staff friendliness/helpfulness
- Cleanliness of lavatories
- Cleanliness of cabin
- Baggage delivery service
- Productivity
 - Passengers per work hour
 - Flights per work hour
 - Ramp

- Cleaning

- Lost baggage

The spoke station managers all mention on-time-performance as the most important performance measurement. Other performance measurements they have at their disposal are those performed by airport authorities on security queues and other airport related processes as well as the performance measurements the partner companies at the airport provide, if any.

There does not seem to be any standard way of reporting performance of the stations other than an overview of on-time-performance which is reported for all stations in the Icelandair management information system, Cognos.

A further note on performance measurements: In Icelandair's Ground Operations Manual it is stated that the aim of the Service Level Agreement (SLA) made between Icelandair and the Ground handling company at the station is to ensure that quality standards are set and can be measured accordingly. A sample SLA from Icelandair was part of the research data. This sample fulfilled its purpose of defining and setting the quality standards well but there was no mention of who was responsible for and how these performance levels would be monitored.

Performance measurements, other than on-time-performance, were not easily available in Icelandair's information systems and the manager stations and station managers did not have easy access to important indicators such as number of station related customer complaints, lost baggage per station or staff time.

4.2.2 Incentives

An organizational architecture of a firm consists of three main activities: (1) performance measurement, (2) rewarding performance and (3) partitioning decision rights. (Zimmerman, J.L., 2006) Partitioning of decision rights has been observed in the numerous manuals, work procedures and organizational hierarchies described there within. Performance measurements have also been observed, although access to data and definition of key performance indicators is not optimal. What about rewarding performance?

In general the salary scheme of the employees working in the flight departure process at the Icelandair stations that were observed and interviewed does not include any performance based bonuses or other incentives. The station managers have played around with rewarding exceptional performance with the means that they have at their disposal. These incentives have included: pizza lunches for meeting on-time-performance goals, free or reduced ticket prices on Icelandair for exceptional customer service, taking departments out for dinner for fewest sick days and general compliments and praise for a job well done.

The same applies to the relationships with the partner companies at the stations. No incentive structures are built into the contracts. The contracts are built on service level agreements (SLA's) in which the minimum service levels that the partner company is supposed to render are detailed. None of these contracts contain incentive structures for these companies to exceed these minimum service levels and only a few of the contracts contain penalty clauses for not meeting those service levels, according to the station managers. Furthermore, when those penalty clauses exist, they are not exercised when applicable as a good faith gesture and to keep a positive relationship with the partner company.

All of the station managers that were interviewed think it would improve performance if performance rewarding would be used at the stations – both towards employees and partner companies. Some of them expressed concerns that implementation might be hard because of issues like difficulty in defining the appropriate performance measures which award desired behavior rather than a desired outcome caused by external factors and insufficient communication levels within partner companies for incentive based contracts to be effective.

The station managers suggested several key performance indicators that could be the foundation of a performance reward system:

- On-time-performance
- Meeting or exceeding budget
- Passenger complaints
- Revenue created by charging for excess baggage
- Employee knowledge
- Attendance

4.2.3 Supervision

The supervision of the four different stations surveyed differs quite much. Supervision at the hub in KEF is completely in the hands of the handling company IGS. Their organizational structure regarding the flight departure process is described in Figure 4-1.

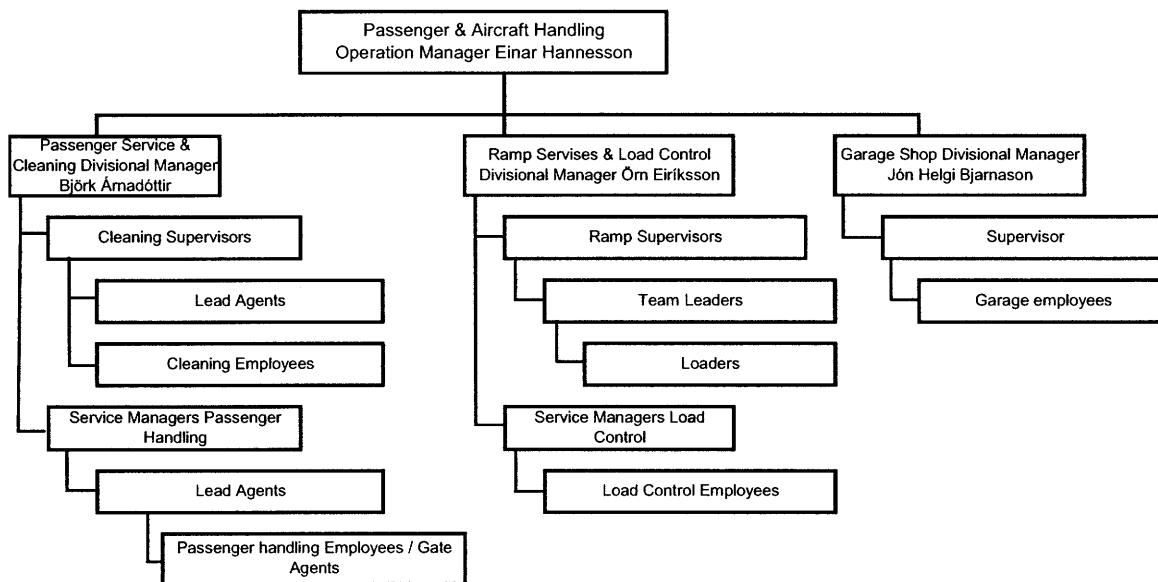


Figure 4-1 Organizational structure of flight operations at KEF station

At the spoke stations the station manager supervises the Icelandair employees at the station and is responsible for communication and coordination with the partner companies at the station. The partner companies then have their own supervision and organizational structure to support its operations.

All of the stations researched currently have station managers, but the Icelandair station manager positions at LHR and CPH have just recently been reinstated. That means that for the year 2005 for which the performance measurements are there were no station managers at these stations. Why did Icelandair choose to discontinue the station manager roles at the LHR and CPH stations in 2002?

All the flight departure related operations in these stations had at the time been completely outsourced. In the times of extreme cost control at all airlines in the wake of 9/11 the position of station manager seemed like an obvious choice to eliminate because the partner companies at the airports had their own supervisory staff. In such a setup the manager stations at Icelandair

headquarters becomes responsible for communication and coordination with the partner companies.

4.3 Discussion

In this chapter the systems of coordination and control observed at the four Icelandair stations will be described and discussed. These systems create the foundation for coordination and relationships between the twelve job functions in the flight departure process.

Table 4-3 indicates that the design of these systems impacts the level of coordination and relationships at the stations. The stations primarily differ in their systems of control of performance measurements and supervision. It is therefore possible to conclude that these systems of control are important for strong relationships and communication. In chapter 3 it was also shown that relational coordination is likely to affect the performance at the stations. Airlines should pay careful attention to the design of these systems because they will decide to some extent whether improvements in efficiency and quality can be made at the stations.

