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Airport Ground Operations Through the Lens of Human-Technology Systems

a descriptive case study of
ground operations at a Swedish airport

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Preface

This study has been performed because of our interest and curiosity in how things work. Our interest in work systems, product development, people's behavior and the interaction between different systems led us to the idea for this thesis. During our masters degree in Technology Work and Health, we have learned about the different aspects of **Human Technology and Organization** (HTO), which details the importance of how the interaction between these three subsystems should work together.

These two years of studying our masters degree has taught us not to see problems as problems but more as an opportunity to improve a situation. Our shared interest and strong collaborative teamwork made us start discussing early about writing this study together, which lead us to this report.

We would like to thank the Head of Health and Work Environment at the company this study was conducted, for all the help with guidance and giving us the opportunity. We would also like to thank the Ground staff that welcomed us to their workplace and the respondents participating in the observations and interviews.

Finally, a big thanks to our supervisor for guiding us and giving us ideas that resulted in new solutions.

Thank you!

Summary

Aim The aim with the study was to explore the work conditions of the Ground staff performing unloading and loading from an HTO perspective, and to identify areas for improvement. **Research questions** 1. Which factors are important for the work performance? 2. To what degree do the employees follow the work instructions regarding the use of the equipment on the ramp? 3. Which recommendations can be provided to improve work performance at ramp operations and minimize risks for accidents? **Background** Ramp operations have, according to Studic et al., (2017), repeatedly been estimated as one of the areas with the highest, still increasing, safety risks. Passenier, Sharpanskykh and de Boer (2015) also confirms how the work within the ramp operations, and performance of unloading and loading, is an area with high risks of injuries and deaths. **Methods** The study was conducted with a qualitative research approach and Descriptive Case study design (Baxter & Jacks, 2008). **Results** Five categories were found; time pressure, “safety mindset”, education, culture and equipment. The findings also showed that the employees prioritize the safety of the aircraft rather than their own safety. **Conclusions** Out of the five factors, time pressure and equipment are the factors in the environment which the respondents have to work in line with to make it function in the environment.

Keywords: HTO, Time pressure, Ramp operations, Ground handling, Unloading and loading, Baggage handling

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1.Introduction

This section gives a short presentation of the preparations of this study and leads on to background information and details about the work performance of unloading and loading of baggage to an aircraft's compartment. Also included in this section is the aim, research questions as well as the delimitations of this study.

The aviation industry is known for prioritizing safety in so many aspects, primarily the safety of passengers, safety during flight and safety when preparing for flight. Although the focus usually lies on the above-mentioned aspects, it was decided to take a closer look at a specific aspect in the aviation industry that many people may not think of when flying to their chosen destination. Baggage handling is the work performance of loading and unloading of the aircrafts compartment before and after every flight, a task in which ground staff handle baggage, cargo, mail and other goods that are transported by air.

1.1. Background

Before and after every flight, aircrafts are usually parked at a gate where numerous ramp operations are performed by ground staff. Operations such as catering, fueling, safety checks, maintenance and baggage handling are typically performed at a noisy, congested ramp area (Landry & Ingolia, 2011; Wenner & Drury, 2000; Studic, Majumdar, Schuster & Ochieng, 2017). The demand on speed and efficiency therefore often puts ground staff on the ramp under time pressure performing repetitive tasks (Wenner & Drury, 2000), which does not usually result in a good work environment.

There have been countless advances in the evolution of the aviation industry as they develop better and more efficient machines. All this progression has been possible because of high standards when it comes to safety in the air. Safety and efficiency are emphasized to be two of the priorities of the International Civil Aviation Organization (ICAO, 2011) and this is also some of the priorities that airline companies strive to accomplish. For the work performed on the ground the safety standards are not followed as strictly (Landry & Ingolia, 2011; Studic et al., 2017).

Being aware of this lapse makes it more understandable that the work environment for those performing ramp operations can be risky and needs a closer look.

Ramp operations has, according to Studic et al. (2017), repeatedly been estimated as one of the areas with the highest, still increasing, safety risks. Passenier, Sharpanskykh and de Boer (2015) also confirms how the work within the ramp operations, and performance of unloading and loading, is an area with high risks of injuries and deaths.

“Turnaround time” is the term used when the aircraft is parked and ramp operations are being performed (More & Sharma, 2014; Studic et al., 2017). A parked aircraft is a cost for an airline company, so they want the aircraft to be back up in the air as quick and safe as possible again (More & Sharma, 2014; Malandria, Mantecchia & Reis, 2019) .

Introduction

Rattat, Matha and Cegarra (2018) explains how time pressure can bring people to use different strategies in how to handle information of importance. This can be done through internal prioritizations which are valued by different individual needs. Duan, Wang, Hu and Kounios (2020) expressed through their findings how tasks were solved under stress; the response to the task was fast but the accuracy was not adequate. Further on it was shown that stress decreased the flexibility for individuals to find solutions. Stress has been shown to affect the cognitive areas in a negative way, this can mean that the task solving and working memory also are affected (Duan et al., 2020; Shields, Sazma & Yonelinas, 2016)

This study has been conducted with a company that desires more input of near accident events from the ground handling department. By understanding the reasons why there is a lack of data, it should be possible to implement improvements to help eliminate the problem areas or at least know where to focus concerning these issues.

Landry and Ingolia (2011) emphasizes that the lack of data makes it almost impossible to mitigate the risks. The benefit of having data of near accidents can help the airline to take action towards preventing unwanted events from happening or minimizing the risks which is also confirmed by Wenner and Drury (2000).

Khakzad, Kahn and Amoyette (2015), Rathnayaka, Kahn and Amoyette (2011) and Wenner and Drury (2000) describes and highlights the importance of knowledge of near accidents in order to foresee the major accidents which may give an understanding to why they occur and how to work proactively.

As mentioned above there are different types of ramp operations and to make the study more comprehensive, the focus of this study will be specifically on baggage handling of unloading and loading from the aircraft.

1.2 Aim and Research Questions

The aim with the study was to explore the work conditions of the Ground staff performing unloading and loading from an HTO perspective, and to identify areas for improvement.

1. Which factors are important for the work performance?
2. To what degree do the employees follow the work instructions regarding the use of the equipment on the ramp?
3. Which recommendations can be provided to improve work performance at ramp operations and minimize risks for accidents?

1.3 Delimitations

The study is limited to regard the employees who performs unloading and loading of baggage and cargo within ramp operations at a Swedish airport.

2. Theoretical Framework

This section presents the framework Human, Technology, Organization (HTO) from the perspective of Rollenhagen's system risk model (1997) which the study was based on, and also one more model; Control support stress-model (Karasek & Theorell, 1990) which also was used for analysis.

2.1 Human Technology Organization (HTO)

The content and meaning of the model consisting of Human, Technology, Organization (HTO) systems can be described from different aspects depending on the subject of the work situation. The main focus from an HTO angle is to capture and understand how the work was functioning and progressing through the interaction of the three systems and especially the human interaction with technology. The model is also emphasized to be valuable in analyzing intricate systems, human factors and ergonomics (Karlton, Karlton, Berglund & Eklund, 2017).

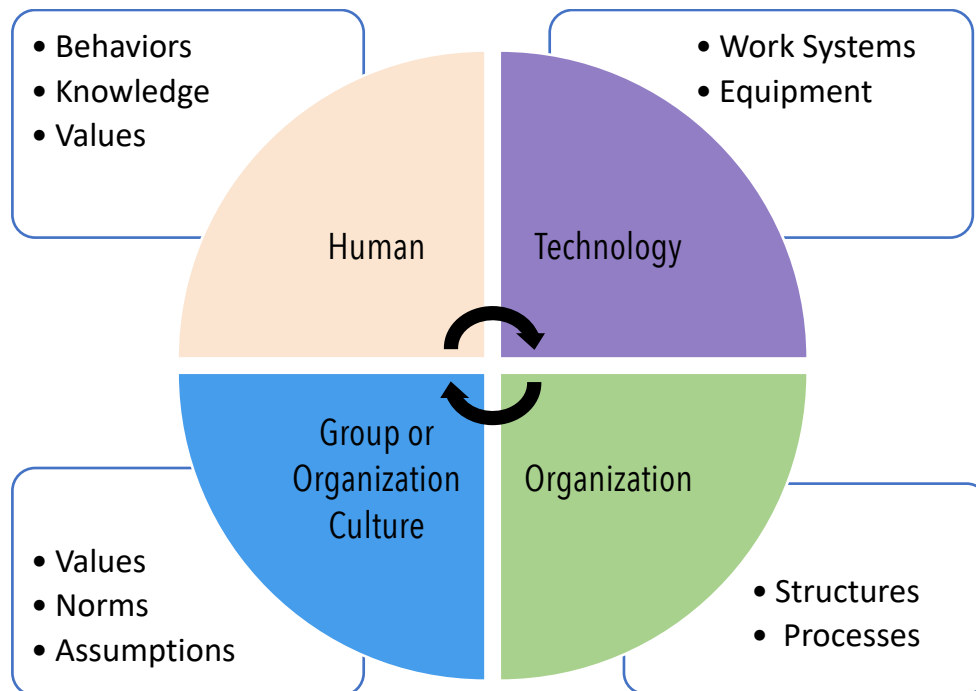


Figure 1: HTO concept modified from Rollenhagen (1997) and were the components ends up giving both risks and values of the work processes.