Table 4-3 Summary of qualitative observations of the level of use of Systems of Coordination and Control at the four stations

	BOS	CPH	KEF	LHR
Systems of Coordination				
Written rules and protocols	+++	+++	+++	+++
Unwritten rules and protocols	+	+	+++	-
Continuous improvement processes	+	+	++	+
Use of information systems	+	+	+	+
Use of boundary spanners	+	+	+	+
Cross-utilization	+	?	++	+
Cross-functional meetings	-	+	++	+
Systems of Control				
Active performance measurements	-	-	+	-
Use of incentives	-	-	-	-
Supervision (in 2005)	+	-	++	-
Relational Coordination Index	46.21%	36.36%	48.24%	35.00%
Legend: +++ Very strong use observed ++ Strong use observed + Some use observed - No use observed ? Not known				

The control mechanisms currently in place at Icelandair mainly serve to keep a status quo of performance. Motivation to look for improvement is almost nonexistent because such efforts are not awarded systematically and key performance metrics are generally not monitored tightly. It is likely that Icelandair could improve the levels of relationships, communication and coordination by improving the systems of control at the stations. Especially it is recommended that they implement more detailed performance measurements and use of incentives both on individual staff levels as well as in the relationships with outsourcing partner companies. By reinstating the station manager positions at CPH and LON at the beginning of this year Icelandair has already started to make improvements on their systems of control.

5 Effects of Outsourcing on Relational Coordination

“Outsourcing is defined as the procurement of products or services from sources that are external to the organization. Firms should consider outsourcing when it is believed that certain support functions can be completed faster, cheaper, or better by an outside organization. Tasks that are not core competencies of the organization are candidates for being contracted out. However, any skill or knowledge that allows you to serve your customer base better, that deals directly with the product or service you are trying to put out of the door, is one that must remain in-house.”

(Lankford, 1999)

When companies make the decision to outsource they are usually looking to benefit from one or more of the following effects: cost reduction, superior quality, flexibility, focus, leverage and diversification. (Jennings, 2002) The general rule is that companies should consider outsourcing only those functions that are not a core competency of the company and therefore do not create a competitive advantage to it.

Icelandair outsources its flight departure related job functions primarily to achieve cost reduction through economies of scale and flexibility of the partner company. Flying on average from once up to four times per day to the stations and spoke cities examined in this thesis, Icelandair is able

to reduce its costs by outsourcing its ground operations to a ground handling partners, who also handle other airlines and are thereby able to achieve better utilization and efficiency through increased volume of operations. Furthermore, Icelandair's ground handling partners are paid on a per flight basis giving Icelandair the flexibility of scaling its operations up or down based on demand without having to worry about fixed costs.

This arrangement leaves Icelandair with less control over its flight departure process, which along with its network, has the greatest impact on the utilization of the its fleet. In the interviews and observations Icelandair was shown to use a number of mechanisms to keep in control of its flight departure process:

- Contracts and negotiation: The main source of efficiency gains Icelandair has observed in the past years have been obtained through negotiating lower ground handling rates with the ground handling partners. In these contracts Icelandair pays a certain amount for each flight. This shifts the responsibility of achieving the necessary efficiency gains over to the ground handling partner. There did not seem to be any incentive schemes built into the contracts to better align the interests of Icelandair and the ground handling company.
- Service Level Agreements (SLAs): To ensure a minimum performance standard, Icelandair made SLAs with the ground handling company which accompanied the general ground handling contract. None of these SLAs contained performance incentives but some of the station managers reported that the contracts for their stations contained penalty clauses for when the ground handler did not reach the minimum SLA. These penalty clauses were however rarely, if ever, used.

- **Station Managers:** At many of their whole year stations Icelandair has created a station manager position. The purpose of the station manager is to coordinate the work on Icelandair flights at the station, communicate with the ground handling partners and represent Icelandair at the station.

The mechanisms currently used seem to have led to an arms length relationship between Icelandair and its partner companies at the stations. In the interviews conducted with the station managers, manager stations and operations manager of IGS, one of the partner companies, it was clear that there was a lot of finger pointing going on in the relationships.

The purpose of this chapter is to answer the main research question: What effects, if any, does outsourcing have on relationships, communication and consequently the performance of the flight departure process?

5.1 Outsourcing at the stations

The observed outsourcing the stations varied as can be seen from table 5-1. The ground service at KEF is outsourced to a sister company of Icelandair which also serves Icelandair's biggest competitors in the airport. BOS has Icelandair staff in 6 of the twelve job functions involved in the flight departure process while CPH and LON outsource most of their departure related job functions to 3rd party providers.

Table 5-1 Outsourcing at the four stations

	BOS	CPH	KEF	LON
Ticketing Agents	FI	3RD	REL	FI
Gate Agents	FI	3RD	REL	3RD
Baggage Transfer Agents	FI	3RD	REL	3RD
Ramp Agents	3RD	3RD	REL	3RD
Operations Agents	FI	3RD	REL	3RD
Pilots	FI	FI	FI	FI
Flight Attendants	FI	FI	FI	FI
Mechanics	3RD	3RD	FI	3RD
Caterers	REL	REL/3RD	REL	REL
Cabin Cleaners	3RD	3RD	REL	3RD
Fuelers	3RD	3RD	3RD	3RD
Cargo Agents	3RD	3RD	REL	3RD
Job functions outsourced to 3rd party	5	9	1	8
Outsourcing to 3rd party (perc of departure Job fcts.)	41.7%	76.9%	8.3%	66.7%
Job functions outsourced to rel.comp	1	1	9	1
Job functions inhouse	6	2	2	3
Number of diff. Companies	6	7	3	7
Legend:				
FI	Job function performed by Icelandair			
REL	Job function performed by company related to Icelandair			
3RD	Job function performed by 3rd party partner company			

5.1.1 Hub station in KEF

Icelandair outsources most of its flight departure related job functions in the KEF hub to two companies: Icelandair Ground Services and EAK, a fuelling company co-owned by oil distributors in Iceland. As in chapter 3, the relational coordination index of the stations was highest in KEF.

On the 1st of January 2001 Icelandair Ground Services (IGS) was established as a separate sister company of Icelandair following a deregulatory act ending Icelandair's monopoly on ground handling at Keflavík Airport. IGS was established for it to be able to serve other airlines at the airport, creating an additional revenue source for Icelandair and to create managerial focus on the

ground handling unit. IGS revenues were 2.2 billion ISK in 2004. In the same year Icelandair revenues from passenger flight were 29 billion ISK. IGS serves the major competitors of Icelandair in KEF.

In interviews with both employees of Icelandair and IGS it is clear that there are some challenges in this setup. IGS employees report that they have a difficult time deciding when they should be representing Icelandair and when they are supposed to represent IGS. One moment they are told to distinguish themselves from Icelandair because they are also serving their competitors at Keflavík but the next they are reminded that they are often the first face to face contact of the passenger with an Icelandair related employee and that interaction can make or break the passenger's perception of the company.

Furthermore Icelandair station management at headquarters described some frustration with the relationship with IGS. They felt that their leverage in negotiation with IGS was weaker than with 3rd party handling companies because the threat of taking Icelandair's business elsewhere is idle under the circumstances. They therefore felt that IGS didn't give as much attention to managing its relationship with Icelandair as the size of the business transaction warranted. In the year of 2005 IGS handled 9,134 departures from KEF and out of these Icelandair's scheduled passenger operations were 5,133 or 56.2%¹.

¹ Source: Total IGS flights handled: reported by IGS – Total Icelandair passenger flights: Icelandair's Management information system.

5.1.2 Pacing stations

5.1.2.1 LHR

The LHR station has the lowest average scheduled turn-around-time of the stations researched in this paper. It is not the station farthest away from the hub in the eastbound direction, but timing of departures from the hub has put this fast turn-around requirement on LHR. On top of the short turn-around times, London Heathrow airport is one of the most congested airports in the world. This makes on-time operation difficult to achieve because of queuing times both in the air and on the ground.

Icelandair has had some challenges in dealing with its partners at Heathrow airport. The biggest of those was when without notice in November of 2004 Swissport, Icelandair's handling company, went bankrupt. This forced Icelandair and a number of other airlines to change handling partners over night and even move between terminals at the airport. This situation describes well one of the risks involved in outsourcing key operations.

Icelandair's departure related job functions are performed by 7 different companies at LHR: the gate, ramp, baggage and operations agents come from Air France Services Ltd. (AFSL), mechanics from Iberia, Cabin cleaners from Swift, fuelers from Q8, cargo agents from Menzies and the catering is done in Iceland by IGS.

The position of station manager at LHR has just recently been reinstated by Icelandair.

5.1.3 Nonpacing Stations

5.1.3.1 BOS

Boston Logan is a busy airport, with a total of 27 million passengers in the year of 2005.

(Massport, 2006) Only 15.6% of these passengers were traveling international which explains why the international Terminal E, from where Icelandair operates only feels like a small to medium sized airport.

Boston is the station which has the highest proportion of Icelandair employees working on the flight departure process. Icelandair employees fill the job functions of ticketing, gate, baggage transfer and operations agents at the airport. Icelandair also offers these services to other airlines at BOS to keep utilization of staff high and costs low. This has been successful to the extent that Icelandair station management has not decided to outsource these job functions like at its other spoke stations.

Icelandair's departure related job functions are performed by 6 different companies at BOS.

5.1.3.2 CPH

Copenhagen has the highest average frequency of the spoke stations of Icelandair with up to four flights per day. Along with LHR it has the highest number of companies involved in the flight departure process or 7. Servisair provides ticketing, gate, baggage transfer, ramp, cargo and operations agents. Mechanics come from SR Technics, Nordic Aero provides cabin cleaners and DRS fuelers. Catering is done by IGS in Iceland for all flights except the ones that stay over night at CPH. In those cases Gate Gourmet caters.

Icelandair did not have a station manager at the CPH station in the year of 2005. This is surprising when the relatively high frequency of operations in CPH is taken into account. The position of station manager was reinstated in early 2006.

5.2 Effects of outsourcing on relationships and coordination

What effects does outsourcing have on relationships and coordination at the observed stations?

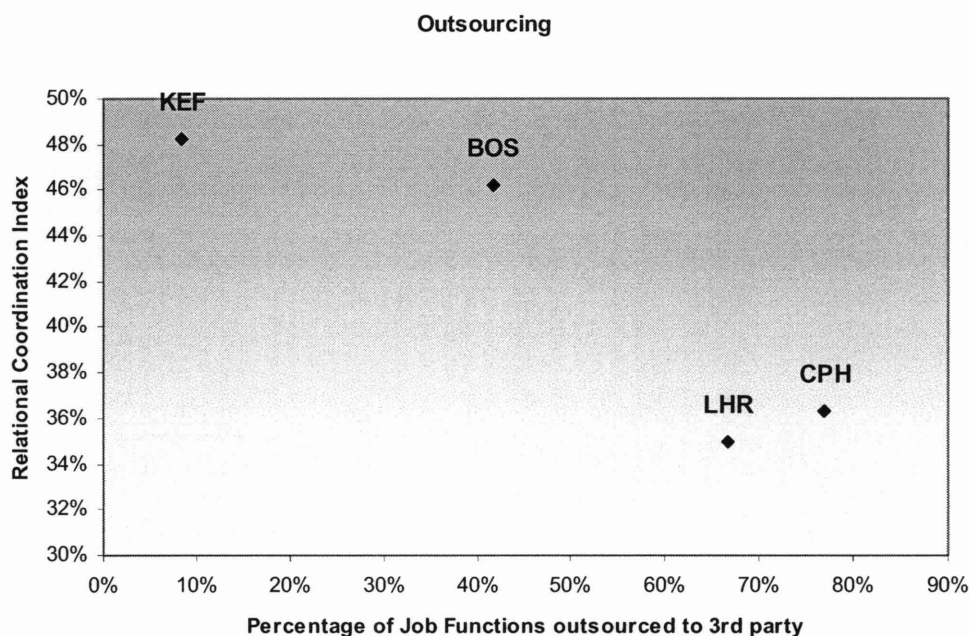


Figure 5-1 Effects of outsourcing on relational coordination

The stations with fewer number of job functions outsourced to 3rd party companies show a higher relational coordination than the stations with a higher number of outsourced job functions. There also seems to be a relationship between fewer participating companies in the process and higher relational coordination. This is understandable because creating strong bonds across companies is harder than within organizations. Different scheduling practices may lead to

different individuals working on the Icelandair process every day making it difficult to create strong personal bonds.

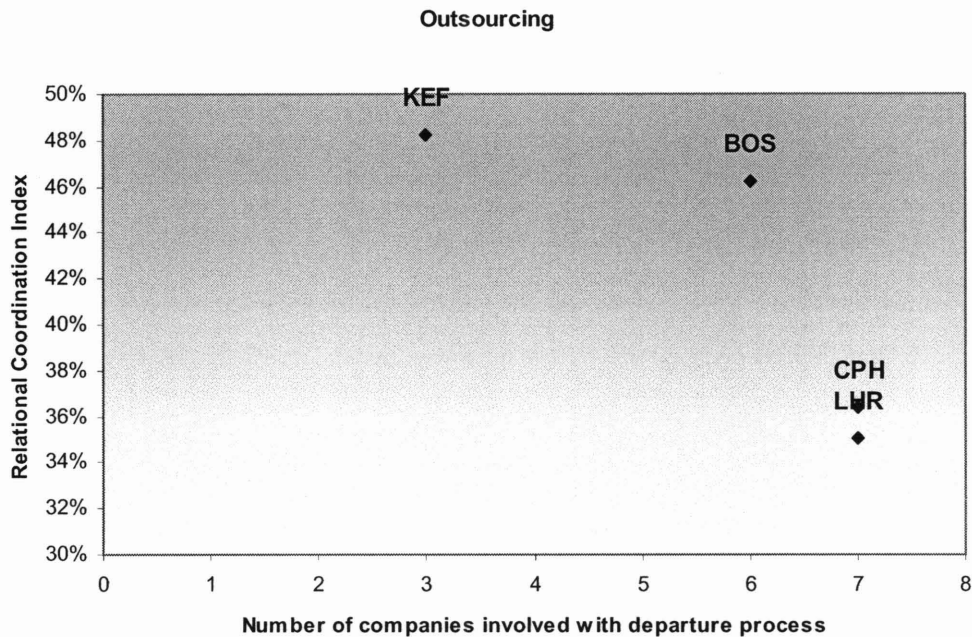


Figure 5-2 Effects of number of companies involved in the departure process on relational coordination

What does this mean for the decision to outsource and how many different companies to involve in the flight departure process? Let us take a look at what the primary motivation for outsourcing is: cost reduction, increased efficiency, quality and flexibility amongst other things. But it has also been shown, both in observations in this paper and others (Gittell, 1995; Gittell 2003; Gittell et al, 2005) that an increased level of relationships and co-ordination is strongly related to increases in efficiency and quality, even complementing each other at the same time. This means that there is a trade-off in the outsourcing decision: in an outsourcing environment when many companies have to work together on completing a process like the flight departure process it is more difficult to achieve high levels of communication, coordination and relationships than in an

environment where the process is performed in-house. The decision to outsource may inhibit the company in taking advantage of efficiency and quality improvements through strong relationships and coordination but can at the same time wield improvements through economies of scale and scope of the outsourcing partner companies.