The model of HTO in this study shown in Figure 1, was defined by Rollenhagens (1997) "system risk model". The model was extended to contain of the system *group and organization culture* and further on to specifically look on the factors of risks for individual and group level (Rollenhagen, 1997). Like the name of the model implies; system risk, which was the main concept, to evaluate and "measuring" how the behaviors and safety aspects were done theoretically and in practice. The systems Human - Technology had a significant meaning to enhance a deep understanding. Karlton et al. (2017) emphasized that the work cannot be thoroughly done if there were too much and broad angles trying to capture the work environment in all the areas from the HTO perspective.

Theoretical Framework

The concept of HTO was developed from earlier deviations in the nuclear industry during the 1980's. It was established that the human interactions with the machines could fall out to be done wrong but with the angle of understanding the total work process and the routines in a whole concept (Karlton et al., 2017).

The framework was used to shed light on the aspects that were not so obvious to the individuals or the organization. It was emphasized that the concept included the three systems Human, Technology and Organization which further on developed subsystems, the content of these systems was described as changeable depending on the characterization of work, which in this case was baggage handling of unloading and loading of aircraft compartments. These systems are interdependent of each other which means that changes in one system affect all the other systems as well (Karlton et al., 2017).

The work, and the performances within the work, was described to be shaped through activities and factors that affected one and another, this was also explained to be a socio-technical system (Karlton et al., 2017).

Karlton et al. (2017) cite Hollnagel (2009) where it was said to be either a success, or less success, in the organization performances in how social and technical factors interact between one and another.

Subsystems

According to Karlton et al. (2017. P.183) there were four subcategories of the Human and two of those were relevant to include:

- "information processing system"
- "member of social groups or cultures"

There were also different ways of viewing what kind of role the human had, for this subject there was focus on the human as "exposed to the system" and the human as "cooperating in the system" (Karlton et al., 2017. P.184). The area of technology could consist of the work system as a subsystem and the equipment's being used. The organization was described to be the large and overall defined concept of informal and formal activities regarding the social environment, what the company was doing and aiming for through the work (Karlton et al., 2017).

The risks were described to be developed and created through interactions between the overall systems. The value consisted of the equipment's being utilized and the employees who performed the work.

2.2 Demand-Control-Support Model

Karasek and Theorell (1990) emphasized the importance of demand, control and support and how these factors could affect one and another. Depending on which area the individual belonged to in the model, there was a certain effect that this placement had.

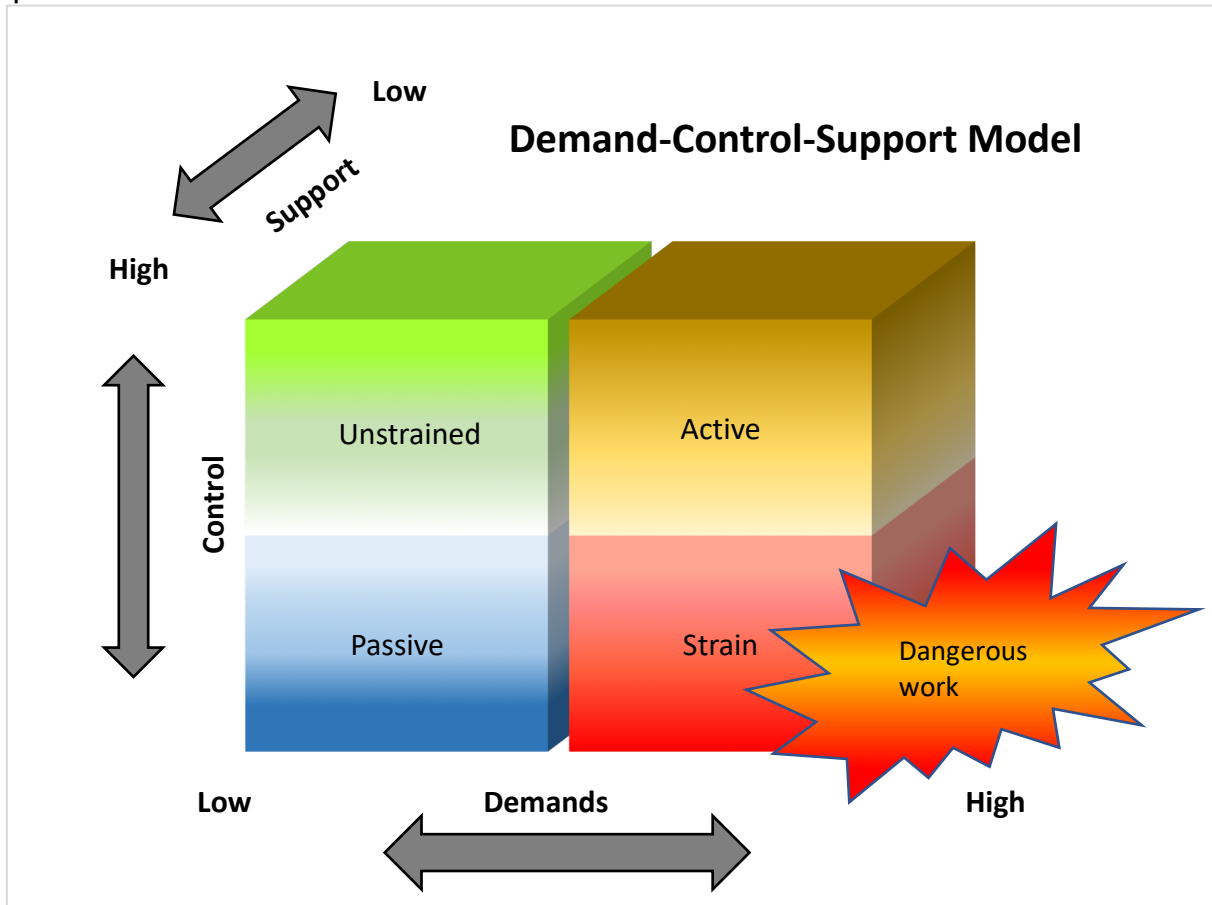


Figure 2: Demand-control-support model modified from Karasek and Theorell (1990)

Seen in Figure 2 is a modified model from Karasek and Theorell (1990), the model shows how the combination of each area could have either a positive or a negative effect in relation to high or low control, support or demands.

The model was described through the four areas in the boxes Unstrained, Active, Passive and Strain. These were also placed in the relation of:

- High or Low Control (Left in the model)
- High or Low Demands (Below in the model)
- High or Low Support (Upper left corner).

The first area mentioned, *unstrained*, shows how the combination of low demands and high control and support can develop a positive contribution to the work performance were the employees have full potential to influence their work.

Theoretical Framework

The second area mentioned, *active*, shows how the combination of high demands and high control and support makes the work to be manageable.

The combination of both low control and low demands show the development of a *passive role* where the employee does not feel any encouragement to take initiatives. The last area is *strain* that is of the combination high demands and low control, the area of strain in the work is shown to be the most critical state where the employees are under demands that they cannot handle.

3. Methods

This section explains the type of approach and design applied, the different methods used for data collection and data analysis.

The study was conducted with a qualitative research approach and Descriptive Case study design (Baxter & Jacks, 2008). Furthermore, the manifest content analysis (Graneheim & Lundman, 2004) was used on accident reports to create an observation guide. The observation guide was formed with inspiration from the Critical Incident Technique (CIT) (Flanagan, 1954). Semi-structured interview questions (Kallio., et al. 2016) was formed after the observations had been conducted. The respondents for both observations and interviews were chosen through convenience sample which means that the employees were chosen by being available at the airport while the observers were there.

3.1 Qualitative Research

The qualitative approach describes the perspective from a deep and descriptive level, which implies the reader to build an understanding from the comprehensive information (Silverman, 2006).

The qualitative research approach was not intended to generalize information or answer hypotheses, but rather give an insight to the subjective experiences which the respondents reveal when being interviewed. With this information, new hypotheses might be obtained, though it was not necessarily a requirement.

3.2 Descriptive Case Study Design

There are two main approaches in which the descriptive case study design could be applied to according to Baxter and Jacks (2008). For this study Yins (2003) approach was chosen and applied because one of Yin's points of interest was to answer "How" and "Why" questions. Yin (2003) also applied a constructivism angle of the case study which means that there could be several truths in one aspect, the truth depends on what the persons have been experiencing. The study design was described by Baxter & Jacks (2008) where they referred to Yin (2003) to be sufficient to use when there was need for a perspective on the "intervention or phenomenon and the real-life context in which it occurred" (Baxter & Jacks, 2008. P.548). The approach was described to be flexible in the way that several data sources could be efficient to provide different angles which the work can be seen from.

3.3 Data Collection

The data collection contained accident reports, observations and semi-structured interviews. The accident reports fulfilled the function of gaining the information needed about the work environment, to build an understanding and be able to structure an adequate observation guide. The observation guide could be constructed with the help of the accident reports where several categories were found to have the bearing and leading part revealed through observations. Figure 3 shows the process steps of the data collection.