This trade-off has to be carefully weighed into the outsourcing decision. If the company decides it is beneficial to outsource the process it should set up mechanisms of control and coordination to support the building of strong relationships across functional and organizational boundaries to minimize the trade-off effect.

5.3 Conclusions

The method of outsourcing seems to have an effect on the relational coordination at the stations. It is likely that the different systems of coordination and control that are employed in different outsourcing circumstances play a big role as well as the number of companies involved in the flight departure process as gaps between job functions tend to be wider across than within organizations.

Research (Ross and Beath, 2005) on outsourcing in the IT industry has suggested that outsourcing in that industry can generally be divided into three types of outsourcing:

1. **Transactional:** Outsourcing of clearly defined transactions or commodities in a competitive marketplace.
2. **Co-sourcing:** Outsourcing of tasks where both parties bring people to the table to solve the task. Joined risk and responsibility.

3. **Strategic Partnership:** Companies work together on aligning their interests and maximize output from less defined processes. Both parties are dependent on each other.

Different approaches should be employed in outsourcing departure related job functions at the stations based on their characteristics, such as:

- Is it a hub station?
- Is it a pacing or non pacing station?
- Size of operations at the station, competition in ground handling at the station and other negotiation leverage factors

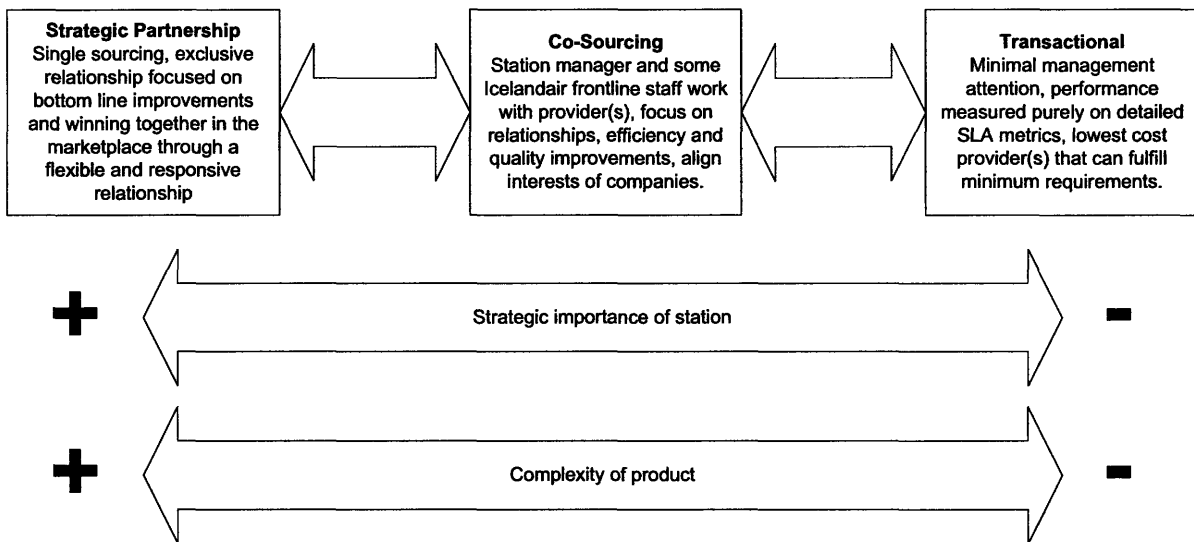


Figure 5-3 Suggested outsourcing approaches and selection criteria

Because of the strategic importance of hub operations for a network airline any outsourcing of departure related operations should preferably be structured as a strategic relationship. This will require a high level of management attention, information sharing and cooperation. The partner companies should work together to win in the marketplace. The high level of integration needed

makes it preferable that the relationship between buyer and provider is exclusive. That means that a service provider would choose not to offer its services to the buyer's competition. The airline should single source or at least keep the number of providers at the airport to a minimum as the data indicates that this helps in building stronger relationships. The client (the airline) needs the vendor (the ground handling company) to adapt their offerings and processes to changing business conditions and the vendor needs the client to adapt their expectations and behaviors to permit appropriate process innovations and service changes. (Ross, 2005)

Pacing hubs are also very important in deciding the productivity of the whole network of the airline. For a small airline like Icelandair with little leverage in negotiation with its outsourcing partners they should aim at creating strong co-sourcing relationships with its service providers at the pacing hubs. Methods to do that include employing some Icelandair staff at the stations like station managers and possibly front line employees.

Ground operations at low frequency non-pacing stations comes close to being a commodity or transaction that can be purchased from the provider that offers best value for money. The need for coordination and communication is lower than at a pacing station or a hub. Here the focus should be on cost efficiency. The relationship with the outsourcing partner should be aimed at minimizing managerial attention while fulfilling the necessary service standards and cost minimization through market powers. This assumes that the market powers are active between service providers in the airport. If there is a monopoly or stable oligopoly it might be necessary to use a co-sourcing relationship to reap the necessary efficiencies.

6 Conclusions

Analyses of the systems of coordination and control, level of relationships and communication of four Icelandair stations show indications of how these factors impact the performance of the flight departure process. The data indicates that the approach to outsourcing at the four Icelandair stations has an impact on their levels relationships and coordination. The observations made indicate that the fewer of the job functions outsourced to a third party company, the higher the level of relationships and coordination at the station. Furthermore, the fewer the companies involved in the flight departure process the higher is the level of relationships and coordination at the station. This implies that careful thought should be put into choosing an approach to outsourcing departure process related job functions. The method of outsourcing chosen should be based on the strategic importance and the complexity of the product offered at the station. These factors will impact the level of integration needed with the partner companies as well as the relative gain the companies would be able to achieve through improved performance with higher levels of relationships and communication.

Higher levels of communication and relationships did result in better performance at the stations studied. This was especially evident when observing the quality metrics of the station performance. Traditionally it is believed that there is a trade-off between efficiency and quality of the products offered. The flight departure process is no exception to this general wisdom. But through focusing on relationships and communication the data in this study as well as previously

published research (Gittell, 1995; Gittell, 2003) indicates that this trade-off boundary can be shifted resulting in improved quality and efficiency at the same time.

To achieve high levels of relationships, communication and thus coordination companies need to pay close attention to the design of their systems of coordination and control. These systems include, but are not necessarily limited to written and unwritten protocols, information systems, process improvement, cross-functional meetings, boundary spanners, performance measurements, incentives and supervision. The maturity of the design of the coordination and control systems in place at the four stations seems to impact their level of relationships and communication.

The framework used in this research can be used to assess the status of relationships and coordination in processes and environments that require cross-functional and/or cross-organizational coordination. The data and visualization methods employed can help in pointing out isolated underdeveloped or hostile relationship between job functions, as well as problems in the design of the systems of coordination and control employed in the setting. Focus on organizational design to support underdeveloped relationships should improve performance.

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A **Appendix A – Relational Coordination Survey**

The Value of Relationships and Communication in Icelandair's Departure Process

SURVEY

The purpose of this survey is to gather insights into the departure process of Icelandair in some of its stations. The survey results will be used to create recommendation on improvements in the processes for all parties involved. Your participation is extremely important for the successful completion of this study.