Figure 3 shows the steps of the process for the obtained data.

3.3.1 Accident Reports

After the visit to the airport the decision was made to focus on ramp operations, mainly the procedures for unloading and loading baggage. The company was asked to hand out accident reports with the purpose to establish a greater understanding and know where to aim the observations.

Table 1 shows the received reports that was from the years 2017, 2018 and 2019 with a total of 426 reports. The reports had to fulfil requirements to be of subject and function to form the observation guide, the requirements were:

- Description of situation
 - What kind of act or decision that was taken
- Where it happened
 - Inside or outside of the compartment when loading or unloading luggage/containers/cargo.
- The reports which fulfilled the requirements was descriptive in a way were it
 - was easy to get an overview of the situation, what happened and why.

Methods

Table 1 gives a descriptive overview of how the reports were obtained and sorted

	Total Reports	Examined	Selected
2017	129	69	28
2018	119	38	27
2019	178	65	19
Total:	426	172	74

After the reports that met the criteria had been selected, there were a total of 74 accident reports which could be used for the further analysis to form the observation guide. After the chosen reports had been thoroughly read, they were handled with the manifest content analysis (Graneheim & Lundman, 2004) in the order of:

- Meaning unit
- Condensed meaning unit
- Code
- Subcategory
- Category

With the work of the manifest content analysis (Graneheim & Lundman, 2004) the codes, subcategories and categories were used as subjects to form a well evaluated and structured guide for the observations. The use of the method was to form a guide of high reliability, this was conducted from the aspect of the employee's own words and experiences which then were worked through with the scientific tool of the manifest content analysis (Graneheim & Lundman, 2004).

3.3.2 Manifest Content Analysis

Manifest content analysis (Graneheim & Lundman, 2004) is an analysis method that contains of different stages were the text works through to see important and bearing parts of the text. This could be handled through different sets of stages (Graneheim & Lundman, 2004) depending on the aim of the analysis .

In this report the compiled stages were meaning units, condensed meaning units, codes, subcategories and categories which provided the bearing and important parts of the text to be lifted forward. This analysis of the documents could provide the trustworthiness and validity in how the information from the documents were being handled and interpreted.

The text was transcribed from observations and also written during the observations. The text underwent a process were the sentences were broken down to the important and bearing parts. These condensed parts of the text was the substance which described the situation that the writers wanted to catch and make an understanding of (Graneheim & Lundman, 2004).

Example of the manifest content analysis process

Table 2 shows an example of how the process of the manifest content analysis could look like and how the text from the documents were broken down to meaning unit, condensed meaning unit, code, subcategories and categories.

Table 2 description of the analysis process.

Meaning Unit	Condensed Meaning Unit	Code	Subcategories	Categories
I didn't do it because I was in a hurry - then I squeezed my wrist. Had I done it [folded out the extra stairs] then we would have been late instead.	I was in a hurry - ...Had I done it [folded out the extra stairs]... ..been late instead.	Stress Not using helping aids Time saving	Work "efficiency"	Conscious Time Pressure
Avoiding getting pinched is hard, it is really hard. It's almost impossible, then you should just pull one cart at the time, unload all the bags from that cart and then you pull it away, and then you pull the next one. It takes forever, we don't have that time.	Avoiding getting pinched is hard, it is really hard... ..then you should just pull one cart at the time... ..It takes forever, we don't have that time.	Unable to prevent injury Time pressure		

3.3.3 Observation Guide

With help of the manifest content analysis and some inspiration from the Critical Incident Technique the observation guide was structured. The inspiration from the Critical Incident Technique developed the guide to include important aspects from the accident reports which gave the observers knowledge and indications on what the work environment could contain of. With the help of the reports the observers were able to follow behaviors, which according to the accident reports could lead to various outcomes in the environment of unloading and loading. Flanagan (1954. P. 1) emphasized the meaning of "Incidents" and that this was important from the observants angle to be able to predict the outcome of which was observed.

The observants should know the procedure and know how the outcome could be. The "critical" angle was possible as the observants had a pre knowledge of the situation and therefore could adjust to the situation and draw conclusions to what could have happened in the situation, or what did happen (Flanagan, 1954). With the establishment of the different types of behaviors and knowledge of procedures the codes, subcategories and categories were used under three headings; "General aspects", "Outside compartment" and "Inside compartment".

See [Appendix 1](#) for the final design of the observation guide. The guide did not include all the different subcategories and categories listed to keep a cleaner and easier structure to follow when observing. Equipment which were used:

- Observations guide
- Mobile phone
 - For recording of observations and interviews out on the ramp

3.3.4 Semi Structured Interviews

The semi-structured interviews were constructed with several questions for one or several themes (Kallio et al., 2016) to increase knowledge about experiences. Kallio et al. (2016) described that the interview process was done from a structure of questions which the participants answered in their own extent. The interview technique was designed for follow-up questions which could be slightly different from other respondents depending on what the respondents talked about. These changes were in line with the semi-structured interview intentions, that the respondents chose how to talk and evaluate the questions asked (Kallio et al., 2016).

Equipment used:

- Computer for interview work
 - Interview questions
- Mobile phone
 - Recording of semi structured interviews with what the students observed

3.3.5 Materials for Observations

A sample of 5 observations, which consisted of 14 employees was derived from a total of 15 observations with 36 employees. The observation samples that was chosen gave a view of full saturation as they were consistent.

3.3.6 Materials for Interviews

For the interviews there was a total of 8 respondents which was chosen through convenience sample at the company, two further respondents were asked but was later not a part of the conducted interviews. Therefore, there was an external drop-out of two respondents. The convenience sample was used because there were certain aspects in the work environment which were aimed for to get answers about (Bryman, 2012), therefore was the employees from the ramp operations chosen, and more precisely during the operation of unloading and loading.

3.4 Data Analysis

The data analysis was conducted in the order of accident reports, manifest content analysis, observation guide and interviews which came to give the work a depth where the areas complemented each other.

3.5 Trustworthiness

The term trustworthiness was a description of how adequate the qualitative work had been conducted. Within the term description there was four categories which were *dependability, credibility, transferability and confirmability*. These categories of trustworthiness were described as to be in relation to the model of the quantitative research area; reliability, internal and external validity, and objectivity (Bryman, 2012, P. 49)

The first mentioned category was *dependability* that confirmed that the results likely could be found again. *Credibility* was the description for how probable the results were which leads to *transferability* that was if the results can be applicable in other areas. *Confirmability* describes how the work had been done without any subjective intentions (Bryman, 2012).

3.6 Ethical Considerations

There were ethical principles to keep in mind regarded when to conduct scientific researches, the principles could differentiate depending on which area that was of interest in the research. Because of the nature of this study, that involved both observations and interviews of employees. The ethical principles used were honesty, respect, reliability and accountability which was used to confirm how the research had been conducted and managed.

Honesty and respect as ethical aspects regarded to all the respondents of the observations and interviews that signed the documents. This informed about the aim

Methods

of the study and how the data collection would be conducted. The both principles also concerned that the respondents were informed both verbally and by a formal document about how the study was conducted, there was information regarding how all participants were free of choice to be within either the observations or the interviews.

The participants had the free choice of not being a part of the study with no further explanations. The reliability has been confirmed in how all the participants information (interviewing records) was kept with an iPhone device which required a pin code and Face ID, this also regarded the transcribed information. The reliability also confirmed that information collected from the respondents only was used for the thesis described. The information would not be used for any other constellations.

Further on, there was not any names attached or described to any of the recorded interviews or to the transcribed material. The material of documents and the recordings will be destroyed after the thesis has been graded, the respondents were informed about this both verbally and through the document.

The accountability confirms that the study has been planned and conducted through continuous dialogue with the Head of Health and Work Environment at the company . This was also conducted with the guidance from the supervisor of this study.

Methods

4.Results

This section explains the obtained results from observations and interviews that was conducted during this study. The result section is structured in the same order as the methods was used.

The observations and interviews elicited rich and varied data; the results presented below are distilled version of the findings that stood out the most.

4.1 Observations

Before the employees began with the unloading and loading procedure, they prepared the gates with certain equipment in order to make them easily accessible when needed. The preparatory work was done by two employees that worked with the arriving and departing flights. A sense of pride, respect and carefulness around the aircrafts was some of the few things that was perceived, from the employees when they worked with the large and heavy machines. When the truck arrived with the baggage cart, it was parked within a certain distance from the aircraft. Employees tended to pull and push the carts the remaining distance, to place them in the right position. [Appendix 3](#) shows a summarized observations guide with some of the findings out on the ramp.

During the observations four different types of helping aids was observed at different occasions. Helping aids that assisted with unloading and loading the cargo.

- High loader and transporter
- Power stow
- RTT longreach
- Regular loading belt

Some of the different helping aids could have been used on multiple aircraft models, but some helping aids had restrictions on what type of model that they could be used or combined with. Some helping aids were more suited to specific models than others and contributed to better working conditions when unloading and loading cargo. Below are the different helping aids presented more in detail of how they work and are utilized.