You are asked to participate in a research study conducted by Tómas Ingason, Candidate for M.S. Engineering in Logistics Degree, from the Engineering Systems Division at the Massachusetts Institute of Technology (M.I.T.), Boston. This survey is part of the student's masters thesis. You were selected as a possible participant in this study because you are part of one of the work groups being studied in the survey. You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

- **PARTICIPATION AND WITHDRAWAL**

Your participation in this study is completely voluntary and you are free to choose whether to be in it or not. If you choose to be in this study, you may subsequently withdraw from it at any time without penalty or consequences of any kind. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

- **CONFIDENTIALITY**

To ensure confidentiality this survey is being conducted anonymously. Any other information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Tómas Ingason, tomasi@mit.edu, 617-692-0162.

Demographic Questions

1. What is your primary job location? Please make a mark in one of the boxes below.

- Amsterdam Schiphol (AMS), Amsterdam, Holland.
- Boston Logan Airport (BOS), Boston, USA.
- Copenhagen Kastrup Airport (CPH), Copenhagen, Denmark.
- Keflavík International Airport (KEF), Keflavik, Iceland.
- London Heathrow (LHR), London, UK.

2. To which work group do you belong? Please make a mark in the corresponding box. If you work in more than one of these positions please indicate so by marking all of them.

- Baggage Transfer Agents
- Gate Agents
- Operations Agents
- Ramp Agents
- Ticketing Agents

Survey for Flight Departures

1. How frequently do you communicate with people in each of these groups about flight departures?

	Never	Rarely	Occasionally	Often	Constantly
Pilots	1	2	3	4	5
Flight attendants	1	2	3	4	5
Gate agents	1	2	3	4	5
Ticketing agents	1	2	3	4	5
Ramp agents	1	2	3	4	5
Baggage transfer agents	1	2	3	4	5
Freight agents	1	2	3	4	5
Mechanics	1	2	3	4	5
Operations agents	1	2	3	4	5
Cabin cleaning	1	2	3	4	5
Fueling	1	2	3	4	5
Catering	1	2	3	4	5

2. When people in these groups communicate with you about flight departures, do they do so in a timely way?

	Never	Rarely	Occasionally	Often	Always
Pilots	1	2	3	4	5
Flight attendants	1	2	3	4	5
Gate agents	1	2	3	4	5
Ticketing agents	1	2	3	4	5
Ramp agents	1	2	3	4	5
Baggage transfer agents	1	2	3	4	5
Freight agents	1	2	3	4	5
Mechanics	1	2	3	4	5
Operations agents	1	2	3	4	5
Cabin cleaning	1	2	3	4	5
Fueling	1	2	3	4	5
Catering	1	2	3	4	5

3. Do people in these groups communicate with you accurately about flight departures?

	Never	Rarely	Occasionally	Often	Always
Pilots	1	2	3	4	5
Flight attendants	1	2	3	4	5
Gate agents	1	2	3	4	5
Ticketing agents	1	2	3	4	5
Ramp agents	1	2	3	4	5
Baggage transfer agents	1	2	3	4	5
Freight agents	1	2	3	4	5
Mechanics	1	2	3	4	5
Operations agents	1	2	3	4	5
Cabin cleaning	1	2	3	4	5
Fueling	1	2	3	4	5
Catering	1	2	3	4	5

4. When problems occur with flight departures, do people in these groups blame others or work with you to solve the problem?

	Blame others		Neither		Solve the problem
Pilots	1	2	3	4	5
Flight attendants	1	2	3	4	5
Gate agents	1	2	3	4	5
Ticketing agents	1	2	3	4	5
Ramp agents	1	2	3	4	5
Baggage transfer agents	1	2	3	4	5
Freight agents	1	2	3	4	5
Mechanics	1	2	3	4	5
Operations agents	1	2	3	4	5
Cabin cleaning	1	2	3	4	5
Fueling	1	2	3	4	5
Catering	1	2	3	4	5

5. How much do people in each of these groups know about the work you do?

	Nothing	Little	Some	A lot	Everything
Pilots	1	2	3	4	5
Flight attendants	1	2	3	4	5
Gate agents	1	2	3	4	5
Ticketing agents	1	2	3	4	5
Ramp agents	1	2	3	4	5
Baggage transfer agents	1	2	3	4	5
Freight agents	1	2	3	4	5
Mechanics	1	2	3	4	5
Operations agents	1	2	3	4	5
Cabin cleaning	1	2	3	4	5
Fueling	1	2	3	4	5
Catering	1	2	3	4	5

6. How much do people in each of these groups respect the work you do?

	Not at all	A little	Somewhat	A lot	Completely
Pilots	1	2	3	4	5
Flight attendants	1	2	3	4	5
Gate agents	1	2	3	4	5
Ticketing agents	1	2	3	4	5
Ramp agents	1	2	3	4	5
Baggage transfer agents	1	2	3	4	5
Freight agents	1	2	3	4	5
Mechanics	1	2	3	4	5
Operations agents	1	2	3	4	5
Cabin cleaning	1	2	3	4	5
Fueling	1	2	3	4	5
Catering	1	2	3	4	5

7. How much do people in each of these groups share your goals for flight departures?

	Not at all	A little	Somewhat	A lot	Completely
Pilots	1	2	3	4	5
Flight attendants	1	2	3	4	5
Gate agents	1	2	3	4	5
Ticketing agents	1	2	3	4	5
Ramp agents	1	2	3	4	5
Baggage transfer agents	1	2	3	4	5
Freight agents	1	2	3	4	5
Mechanics	1	2	3	4	5
Operations agents	1	2	3	4	5
Cabin cleaning	1	2	3	4	5
Fueling	1	2	3	4	5
Catering	1	2	3	4	5

8. How dependant is the outcome of your job on the people in each of these groups?

	Not at all	A little	Somewhat	A lot	Completely
Pilots	1	2	3	4	5
Flight attendants	1	2	3	4	5
Gate agents	1	2	3	4	5
Ticketing agents	1	2	3	4	5
Ramp agents	1	2	3	4	5
Baggage transfer agents	1	2	3	4	5
Freight agents	1	2	3	4	5
Mechanics	1	2	3	4	5
Operations agents	1	2	3	4	5
Cabin cleaning	1	2	3	4	5
Fueling	1	2	3	4	5
Catering	1	2	3	4	5

9. Have you had problems in working with the people in each of these groups in the last 12 months?

	None	Some	Many
Pilots	1	2	3
Flight attendants	1	2	3
Gate agents	1	2	3
Ticketing agents	1	2	3
Ramp agents	1	2	3
Baggage transfer agents	1	2	3
Freight agents	1	2	3
Mechanics	1	2	3
Operations agents	1	2	3
Cabin cleaning	1	2	3
Fueling	1	2	3
Catering	1	2	3

B Appendix B – Structured Interviews

Questions (these questions are based on the questions to the station managers so they may be worded inappropriately):