High loader and transporter

The high loader and transporter were used when cargo pallets and baggage containers were unloaded and loaded on an aircraft. The helping aid worked in the way that the transporter retrieved the cargo or container that was parked nearby the aircraft and transported the object to the high loader which was located right next to the compartment door.

One employee drove the transporter and transported the cargo to the high loader, the cargo was then rolled onto the high loader from the transporter. The employee that was operating the high loader elevated the cargo up to the compartment door.

Results



Figure 4 shows cargo that has been rolled into the cargo compartment by the high loader.

Once the cargo was elevated it was lined up and placed in position to be able to roll into the compartment, Figure 4 shows the cargo pallet that had been rolled into the compartment. Inside the compartment the employee that operated the high loader secured the cargo with safety “hasps”. When that was completed the procedure was repeated until the loading of the cargo was completed.

When this procedure was performed and observed from the high loader, the employee was asked what they thought of working with the high loader compared to other helping aids. The employee said that:

“this task gets pretty boring after a while, it does not get any more interesting than that. When working with other work tasks it’s more hands on and is more demanding”.

Power stow

The power stow was one of the loading belts that was seen on almost every gate and was used during most of the observations. The power stow looks like a regular loading belt, but in the front of the belt there was an extended arm that was easily maneuvered with one hand seen in Figure 5.



Figure 5 shows the easily maneuvered arm on the Power stow.

Results



Figure 6 shows the extended arm and elevated lip on the Power stow.

The extended arm could be pulled into the compartment and had a lip that could be elevated, to make it easier to unload or load the bags which is seen in Figure 6. The power stow was said to be adequate for deep cargo compartments, the bags were transported into the compartment where the employee stacked the bags. The power stow made the work more efficient for the employee, since the employee did not need to crawl back and forth when unloading or loading the cargo, since it is transported all the way.

RTT longreach

This loading belt gave the employee the possibility to bring part of the loading belt inside of the aircraft, that was called “the lip”. This lip could be elevated to a height that made the loading process easier or more manageable for the employee, see Figure 7.

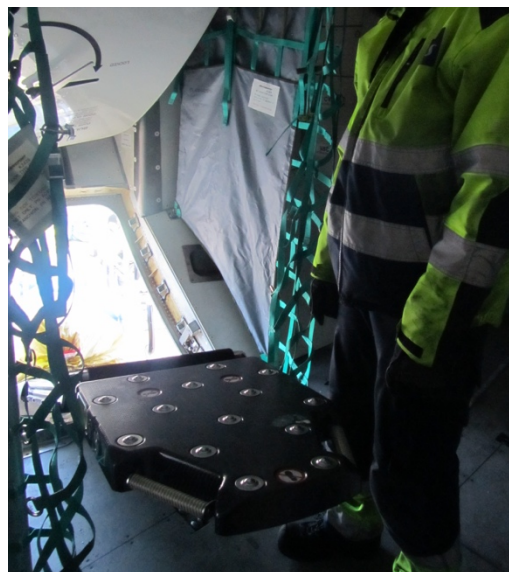


Figure 7 shows the RTT longreach- belt loader extension inside of the compartment.

Results

When using the loading belt, it was important to place the object with the flattest surface facing down on the belt and if the object had wheels, they were supposed to be placed in the direction the object was moving.

An employee using the RTT was asked what they thought of the RTT and they said:

“The loading belt is very sufficient when used in the right way.

It might seem that the speed of the loading belt is slow, but this enables us to load the objects closer to each other and it does not take a longer time, which a lot of my co-workers assume since this loading belt moves slower”.

Regular loading belt

This loading belt was perceived as an older version compared to the different loading belts available, see Figure 8. The belt had no extra functions that improved the working conditions as the other loading belts were able to do. During a couple of observations, the regular loading belt was used. Additional wheels had been added in front of the belt, which worked as a protection for the aircraft in case the loading belt would get hit by another vehicle.



Figure 8 shows a regular loading belt being used when loading

Sample Observations

#5: Airbus 330

Loading

During this observation the unloading and loading was performed with a high loader and a transporter on compartments 1-4. For compartment 5 an RTT band was used. The RTT band was placed in position at the compartment door. Employee 1 then climbed up and manually handled the easily maneuvered lip into the compartment.

As the loading belt was started, employee 2 placed large mail bags close to each other on the belt. While employee 1 inside the compartment was stacking the mail bags and putting them in the assigned area.

Results

Employee 1 positioned the lip to the preferred height, which gave the opportunity to take the mail bags in a near body position, so they could work efficiently with the arriving mail bags.

After packing 1-2 mail bags, employee 1 could see that the bags started to fall off and moved out of place as they arrived at the smaller part of the loading belts lip. Employee 1 then looked at employee 2 and could see that employee 2 was struggling with keeping the bags on the belt. Employee 1 then asked employee 2 if the speed was faster than what they started with, and employee 2 answered that the speed was increased since employee 2 thought the belt moved too slowly. Employee 1 then replied by saying that

*“the mail bags keep falling off and getting out of place
because the speed is too fast”*

Employee 1 later on explained for the loading belt to be as efficient as possible the correct speed needs to be set, which a lot other employees are unaware of and use other loading belts instead.

#3: Airbus 320

Unloading

During this observation a regular loading belt was used and had been set-up on the side of the gate. The loading belt was later on placed near the aircraft, only a very small part of the loading belt was inside of the compartment and could not be placed any further as this was a risk to damage the aircraft if anything would hit the loading belt. The loading belt was for that reason intentionally placed with a small gap between the belt and the aircraft.

Employee 1 worked on their knees inside of the compartment, this position was the only option since the compartment ceiling was too low for working upright. Inside of the compartment the bags were stacked on an inbuilt sliding carpet that moved further and further away from the compartment door, so the person that worked inside did not have to crawl back and forth all the way into the compartment. Employee 1 began to unload the bags from the carpet and placed them on the loading belt.

Employee 1 used different techniques when lifting and pulling the bags to the loading belt. Employee 1 had to reach for the bags above shoulder height to get the ones on top, some bags were taken by the handles and dragged while other bags lifted in a near body's position. No other helping aid than the sliding carpet helped employee 1 to unload the bags. The unloading seemed to be quite demanding in the way employee 1 had to sit on their knees and work.

Meanwhile on the ground employee 2 worked in a low and methodological pace while lifting of the bags of the loading belt and placing them on the cart, which was placed approximately half a meter on the loading belts left side. Employee 2 was seen standing on the same place and did not need to move much, neither did employee 2 seemed to be stressed and performed the work task in an autonomous way which seemed to have been practiced for many years.

Results

Loading

The bags arrived at the gate and employee 2 started the loading belt and began to place the bags on the belt with the wheels facing up.

As the bags were transported on the belt, the first bag that was received by employee 1 was placed right under the loading belt. The reason for placing the first bag under the belt was to have the following bags slide on top of the positioned bag and work as an helping aid, to elevate the receiving bags. This made it easier to handle and pack the bags inside of the compartment.

Employee 1 stopped the loading belt, to rearrange some bags so they wouldn't tip over. This required precision, the placement of the luggage seemed to be of importance as the employee made an effort when packing the bags. Once the employees were done with loading the compartment, they continued with the next work task.

#7: Canadian Regional Jet (CRJ)

Loading

This observation was on a smaller aircraft type, a regular loading belt was used for getting the bags loaded. During this observation the trick of placing the first bag under the loading belt was not used. The reason for this was unknown, perhaps because the accessibility to the compartment room was positioned under the jet engine of the aircraft. This made the accessibility more difficult to get inside compared to the other aircraft models.

Employee 1 was seen in a compressed position, kneeling in the compartment with no place to move other than the little place that the employee took up kneeling on the floor. Employee 2 that placed the bags on the loading belt was seen to work in an autonomous way and a faster pace compared to the other sample observations.

#9: Airbus 320

Unloading

During this observation there were 6 employees and not the usual two employees, that had been observed during other observations. Employee 1 in the compartment used a power stow to unload the bags and began unloading the compartment. Employee 2 stood at the end of the loading belt and placed the bags on the baggage cart.

The four extra employees at the gate were 2 trainees that performed the practical part of their training, and two supervisors observing them and ready to assist in case they needed help. The trainees stood close to the belt reading the tags on the bags, they were looking for bags that were transferring to a connecting flight at another gate. Once they had those bags, they took them to the other gate. Regarding employee 2, the bags on the belt seemed to arrive pretty close to each other and fast.

Results

Employee 2 had difficulty keeping up the pace to place the bags properly on the cart. Employee 2 solved the “issue” by placing the bags quickly on the cart but in an unorganized manner. After all the bags had been emptied from the compartment, then employee 2 reorganized the bags to be properly packed on the cart.

4.2 Interviews

The work with and analysis of the interviews gave a comprehensive picture of the environment of the ramp operations, the analysis was developed and came to contain five categories; time pressure, “safety mindset”, education, culture and equipment. These categories describe the environment from the views of the respondents’ own experiences and knowledge.

Time pressure

Time pressure came forward to be a conscious and well-known matter as there were consistently flights that were scheduled to work with. There was a consistent majority that described the work to be conducted under this constant pressure. Several respondents described how the time pressure pushed other needs in the work environment aside, or it pushed respondents (1, 2, 3, 5, 6) to make undesired choices which was considered to “save time”.