1. Which routines or protocols are followed in the flight departure process?
 - Ground Operations Manual
 - Other?*
 - Who is responsible for updating these routines/protocols?*
 - Pilots
 - Flight attendants
 - Gate agents
 - Ticketing agents
 - Ramp agents
 - Baggage transfer agents
 - Freight agents
 - Mechanics
 - Operations agents
 - Cabin cleaning
 - Fueling
 - Catering
 - How important are unwritten rules for the flight departure process?*
 - Are there any continuous improvement work processes surrounding these rules/protocols?
2. Which information systems are used in the flight departure process? By whom?
 - Check in system – name: *Starcheck?* _____
 - Pilots
 - Flight attendants
 - Gate agents
 - Ticketing agents
 - Ramp agents
 - Baggage transfer agents
 - Freight agents
 - Mechanics
 - Operations agents
 - Cabin cleaning
 - Fueling
 - Catering
 - Reservation System – name: _____
 - Pilots
 - Flight attendants

- Gate agents
- Ticketing agents
- Ramp agents
- Baggage transfer agents
- Freight agents
- Mechanics
- Operations agents
- Cabin cleaning
- Fueling
- Catering
- Airport Information System – name: _____
 - Pilots
 - Flight attendants
 - Gate agents
 - Ticketing agents
 - Ramp agents
 - Baggage transfer agents
 - Freight agents
 - Mechanics
 - Operations agents
 - Cabin cleaning
 - Fueling
 - Catering
- Load calculation – name: _____
 - Pilots
 - Flight attendants
 - Gate agents
 - Ticketing agents
 - Ramp agents
 - Baggage transfer agents
 - Freight agents
 - Mechanics
 - Operations agents
 - Cabin cleaning
 - Fueling
 - Catering
- Other

Name:	Name:	Name:
<input type="checkbox"/> Pilots	<input type="checkbox"/> Pilots	<input type="checkbox"/> Pilots
<input type="checkbox"/> Flight attendants	<input type="checkbox"/> Flight attendants	<input type="checkbox"/> Flight attendants
<input type="checkbox"/> Gate agents	<input type="checkbox"/> Gate agents	<input type="checkbox"/> Gate agents
<input type="checkbox"/> Ticketing agents	<input type="checkbox"/> Ticketing agents	<input type="checkbox"/> Ticketing agents
<input type="checkbox"/> Ramp agents	<input type="checkbox"/> Ramp agents	<input type="checkbox"/> Ramp agents
<input type="checkbox"/> Baggage transfer agents	<input type="checkbox"/> Baggage transfer agents	<input type="checkbox"/> Baggage transfer agents
<input type="checkbox"/> Freight agents	<input type="checkbox"/> Freight agents	<input type="checkbox"/> Freight agents

<input type="checkbox"/> Mechanics	<input type="checkbox"/> Mechanics	<input type="checkbox"/> Mechanics
<input type="checkbox"/> Operations agents	<input type="checkbox"/> Operations agents	<input type="checkbox"/> Operations agents
<input type="checkbox"/> Cabin cleaning	<input type="checkbox"/> Cabin cleaning	<input type="checkbox"/> Cabin cleaning
<input type="checkbox"/> Fueling	<input type="checkbox"/> Fueling	<input type="checkbox"/> Fueling
<input type="checkbox"/> Catering	<input type="checkbox"/> Catering	<input type="checkbox"/> Catering

3. Is there any job function responsible for coordinating and tying together the different job functions in the flight departure process?
 - Pilots
 - Flight attendants
 - Gate agents
 - Ticketing agents
 - Ramp agents
 - Baggage transfer agents
 - Freight agents
 - Mechanics
 - Operations agents
 - Cabin cleaning
 - Fueling
 - Catering
4. How do you conduct cross functional meetings about the flight departure process with the job functions involved/station managers?
5. Are employees incentivized based on performance? Based on which performance measurements?
6. What about contracts with outsourcing partners? Are there incentives for good performance or penalties for bad performance? Are those contracts enforced? Based on which performance measurements?
7. Which performance measures and measurement procedures are in place regarding the departure process? List according to importance.
 - Ticket purchase queue wait time
 - Check-in queue wait time
 - Security queue wait time
 - Special service center queue wait time
 - Gate check-in queue wait time
 - Departure/arrival announcements
 - Passenger identification on baggage (ID tags)
 - Aircraft cleaning effectiveness
 - Lavatory service
 - Aircraft ready to board
 - Aircraft boarding effectiveness
 - Others?
8. Who is responsible for supervising the flight departure process? Individual job functions within the flight departure process?
 - Station manager
 - Pilots
 - Flight attendants

- Gate agents
- Ticketing agents
- Ramp agents
- Baggage transfer agents
- Freight agents
- Mechanics
- Operations agents
- Cabin cleaning
- Fueling
- Catering
- Others: _____

9. Have there been any specific problems with the following job functions in the flight departure process during the past 12 months? If so, please elaborate.

- Pilots
- Flight attendants
- Gate agents
- Ticketing agents
- Ramp agents
- Baggage transfer agents
- Freight agents
- Mechanics
- Operations agents
- Cabin cleaning
- Fueling
- Catering

10. What is a station manager expected to do?

Formal guideline

1.8.4 Station Manager / Ground Handling Agent

Reports to: Manager Stations
Deputy: Ranking Duty Officer at Station

Purpose

Oversees airport services and ground operations at the station with regard to safety, security, and service. Is responsible for supervision of station staff directly employed or contracted to deliver ground handling service at the as instructed or contract to by Icelandair.

Responsibilities and Authority

- Execute ground handling agreement / ground handling instructions for Icelandair at station
- Signing on behalf of Icelandair, invoices, supply orders, handling charge notes and work orders
- Supervision and coordination of ground handling the station
- Ensures that all services are carried out on time and to the approved standards in regards to safety and quality.
- Maintains level of service in accordance with Service Level Agreement

Duties

- Executes current ground handling contracts at station
- Ensures that all Company instructions are communicated to ground handling personnel in a language they understand.
- Monitors performance of station against policies and budgets
- Monitors non-conformities and service failures and ensures timely corrective action
- Keeps abreast of local developments regarding aircraft handling and servicing
- External and internal communications and participates in committees as deemed appropriate by Manager Stations
- Ensures proper processing of customer complaints at station
- Maintains and defends the commercial interests of Icelandair at station as directed or contracted.
- To advise Manager Stations of any failings found in regards to ground operations.
- Oversees matters related to punctuality at station in cooperation with Manager Stations

- Are there any informal guidelines? What is the most important aspect of the job?
- What about continuous improvement/innovation?

11. Other things that you think might be improved or are especially well done at the stations?

12. Organizational chart? Difference between station manager and non station manager stations?

C **Appendix C – List of Interviews and Observations**

- Jón Karl Ólafsson, CEO Icelandair, Meeting on project scope, February 6th 2006, Reykjavík, Iceland.
- Una Eyþórsdóttir, Director Human Resources Icelandair, Meeting on project scope, February 6th 2006.
- Ástþór Ingason, Manager Stations Icelandair
 - Meeting on project scope and initial data collection, February 6th 2006.
 - Structured interview, April 24th 2006.
 - Several phone calls to clarify issues.
- Icelandair Station Managers Meeting, March 2nd 2006, Orlando Sanford.
- Angie Condon, Icelandair Station Manager London Heathrow, Structured Interview,
- Jóhannes Thorberg, Icelandair Station Manager Boston Logan, Structured Interview,
- Mark Snowdon, Icelandair Station Manager Copenhagen Kastrup, Structured Interview,
- Einar Hanneson, IGS Operation Manager, Keflavík International Airport, Structured Interview
- Site visit to Keflavík International Airport, Observation of the flight departure process and hub operations, March 10th 2006.
 - FI306 – Keflavik - Stockholm
 - FI450 – Keflavík – London

D Appendix D – Station Performance Metrics

The station performance metrics are described in detail in chapter 2.