One respondent (2) described how the time pressure was a factor which not only wears on the body but also keep the employee from having a mindful approach to work and not to have time to work at an adequate pace.

Respondents (1, 2, 3, 4) described how it was hard to avoid small or minor accidents as the time is short, this was further described from examples that the baggage carts were pulled or pushed manually, while loaded with bags and attached to one or two other carts. There were trucks available to move the carts but this was described to be a time demanding event. The work of pulling or pushing carts could have different outcomes depending on the weather. There were risks from either getting pinched, getting stuck between the carts and equipment, or falling under the carts.

[“Avoiding getting pinched is hard, it is really hard...Then you should just pull one cart at the time, it takes forever, we do not have that time.”] (Respondent 1).

Respondents put forward how they wanted to perform their work in an adequate way but that the time pressure makes it to be in the most efficient way instead.

Safety mindset

It was emphasized that the work cannot be performed in the way that the procedures are written, this was said to be that there are too many procedures. It was revealed from several descriptions that there were practical and theoretical aspects which do not match in the performance of unloading and loading. During the work performance this was seen, and the respondents emphasized that the work could be planned in other ways to ensure that they still work from the safety mindset, but also make it less time demanding.

Results

The respondents put forward how important the work [unloading and loading] was and that this should come to better attention. Several respondents (2, 3, 6) mentioned that they could not make sufficient plans for how to perform their work as rapid changes, such as removing bags that belongs to a passenger that will miss their flight, often happen. The respondents described how the work procedures was planned without any insight from their angle, which made them question how the safety mindset should go.

But it was emphasized from the majority of the respondents that the aircraft was the priority which should not, in any way, be damaged. The respondents acknowledged that if they worked in a safe way with the aircraft, they also had a safe work environment. There was a need to have awareness at work, or else it was hard to perform the work in a safe way.

Respondents (1, 2, 3, 4, 5, 6) described how safety mindset was of the highest significance in the work environment and that the performances was regarded to keep the aircraft and the employees safe. But there were some differences in how employees perceived the meaning of safety to mean that the safety mindset firstly regards the employees (2, 4, 5) or that it firstly regards the aircraft and to keep it safe from damage (Respondents 1, 3, 6).

The respondents described the perceived feeling of what the safety mindset meant for the company and there were a small proportion (2, 4) which described it from the importance of their own safety, that they perform the tasks without being injured.

It came forward that there were some problems in the way to perform the work from safety aspects or the way it should be on paper when larger aircraft were parked at gates which originally were built for smaller aircraft.

“...when we have our slightly larger A320 and it gets very crowded with large equipment, we take up the entire gate and it gets very busy, it's not always good conditions to work safely”.

Education

Two out of eight respondents (7, 8) described that there was a high need for education and support for some aspects in the environment, for example the RTT belt, and human Factors. This included the way in which the employees obtained some courses which was seen as waste of time as they were learned on the computer. This was being brought forward as a problem as the employees were seen to take the courses while being occupied by other things at the same time. There was much doubt if the information during these courses was retained as some could be 3.5 hours long. As mentioned by one respondent, some employees conducting a course were listening to music and waiting for when to press the “next” button on the computer.

“You are taking a web course. Perfect! I'll go and get coffee, put on my headphones, Spotify... It is a coffee break. There is nothing ensuring that the information is understood.” (8).

Results

There are some teacher led courses which validates the employees to perform more advanced work task, from two respondents (7, 8) this was said to be of a need for the rest of the educational area which is conducted with time efficient education on the computer instead.

It was said that equipment was available, but the employees have not received a proper education for how to use some of them, so they are either being used and mistrusted or that the old methods are being used because they know how to handle them.

The importance of training and education was brought up as this could help the employees to use proper equipment (8) and, which was emphasized, that the employees start to understand how some equipment really functions. There were different aspects to think of depending on which loading belt that was being used. Other aspects than using the right equipment were to have the correct technique, this was said to be often not done. There were several respondents who daily saw employees lifting in the wrong way or using their body inefficiently in other ways, this was an ongoing event found in another category (Time Pressure). It was mentioned that one respondent (2) thought that there was a reminder of the lifting technique sometime at a meeting, but the reminder does not occur so often.

Culture

Some employees (1, 2, 3, 4, 6) expressed how there is a consistent knowledge of things that could happen, and are happening, but that everyone does not report near accidents and accidents as they are used to them in the environment. One respondent described the situation as to be used with and to have the knowledge where to not slip and fall.

"...you do not really know what all the risks are, but you learn on the way." (3)

The importance of which shift the employees are scheduled on was expressed by the respondents (3, 4, 6) and this was said because the attitudes within some shifts can be of a negative character. Further it was described that new employees are placed with people who have a positive character and influence which was desirable to bring forward. It was also expressed how several respondents appreciated their shifts and collaborations with their colleagues as they have an adequate workflow where one and another know just what to do and do it.

"Yes, it depends on who you end up with, what shift you end up in..." (6).

[..people are influenced by each other... for the shifts that has been working together all the time, there might be a little bad attitude.] (6).

Three respondents (2, 3, 4) expressed how things in the environment were learned by observing others work or just by asking. This was the way to catch up, to know exactly what to do and when to do it. It was expressed further (4) that the questions are important, to ask questions rather than try by yourself if you do not know what to do.

Results

In the performances of unloading and loading it was expressed how the work situation was not perceived to be planned (Theory) from what they actually do (Practice). Further work routines were added but without adjusting the time they have to perform the work. This was said to be one of the reasons why personal security had to be put aside and the reason for cutting corners.

“ If theories does not go along with practices then everyone eventually finds their own solutions to make their work situations to function.” (8)

Equipment

The work with unloading and loading was described as a heavy and physical work task. One respondent talked about how they managed the work with only their hands and strength (1). There were several helping aids described by the respondent (1), like Power Stow which transports the luggage right into the aircraft, used if it is a deep compartment aircraft. RTT, that can be placed quite into the aircraft, made it possible to approach the oncoming luggage in a near body position. This was expressed to be managed just to transport the luggage into the compartment in some way, but there was still need for the employee to carry, turn and stack it.

[“Here is nothing that can help me, and there is no safety either.] If it is a 30 kg bag and there are 20 of those, then I am at 600 kg [during some minutes.]” (1).

From another respondent RTT was described to have a significant impact on the work environment as the loading belt is specially designed to fit with the sliding carpet. Further on RTT has a potential to increase the work environment to be a positive contribution and to give the employees the tool to perform the work in a secure way (8). The use of the RTT requires knowledge and training to use it in an adequate way which was described by some respondents (7, 8).

“With the big aircrafts and RTT; It feels like people think, “What kind of crap is this, you force us to use this loading belt” (Respondent 8).

It was revealed how equipment both was available and used but that the full potential of them is not often taken by the employees. This was said because some employees simply do not know how to handle the equipment (Respondents 7, 8).

5. Discussion

This section presents the analysis of the results where the theoretical framework models are taken into account and further discussed.

The aim with the study was to explore the work conditions of the ground staff performing unloading and loading from an HTO perspective, and to identify areas for improvement. This will be further discussed through the research questions under the models of HTO (Rollenhagen, 1997) and the demand-control-support model (Karasek and Theorell, 1990).

There are several interesting things that were discovered during the observations and interviews.

5.1 Research Questions

5.1.1 Which factors are important for the work performance?

Factors which came forward as important for the work performance were *time pressure, safety mindset, education, culture and equipment*.

The colored areas in Figure 9, describes the model from chosen angles. The focus is on human - technology

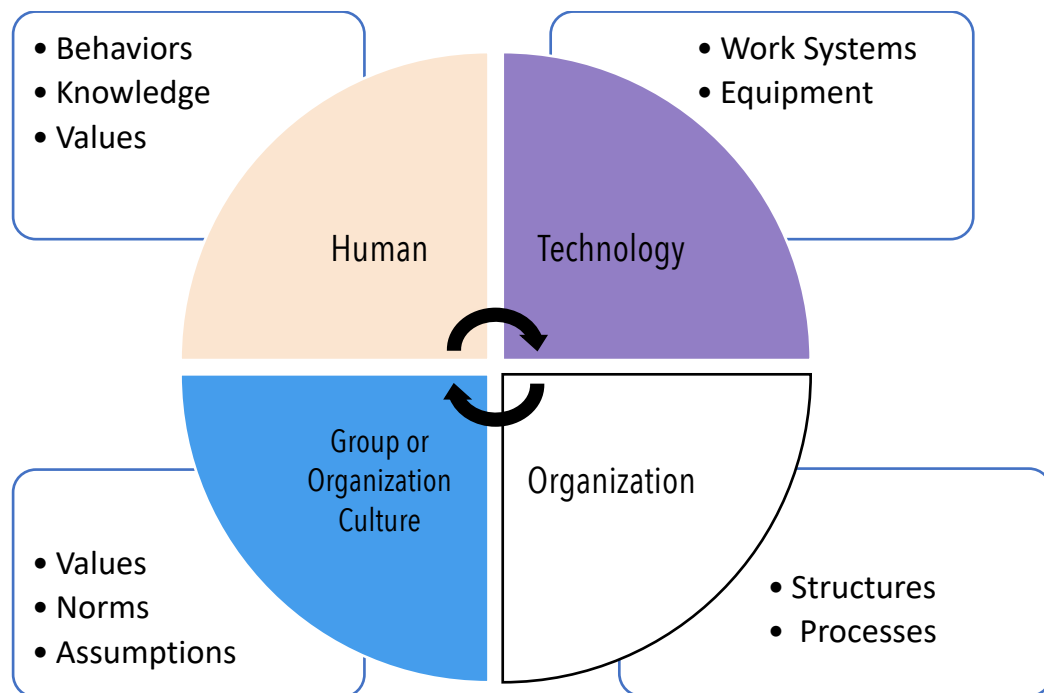


Figure 9 shows the systems and subsystems that are interdependent of each other.

The results shown discussed from the HTO model of Rollenhagen (1997) exemplifies how the total situation of the ramp operations can confirm observations seen as well as they have been confirmed through the described experiences in the interviews.

Discussion

What seems to be organizational demands in how to perform in a significant safety aspect during the work can be in conflict with flights that are departing on the scheduled time. Can the time pressure be seen as a factor which develops new subsystems within the work system as to increase the progress of work?

Rather than thinking how to work in the safest way from the perspective as an employee, the time pressure seems to be the motivation for *how to work* most efficiently (Malandria et al., 2019; More & Sharma, 2014; Wenner and Drury, 2000).

Time pressure is a factor which is found to be consistently in the environment of unloading and loading. This factor could be a part of both the work system (technology) and the structures and processes (organization) (Rattat et al., 2018; Wenner and Drury, 2000). The employees (human) are exposed in the system as there are demands from several points of view which cannot be controlled by the employees, they say they enhance themselves with the shortcuts by prioritizing the aircraft before they prioritize their own safety if there are risks. As the employees are both aware of the work conditions there is also the aspect which shows how some employees develop a lack of concern of the individual risks (Wenner and Drury, 2000).

Although **safety mindsets** from the employee's point of view is known for not to be prioritized, maybe the group belonging is significant as this confirms that the employees actually fulfill the group norm and act accordingly to what the employees themselves know that functions in the practices of their work to perform the task on time (Wenner and Drury, 2000). The safety mindsets are defined by the employees themselves to what is important to think of, and also what is acceptable in the group, what can be afforded to not count when working. The aircraft is as mentioned, a significant aspect in their environment where there is a low acceptance if the area is under any risk.

There are high demands on the employee from the view as an information processing system, there can be rapid changes in the work conditions and there are small spaces of time to handle this shift, what this means from this point of view can be widely discussed. Maybe how the employees handle the future flights will be affected, with lower ability to handle complex situations (Duan et al., 2020; Shields et al., 2016) if there has not been enough time to catch their breath?

As one comment from a respondent revealed (8) *"If theories do not go along with practices then everyone eventually finds their own solutions to make their work situations to function"*, this has an appropriate and qualified description of why and how certain behaviors to factors have evolved in the work environment (Wenner and Drury, 2000). The employees are not only exposed to the system, they are also cooperating in the system. This cooperation is both between the employees, and also exists towards the organization with the restrictions that the employees have needed to modify structures and processes within their own informal social groups, so this is thereby not a work procedure which the organization has justified.

Discussion

The web-based **education** (technology) seems to have the role to just deliver information, or maybe solve an issue for the employees (human). If some of the employees perceive the environment to be of less risk than it really is, how can the computer capture these deficiencies and count it when assessing the education for the employee? It is not possible even if the employee would complete questions before the course starts to assess the right level of knowledge, it is easy to say – or to think – that this is known.

The employees also spend their days handling heavy and large equipment, not to mention the aircrafts they are used to dealing with, could this affect the low interest for computer education? They are used to working with direct and practical issues out on the ramp, this should be enhanced with the same training and problem-solving practices instead of computer courses (Wenner & Drury, 2000). The organization seems to think of the courses as time efficient (Technology) but this is rather the opposite side as there has not been an individual assessment of the learning method technique.

The **culture** and the employees (humans) as cooperating in the systems is seen as an important aspect for some of the respondents as the colleagues are a significant part of the work being done on time (Passenier et al., 2015).

This is due to adequate collaboration, and that the shift some are working in is sufficient in both practical as well as the psychological aspects. Could this be an effect of how some employees seem to have developed a high belonging in the group which gives more flexibility in some areas like how to perform and act from a safety mindset? Could this feeling of belongingness contribute to how safety mindsets can be distanced from the employees in an acceptable way?

The **equipment** is shown to both be a contribution in the work environment and an issue of problems. Some respondents perceive the loading belt [RTT] to be a significant help which achieves some ergonomic issues to be less of a problem, but this is also on the contrary where there is a need to know exactly how to utilize the loading belt, which some employees did not seem to know. Employees seem to either manage to use equipment even though not trained for use or to make it work manually as there is a limit of time (Studic et al., 2017; Wenner & Drury, 2000). Through the interviews, descriptions of employees (Human) and work systems with equipment (technology) could confirm what the observations captured which is how things are chosen to be handled manually rather than choosing equipment that could be of help.

The employees are exposed to the system (technology) and do what they need to do to get the work done, which opens up to make different solutions and their own assumptions to how the work should be managed (Studic et al., 2017; Wenner & Drury, 2000). The exposure is both from the perspective of procedures (organization), work systems (technology) and employees (human) as employees who make different choices also can expose their colleagues and not only themselves. It can be the reason why employees take the risk of pushing and pulling carts manually which puts themselves and others at risk, but saves time (Studic et al., 2017). This could be worth the risk if it goes as “planned” (not falling under or getting stuck between carts and equipment). Can it be that the more **risks** taken could give a higher **value**, which can be worth the risks.

Demand-control-support model (Karasek & Theorell, 1990)

The descriptive observations and interviews made can show how areas in the model (Figure 10) of Karasek and Theorell (1990) can give the effect of the employees being set into work situations that can be related to the colored boxes. In this further discussion the factors time pressure, safety mindset, education, culture and equipment are related to the model to try to achieve a comprehensive picture of the work situation from both the aspects of observations and interviews.

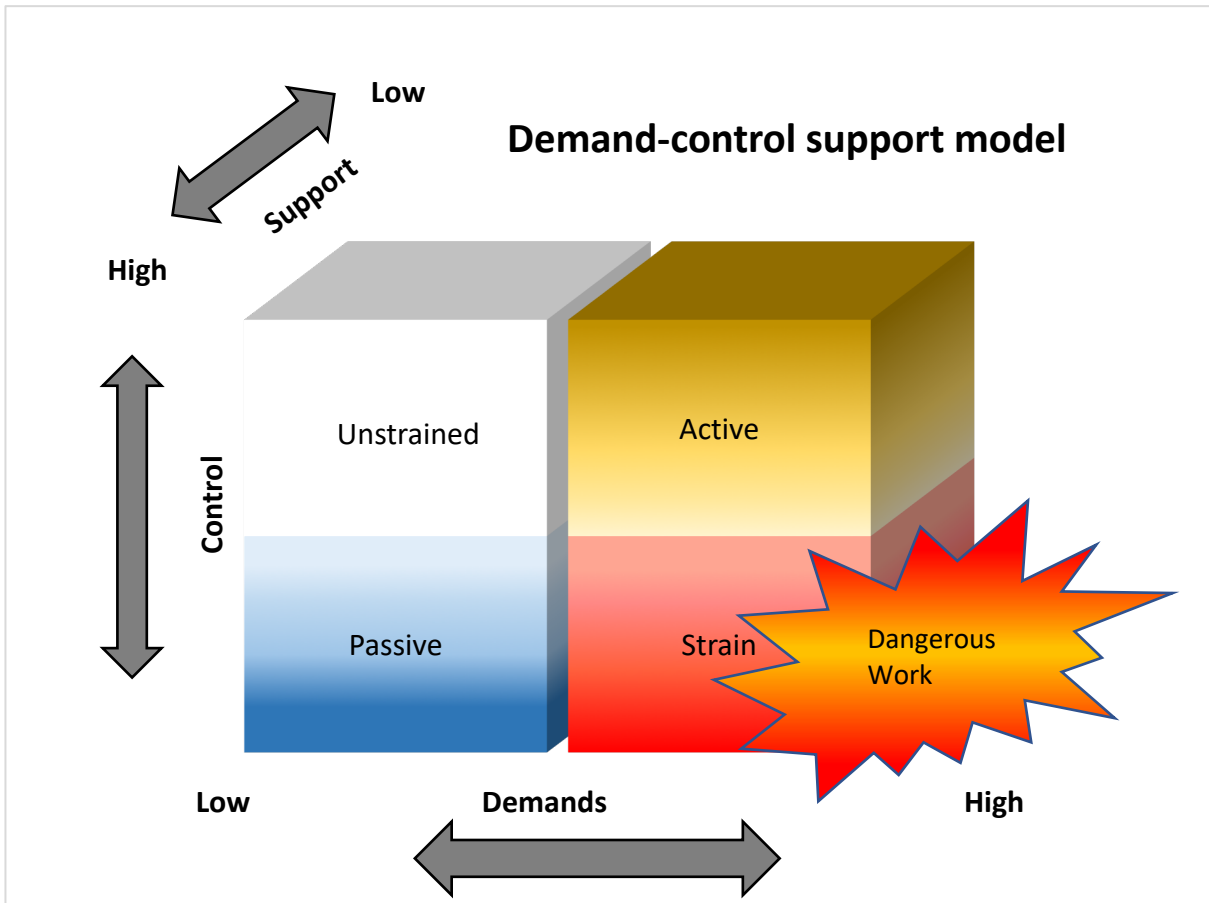


Figure 10: Description of how the work could be interpreted by Karasek and Theorell (1990).