BOS

	2005												2005	St.dev	
	JAN	FEB	MAR	APR	MAI	JUN	JUL	AGU	SEP	OKT	NOV	DES			
Efficiency															
Turnaround time	165	165	169	190.5	190	190	190	190	190	189.4	165	165	180.2	12.5	
Staff time	133	116	101	107	102	76	79	88	108	107	99	102	101	16	
Efficiency index	1.69	1.58	1.50	1.64	1.61	1.44	1.46	1.52	1.65	1.64	1.47	1.49	1.56	0.09	
Quality															
Customer complaints	26.79	26.77	37.85	21.51	38.27	45.90	29.59	16.52	21.72	0.00	39.94	41.14	29.30	12.91	
Lost baggage (bags per 1000 pax)	28.66	16.33	21.01	14.20	23.15	13.77	11.10	29.24	15.64	25.86	20.57	34.55	20.83	7.30	
Late departures	7%	4%	10%	0%	6%	17%	10%	6%	0%	0%	0%	17%	6%	6%	
Quality index	0.95	1.34	0.92	1.72	0.92	0.87	1.30	1.09	1.63	1.89	1.04	0.66	1.19	0.38	
Product															
Flights per day	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.99	0.03	
Average flight length	3882	3882	3882	3882	3882	3882	3882	3882	3882	3882	3882	3882	3882	0	
Passengers per flight	128.7	133.4	170.5	155.0	168.6	217.9	218.0	195.3	153.5	160.9	166.9	167.7	170.2	28.4	
Cargo per flight (ton per flight)	1.03	1.17	1.10	1.13	1.18	1.45	1.57	1.55	1.46	1.28	0.96	1.35	1.27	0.20	
Passenger connections to flight	8.1%	6.4%	8.3%	5.2%	8.3%	7.2%	6.0%	6.2%	5.7%	4.3%	5.6%	7.9%	6.6%	0.01	

CPH

	2005												2005	St.dev
	JAN	FEB	MAR	APR	MAI	JUN	JUL	AGU	SEP	OKT	NOV	DES		
Efficiency														
Turnaround time	95.1	96.2	93.4	83.6	85.0	82.9	85.6	85.5	85.4	85.2	95.6	94.7	88.3	5.4
Staff time	87	64	60	55	61	66	62	65	71	71	57	62	65	9
Efficiency index	1.04	0.89	0.86	0.77	0.82	0.84	0.83	0.85	0.88	0.89	0.85	0.87	0.87	0.06
Quality														
Customer complaints	28.10	38.43	19.56	18.34	23.70	34.88	24.26	20.91	7.67	15.11	29.43	39.52	24.30	9.58
Lost baggage (bags per 1000 pax)	20.93	16.91	15.84	10.36	12.40	17.85	17.57	18.19	22.62	19.57	22.27	33.30	18.71	5.79
Late departures	19%	20%	22%	17%	25%	19%	24%	13%	23%	30%	15%	31%	21%	5%
Quality index	0.92	0.87	1.09	1.41	1.07	0.89	0.96	1.18	1.10	0.96	0.94	0.60	1.00	0.20
Product														
Flights per day	2.06	2.00	2.03	2.17	2.48	3.80	3.87	3.74	2.43	2.29	2.07	2.10	2.59	0.75
Average flight length	2151	2151	2151	2151	2151	2151	2151	2151	2151	2151	2151	2151	2151	0
Passengers per flight	111.2	139.4	162.3	167.7	164.4	150.9	171.7	164.9	178.6	186.4	164.4	155.7	160.9	19.6
Cargo per flight (ton per flight)	1.30	1.63	1.47	1.49	1.09	0.84	0.65	0.83	1.27	1.36	1.72	1.61	1.18	0.35
Passenger connections to flight	25.5%	18.3%	20.3%	20.9%	17.6%	16.5%	15.1%	16.2%	17.1%	13.4%	13.9%	12.4%	16.8%	3.7%

KEF

	2005												2005	St.dev
	JAN	FEB	MAR	APR	MAI	JUN	JUL	AGU	SEP	OKT	NOV	DES		
Efficiency														
Turnaround time (minutes)	78.6	80.8	76.1	76.7	73.8	79.7	76.8	75.6	75.0	75.3	75.9	74.6	76.5	2.1
Staff time	87	86	66	66	65	52	46	46	59	63	74	83	66	14.3
Efficiency index	0.95	0.96	0.81	0.81	0.79	0.74	0.68	0.67	0.75	0.78	0.86	0.91	0.81	0.10
Quality														
Customer complaints	9.80	10.68	7.25	7.32	5.92	16.25	9.18	7.41	8.35	6.12	8.00	10.90	9.02	2.82
Lost baggage (bags per 1000 pax)	4.46	3.90	3.98	2.89	2.65	4.88	5.55	4.87	3.32	3.52	4.52	6.52	4.34	1.12
Late departures	37%	30%	33%	20%	34%	53%	46%	43%	34%	30%	24%	44%	37%	10%
Quality index	1.30	1.52	1.51	2.21	1.58	0.91	1.09	1.21	1.48	1.70	1.82	1.07	1.45	0.36
Product														
Flights per day	10.55	10.61	11.58	12.13	13.87	19.70	20.48	20.13	14.37	13.06	11.13	10.84	14.06	3.86
Average flight length	2705	2677	2705	2775	2777	2776	2757	2773	2795	2805	2699	2695	2752	45
Passengers per flight	124.8	126.1	153.8	150.1	157.2	156.2	171.6	173.0	166.8	161.5	149.6	136.6	155.5	16.1
Cargo per flight (ton per flight)	1.97	1.90	1.77	1.82	1.59	0.88	0.85	0.83	1.39	1.60	1.72	1.93	1.41	0.43
Passenger connections to flight	36.2%	30.8%	37.1%	34.0%	40.6%	44.8%	41.9%	38.3%	38.7%	36.3%	30.1%	37.6%	0.38	4.3%

LHR

	2005												2005	St.dev	
	JAN	FEB	MAR	APR	MAI	JUN	JUL	ÁGÚ	SEP	OKT	NÓV	DES			
Efficiency															
Turnaround time	69.1	68.5	68.0	68.2	67.6	67.5	67.5	67.5	67.5	68.1	65.4	65.9	67.6	1.0	
Staff time	99	62	57	64	73	105	95	102	80	63	66	70	78	17	
<i>Efficiency index</i>	0.99	0.74	0.71	0.76	0.81	1.02	0.95	1.00	0.85	0.75	0.76	0.78	0.84	0.11	
Quality															
Customer complaints	66.36	39.22	48.21	10.94	30.39	50.92	25.51	47.17	60.50	38.37	35.71	46.32	40.55	15.17	
Lost baggage (bags per 1000 pax)	23.39	10.46	12.53	9.52	9.22	13.75	16.33	19.25	18.03	12.18	11.43	13.78	13.98	4.31	
Late departures	33%	19%	42%	38%	28%	50%	48%	26%	35%	47%	23%	42%	36%	10%	
<i>Quality index</i>	0.54	0.97	0.65	1.11	0.99	0.59	0.72	0.71	0.59	0.69	0.95	0.65	0.76	0.19	
Product															
Flights per day	1.87	1.86	1.90	1.83	1.97	2.00	2.00	2.00	2.00	1.87	1.87	1.84	1.92	0.07	
Average flight length	1901	1901	1901	1901	1901	1901	1901	1901	1901	1901	1901	1901	1901	0	
Passengers per flight	103.9	147.1	175.8	166.2	161.8	163.7	189.7	171.0	137.7	179.8	150.0	151.5	158.5	22.6	
Cargo per flight (ton per flight)	0.58	0.79	0.77	0.86	0.75	1.14	0.94	0.77	0.93	1.04	0.97	1.02	0.88	0.16	
Passenger connections to flight	4.4%	2.8%	2.0%	3.3%	3.5%	3.1%	3.6%	4.3%	3.3%	2.7%	3.3%	2.5%	3.2%	0.7%	

E Appendix E – Relationships between job functions

These tables show the percentage of the answers to the eight questions regarding relational coordination in the survey that were answered 4 or higher on a 5 point Likert scale. The five job functions that answered the survey are depicted in the lines and the job functions they answered the questions about are depicted in the columns.

All stations

Relationships between job functions												
	Pilots	Flight attendants	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanics	Operations agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	42%	36%	49%	45%	55%	59%	23%	37%	51%	24%	27%	21%
Gate agents	50%	50%	86%	65%	67%	49%	25%	24%	74%	26%	20%	21%
Operations agents	82%	60%	87%	43%	80%	59%	38%	52%	97%	56%	61%	48%
Ramp agents	42%	39%	51%	38%	75%	55%	40%	39%	60%	42%	25%	39%
Ticketing agents	36%	33%	67%	73%	52%	42%	19%	23%	49%	18%	19%	19%

BOS

Relationships between job functions												
	Pilots	Flight attendants	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanics	Operations agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	67%	46%	64%	62%	62%	55%	19%	44%	79%	30%	41%	27%
Gate agents	67%	46%	64%	62%	62%	55%	19%	44%	79%	30%	41%	27%
Operations agents	88%	38%	63%	75%	88%	75%	44%	81%	100%	50%	81%	50%
Ticketing agents	47%	27%	56%	64%	44%	38%	31%	44%	50%	31%	44%	38%

CPH

Relationships between job functions												
	Pilots	Flight attendants	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanics	Operations agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	41%	38%	58%	54%	65%	66%	27%	16%	41%	9%	9%	9%
Gate agents	61%	70%	95%	70%	77%	61%	36%	18%	76%	24%	13%	13%
Operations agents	90%	80%	95%	39%	68%	50%	38%	53%	98%	58%	58%	53%
Ramp agents	35%	26%	41%	23%	79%	60%	40%	31%	65%	14%	25%	15%
Ticketing agents	18%	22%	78%	80%	56%	33%	14%	9%	60%	7%	5%	5%

KEF

Relationships between job functions												
	Pilots	Flight attendants	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanics	Operations agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	31%	31%	36%	27%	49%	71%	28%	50%	46%	35%	31%	28%
Gate agents	46%	51%	84%	58%	87%	47%	29%	31%	61%	45%	23%	41%
Operations agents	76%	33%	84%	46%	87%	65%	52%	51%	95%	69%	74%	69%
Ramp agents	49%	50%	60%	52%	70%	50%	39%	46%	54%	68%	26%	61%
Ticketing agents	46%	38%	51%	61%	51%	41%	26%	29%	37%	29%	31%	32%

LHR

Relationships between job functions												
	Pilots	Flight attendants	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanics	Operations agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	0%	0%	28%	42%	33%	19%	0%	0%	11%	0%	0%	0%
Gate agents	21%	21%	91%	64%	40%	27%	8%	10%	77%	10%	12%	10%
Operations agents	80%	74%	90%	33%	81%	56%	20%	39%	96%	44%	45%	18%
Ramp agents	0%	0%	28%	42%	33%	19%	0%	0%	11%	0%	0%	0%
Ticketing agents	50%	55%	77%	80%	50%	64%	6%	24%	43%	11%	10%	15%

F Appendix F – Observed problems in the flight departure process

All stations

Problems between job functions												
	Pilots	Flight attendants	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanics	Operations agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	1.33	1.89	1.90	1.68	1.71	1.65	1.61	1.39	1.42	1.33	1.67	1.39
Gate agents	1.54	1.85	1.44	1.56	1.19	1.15	1.13	1.09	1.19	1.17	1.30	1.21
Operations agents	2.37	2.61	2.68	1.94	2.21	1.95	2.95	1.74	1.47	2.05	2.05	1.79
Ramp agents	1.96	2.44	1.64	1.56	1.96	1.82	1.72	1.73	1.85	1.89	1.31	1.85
Ticketing agents	1.19	1.25	1.38	1.31	1.25	1.19	1.19	1.00	1.25	1.06	1.13	1.06

BOS

Problems between job functions												
	Pilots	Flight attendants	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanics	Operations agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	1.20	3.20	2.60	1.60	1.00	1.40	1.40	1.00	1.00	1.20	1.60	1.00
Gate agents	1.20	3.20	2.60	1.60	1.00	1.40	1.40	1.00	1.00	1.20	1.60	1.00
Operations agents	1.00	4.00	3.50	2.00	1.00	2.00	2.00	1.00	1.00	1.50	2.50	1.00
Ticketing agents	1.00	2.00	2.00	1.50	1.00	2.00	2.00	1.00	1.00	1.00	1.50	1.00

CPH

Problems between job functions												
	Pilots	Flight attendant s	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanic s	Operation s agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	1.50	1.40	1.67	1.80	2.17	1.80	1.50	1.50	1.60	1.50	1.50	1.50
Gate agents	1.44	1.50	1.30	1.70	1.30	1.11	1.00	1.00	1.11	1.38	1.50	1.63
Operation s agents	2.40	2.80	2.60	2.00	2.60	2.40	2.40	1.80	1.80	2.00	2.40	2.20
Ramp agents	1.85	2.08	1.64	1.46	2.00	1.93	1.85	1.38	1.92	1.23	1.31	1.31
Ticketing agents	1.00	1.00	1.67	1.67	1.67	1.17	1.17	1.00	1.67	1.17	1.17	1.17

KEF

Problems between job functions												
	Pilots	Flight attendant s	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanic s	Operation s agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	1.43	1.57	1.86	1.86	2.00	1.86	2.00	1.71	1.71	1.43	2.00	1.71
Gate agents	1.60	1.60	1.20	1.20	1.00	1.20	1.25	1.50	1.00	1.00	1.00	1.00
Operation s agents	3.33	2.60	2.33	1.20	2.50	1.83	3.33	2.67	1.67	1.83	2.00	1.83
Ramp agents	2.07	2.79	1.64	1.64	1.93	1.71	1.58	2.08	1.79	2.50	1.31	2.36
Ticketing agents	1.60	1.40	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

LHR

Problems between job functions												
	Pilots	Flight attendant s	Gate agents	Ticketing agents	Ramp agents	Baggage transfer agents	Freight agents	Mechanic s	Operation s agents	Cabin cleaning	Fueling	Catering
Baggage transfer agents	1.00	1.00	1.33	1.00	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Gate agents	1.86	1.57	1.00	1.57	1.29	1.00	1.00	1.00	1.57	1.00	1.00	1.00
Operation s agents	1.83	2.00	2.83	2.50	2.00	1.67	3.33	1.00	1.17	2.50	1.67	1.67
Ramp agents	1.00	1.00	1.33	1.00	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Ticketing agents	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00