Time pressure can be a demand that can achieve employees to be active in the work but can possibly contribute to strain. In Figure 10 it can be seen that all areas are in relation to each other. Rapid changes in the work situations can make some things, which earlier was under control, to be under strain where the employees have to make choices that are out of their control (Rattat et al., 2018; Duan et al., 2020) which could be moments as pushing or pulling carts even though risks are known or handling luggage to be placed in the compartments without help of the equipment. The work is mainly in the areas of Active and Strain but also the Passive area, there are thin lines between the acceptable and unacceptable stress.

From the respondent's side talking about stress, there seems to be an awareness to why stress was not adequate, especially on the ramp, which is why they "hurried slowly".

Discussion

But through the results and previous discussions it seems like there is an indication that stress is a daily event for them. How do they know when they are too stressed to handle the situation if they are not aware of the negative stress which presumably is present? The factor **safety mindset** seems to contribute to determine more or less stress (strain or passive area in Figure 10) depending on where the focus is. But it could be stress in both the practical and theoretical work as the employees seem to have low possibilities to affect the actual routine.

Can the safety mindset bring a sort of stress as it certainly requires a functional working memory and adequate task solving management (Duan et al., 2020). Regarding the employees' own safety to not get too stressed, it is interpreted through Figure 10 to be hard to not be in the strain area, stress seems to be a daily contribution in the work environment and it is only a matter of how to handle it and to know when to ask for help. Stress can sometimes be seen as effective if it is not a persistent event, but when it becomes an ongoing event there are effects on the human performing the work (Duan et al., 2020; Shields et al., 2016).

To have proper **education** seems to be an essential part of the work environment as this contributes to the individual performances and overall safety aspects. Even though the employees have their ground knowledge for the ramp operations and also some individual educational aspects, this can be seen as a dilemma as they also know that everything cannot be done in accordance with the organization's prioritization (Bergsten, 2017; Wenner & Drury, 2000).

Even though receiving education and confirming that the information is apprehended can be an enrichment for the individual, this perspective seems like a contribution to stress which also comes forward in **culture**. To be captured in areas like Passive or Strain (Figure 10) and have the education without the ability to influence the time could possibly have diverse effects where employees are encouraged to violate routines (Wenner & Drury, 2000). The culture within the work group can function like a contribution to increase the feeling of support and control (Figure 10) to achieve work goals (Bergsten, 2017). In the use of the **equipment** high loader (observations) there is a capturing description of how incurious the use of the machine as the employee mainly pushed some buttons and then bent down to secure the loading (Wenner & Drury, 2000), the passive area in figure 10 was adequate for this as the employee was under low demands and low control.

In some aspects the equipment is not used because of time pressure or that it cannot be used for other reasons and the employees do not seem to differentiate between the stress they put on themselves or from the environment. Even though they know that stress is not adequate on the ramp and they work against stress, the findings show another side to the story. Can the employees be so comfortable in their environment that the stress is not a visible threat anymore? Has the stress been changed or modified in type to fit in their work aspects, to make it to be an acceptable stress? Although the risks seem to be known, or that all risks are not known, there seems to be an apprehension that stress is something they are aware of and are affected by. But how is this known?

5.1.2 To what degree do the employees follow the work instructions regarding the use of the equipment on the ramp?

Reflecting on the results, what stands out is that the employees utilize the equipment to the best of their knowledge. Depending on how the equipment interferes with the employee's priorities determines how the employees use the equipment.

To give a more in depth answer and with help of the observations list the different types of equipment that are used on the ramp by ground staff personal:

- Baggage carts
- Loading belts
- Sliding carpet

The employees fall into the sub-system **human** where their behaviors, knowledge and values affect how they utilize and perceive the equipment available, which falls under the sub-system **technology**. The interaction the employees have with the equipment could perhaps be explained based on the results that the employees work under time pressure (Malandria et al., 2019), which was confirmed through observations and interviews.

The equipment's main purpose is to assist the employees by facilitating the work tasks. The flight safety is a topic that is understood to be highly prioritized amongst the respondents (Studic et al., 2017). The responsibility is explained by several of them that the bags must be packed and loaded properly, and that they would feel responsible if anything would go wrong (Wenner & Drury, 2000). It became clear that performing the work task in a safe and efficient manner is prioritized by the respondents.

If the equipment does not help accomplish the work task and if the employee does not prioritize the equipment's function, the employee tends to solve or make up for what is lost by cutting corners (Wenner & Drury, 2000) or asking a co-worker that has more experience. This is apparent throughout interviews with the respondents.

The respondents refer to cutting corners as rushing, pulling and pushing the heavy luggage carts, hurrying things up, solving issues, and sacrificing themselves, all just to get the job done in time (Bergsten, 2017; Wenner & Drury, 2000). Although the equipment (Technology) is a subsystem within the system, the employee (Human) chooses to use what they are familiar with, and not take advantage of the full technology subsystem since time pressure has such a big effect in the way the work is performed (Wenner & Drury, 2000; Studic et al., 2017; Malandria et al., 2019).

Reflecting back in regard to the equipment, the observations and interviews communicate that there is a knowledge gap of not knowing how some of the loading belts work out on the ramp (Landry & Ingolia, 2011). It is clear that there are different types of equipment suited for different types of aircraft models, but for the equipment to facilitate to its fullest potential, the employee operating the equipment needs to know how to do so (Landry & Ingolia, 2011).

Discussion

Most of the respondents indicated that getting the task completed quickly and efficiently as possible is the key to be successful with the job (Studic et al., 2017). Only a few respondents have "other" priorities regarding the equipment. Where these respondents have the knowledge of how to utilize the equipment to facilitate the work task. The respondents said the organizational demands do not really give the opportunity to learn or teach how to utilize the equipment in a more effective/productive way (Bergsten, 2017; Landry & Ingolia, 2011).

Employees use the equipment to the extent that they can, based on the knowledge and experience they have gained (from using the equipment) (Landry & Ingolia, 2011; Wenner & Drury, 2000). A loading belt is merely a loading belt that serves as an aid to transport the bags into the cargo compartment. No one really asks:

“How does this loading belt work?”

“What is the difference with this loading belt compared to that other one?”

It seems that the employees are using their equipment only based on getting the job done in time and not damaging the aircraft (Wenner & Drury, 2000).

The disadvantage with the way the equipment is used is that the equipment is not being utilized to improve the employees working conditions on the points it actually could facilitate their tasks. This can be assumed from most of the respondents' answers, since their health and well-being is rarely mentioned or put in perspective. Time pressure and culture could be another reason for the lack of interest regarding the equipment's different characteristics and possibility to facilitate the work task (Wenner & Drury, 2000).

As mentioned earlier there is an interaction between human and technology, where the humans priorities are to get the job done and not so much to ensure that the body gets the best conditions. Rather that the body must adapt to the work conditions and that there is no other choice than to get used to it and suck it up, because that's how it is. Which was stated by some of the respondents in the interviews.

Interpreting this result to the model, clear interactions can be drawn between the different subsystems. Were the utilization of the equipment (t) will not reach its fullest potential unless the knowledge gap (h) of the equipment will be fixed or dealt with.

Risks that evolves from the model are that the employees do not seem to have time to perform the work from their individual perspective, they rather have to prioritize between aircraft safety and individual safety (Rollenhagen, 1997).

Values that evolves from the model seems to be that the work gets done and that many of the aircrafts can depart on time. Values can also be the performed work from an individual aspect in cases that do not involve employees who got injured somehow (Rollenhagen, 1997).

Reflections:

How should the employee be able to act as an information processing system if there is barely time to think of the consequences? The human and the choices which need to be made should be handled as a valuable system that are limited. The human can easily be overloaded during heavy physical work and to have time to think of the consequences that can happen, which there is not time to think of while working with a pressed schedule. What remains is to make fast decisions where the risks will be shown after they have been made.

The presented results show how there is an interdependence between the factors time pressure, safety mindset, education, culture and equipment where they affect each other or are affected by things in the environment. The aircraft is the aspect to which the employees relate and thereby work under to solve work tasks. For example, time pressure seems to decide which level of safety mindset can be used, which affects the factors education, culture and equipment.

5.1.3 Which recommendations can be provided to improve work performance at ramp operations and minimize risks for accidents?

The education for the employees could be further assessed with different participatory workspace designs (Broberg, 2010); were the employees and managers are both a part of the simulation. This gives the managers opportunity to see where theories and practices does not function and perhaps develop new ideas, to see what actually works and together exploit new opportunities.

Further on there seems to be a need to implement adequate training and learning design to increase the improvements and confirmations to that the educations has been helpful regarding the work (Torrissi-Steele & Carrim, 2019; Bergsten, 2017; Doo, 2000). The educations through the web-based learning is as mentioned in the results not fully apprehended, which is why the suggested area of new implemented training can be useful. The learning should be adapted to meet the variety of the different individuals in the organization who are under training.

Safety thinking for the individual is also something that seems to be an area of improvement as there are confirmed events of not prioritizing the individual safety perspective. To improve the safety mindset it has been shown by He, Payne, Yao, and Smallman (2020) that there is a positive contribution to safety behaviors with counterfactual thinking. The counterfactual thinking can maybe improve and give the employees the mindset to not take unnecessary risks which can be thought of as time saving.

Ergonomics training and lifting technique are needed as some of the employees emphasize that there is not so much of that kind of training in general. The article of Stanton, Li, & Harris (2019) are aiming towards ergonomics and the human factors in the aviation industry, ramp operations was briefly mentioned to assess Crew resource management (CRM) but it was not further mentioned about the ergonomics situation during unloading and loading or in general for the ramp operation employees.

5.2 Method Discussion

Bryman (2012) describes trustworthiness as how sufficient the qualitative work is being conducted and the words *dependability*, *credibility*, *transferability* and *confirmability* further gives an in depth description of their meaning.

Dependability describes how solid the work has been conducted and also if it gives a complete description to the work. If the description is solid there is also an opening for more research that is going to be conducted to be valid. The examples are as descriptive they can be with modifications in places to mitigate the chance of a respondent being recognized by an event. This has been processed and valued in a way to not take the respondents' own words away too much.

Credibility is how the work has been conducted under the influence of the ethical aspects of the consent claim, informed consent, confidentiality and useful claim (Bryman, 2012). The respondents were chosen out of a convenience sample, with a small chance that one of the employees can remember or could have seen which employees came to be interviewed. The interviews were conducted at a Swedish airport, therefore the interviews were not conducted at a neutral site where the respondents would be unaffected by the environment. There is a chance that the respondents that were interviewed could have been affected by the workplace environment but the descriptions of each participant's own story, which also is consistent with other individual aspects, gives verification that the respondents could speak out of their own experiences without being too affected by the environment.

Transferability describes how comprehensively the work is described to know if it also can be applied to other workplace ramp operations conducting unloading and loading (Bryman, 2012). The description of the work is as objective as possible from the circumstances surrounding the accident reports. The reports were not chosen to function as a subjective measurement, but to give an extensive overview of the ramp operations and to know where to have the focus with objectivity as the basis.

Confirmability is based on the work being conducted under verifiable circumstances and that any inconsistencies would have been revealed so as to not expose the employees to any negative effects. The nature of the work is itself an area of risk but there are no further aspects which go along with this.

The Qualitative approach and following methods chosen were originally used in the thesis as the priority is to enhance the employees' experiences and get the perspective from their view. The methods chosen gave the answers and understanding expected since the results are descriptive and give deeper insight to ongoing events of their environment. The accident reports fulfill a significant part of the work that helps conduct and view the environment from a concentrated and objective perspective. If there would have been a survey conducted about the work this would maybe have given a depth and complemented the interview questions in a helpful way. Also, there could have been more respondents for the interviews but as the method was of a qualitative nature and the interviews had already given a complete picture, this is perceived as valid, though it might be interesting to see what the results could be with more respondents or maybe even focus group interviews. The external drop-out of two respondents does not seem to have had a significant impact but this could also just be the truth for now as the environment is not static.

6. Conclusions

The conclusion from the conducted study is that the employees are affected by the five factors; time pressure, safety mindset, education, culture and equipment in their work environment. These factors are shown to be important both through conducted observations and interviews. There is a need for more practical training for all employees to ensure the quality of work, the training is also important for increasing the knowledge and utilization of equipment.

Out of the five factors, time pressure and equipment are the factors in the environment which the respondents have to work in line with to make it function in the environment.

Recommendations

- Participatory workspace design
- Implement an adequate training and learning design
- Counterfactual thinking
- More ergonomics thinking during unloading and loading

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Appendices

Appendix 1

Observation guide

General

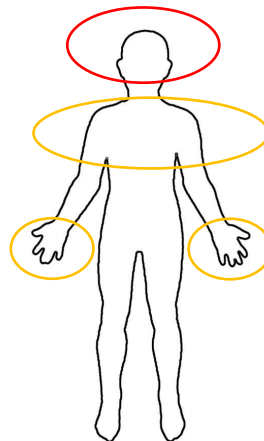
- Workload
 - Heavy work
 - Heavy baggage
- Persons
 - Different Work pace
 - Communications
 - Individual adjustment
- Injured by object/ equipment
- Continue work but injured
- Equipment issues

Frequently reported injuries

- Often
- Occasionally

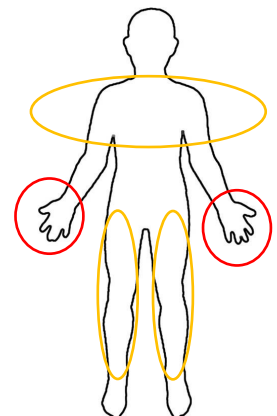
Inside Compartment

- Falling Objects
- Slip and Fall
 - From height
- Workload
 - Heavy work
 - baggage
 - Lifting
 - Pulling/Sliding
- Body part injured



Outside Compartment

- Slip and fall
- Workload
 - Heavy work
 - Pushing/Pulling baggage carts
 - Heavy baggage
- Body part injured



Other Discoveries

Appendix 2

Interview guide

Praktiskt utförande

Hur hade du beskrivit din arbetsuppgift?

- a. Vad anser du vara/är viktigast när du utför din arbetsuppgift?
- b. Vad tror du din arbetsgivare tycker är viktigast (när du utför din arbetsuppgift?)
 - i. Är det genomförbart?

Hur utförs informationsinhämtning om arbetsrutiner

- c. Om ja, hur har du tagit del av dessa?
(Pappersform/Digitalt/Utbildningsvideo/Praktiskt utförande?)
- d. Hur lärde du dig arbetsrutiner
- e. Hur hade du strukturerat /ändrat din arbetsuppgift?

Beteende

Hur hade du beskrivit ditt arbetsutförande? (Beteende)

- a. Vad tycker du är ansträngande i ditt arbete?
- b. Hur påverkas du av din arbetsuppgift?
 - i. Finns det något som skulle underlätta din arbetsuppgift?
- c. Om jag skulle utföra arbetsuppgiften, vad är viktigt att tänka på?

Policys och Standards

Vilken typ av träning/utbildning får man för att kunna utföra av och pålastning av bagage?

- a. Hjälper den träning/utbildning dig/er att utföra det som flygbolagets Policys och Standards ämnar efter.

Hur tolkar/uppfattar du era riktlinjer och standards?

- a. Hur blir du informerad av ny eller uppdaterad information gällande ditt arbete?

Rapportering

Vilken typ av risker är aktuella under arbetet på rampen?

- a. Hur är kommunikationen om riskerna på rampen?

Vad är "rapportering systemets" uppgift/målsättning?

Vad har du för rapporteringsrutiner?

- a. Vad är viktigt för dig att rapportera?

Hur upplever du rapporterings kulturen?

- a. Är det lätt att rapportera?
- b. Finns det tid till att rapportera?
- c. Finns det någon mening med att rapportera?

Appendix 3

Used Observation Guide

General

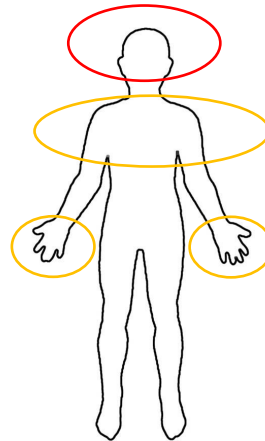
- Workload
 - Heavy work
 - Heavy baggage ✓
- Persons
 - Different Work pace ✓
 - Communications ✓
 - Individual adjustment ✓
- Injured by object/ equipment
- Continue work but injured
- Equipment issues

Frequently reported injuries

- Often
- Occasionally

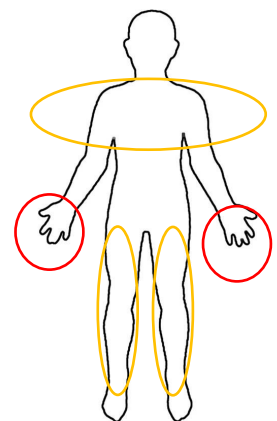
Inside Compartment

- Falling Objects
- Slip and Fall
 - From height
- Workload
 - Heavy work
 - Baggage ✓
 - Lifting ✓
 - Pulling/Sliding ✓
- Body part injured



Outside Compartment

- Slip and fall
- Workload
 - Heavy work ✓
 - Pushing/Pulling baggage carts ✓
 - Heavy baggage
- Body part injured



Other Discoveries

- Wrong or not suitable loading belt used.
- Using baggage as helping aid because of height difference between loading belt and the aircraft compartment.

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