UNIVERSITY
OF BORÅS

Internal logistics

Optimizing the flow of goods with milk runs

Sven Kurzbach & Jessica Millegård

Bachelor Thesis 2016, 15 credits

Industrial Economics – International Business Engineering

SVEN KURZBACH, sven.kurzbach@gmail.com

JESSICA MILLEGÅRD, jessica_millegard@hotmail.com

Subject Category: Bachelor Thesis

University of Borås

School of Engineering

SE-501 90 BORÅS

Telephone +46 033 435 4000

Examiner: -

Supervisor name: Håkan Svensson

Keywords

Internal logistic, logistic processes, milk run, value stream mapping, route optimization.

Abstract

In today's world the challenge of logistics becomes more and more important for all companies, which consequently contributes to the need of an integrated system of in-house logistics. Goods must flow easily between stations and departments in order to achieve the best utilization of transportation as well as maintaining a good distribution structure to handle these processes in an efficient and effective way to enhance business performance and competitiveness. This report aims to provide research on how to strategically organize, plan and structure the flow of internal logistics within an organization. The research in this study originates from 3 main methods, a theoretical review, a case study and a benchmark. The main idea of the thesis was to contribute with scientific knowledge of improvements that can be achieved within internal logistics targeting companies operating within the service sector. In order to understand the scope of the problem the current state at the case Tropical Islands was analysed and served to identify areas where possible improvements could be achieved. Further on, in combination with the theory and empirical findings the main conclusions of the thesis was the need to strategically organize the flow of internal logistics to improve efficiency and enhance competitiveness. It was made evident that planning is essential in order to successfully implement the milk runs. Other tools could be utilized to further eliminate drawbacks that might occur.

Table of Contents

1. Introduction and problem definition

In today's world the challenge of logistics becomes more and more important for all kind of companies. When talking about logistics, today's research often specifies on industries and their supply chains in a wide-ranging aspect. The importance of growth opportunities is essential due to the market expansion and growing population. The demand for goods and services are increasing which in turn requires a better flow and handling of material and information within a business regarding the processes of transportation of goods, material handling, just in time deliveries, storage handling etc. (Jonsson, 2008). However, this report will address the aspect of logistics within focal companies. The coordination of goods throughout different departments are described and analysed through a case study that will adopt and apply different theories to reach the aim of improving logistic flows internally. Consequently this contributes to the need of an integrated system of in-house logistics. Goods must flow easily between stations and departments in order to achieve the best utilization of transportation as well as maintaining a good distribution structure to handle these processes in an efficient and effective way to enhance business performance and competitiveness. It is a vital factor to create a well functioning internal logistic system due to its main objective to provide the right supplies and information to the right operational unit at the right time (Schulze and Wüllner, 2006).

The internal logistics covers many areas, department, activities and processes. To cover the subject of integrating in-house logistics activities within the focal firm a centralized logistics department can be created to manage responsibility for flow of goods and material within the business. A case study was then conducted to analyse the in-house logistics between departments with the most logistic movement processes at Tropical Islands (TI). This bachelor thesis will be based on scientific knowledge that will create the basis for the report and further on give recommendations to the company Tropical Islands on how they can improve their flow of logistics.

1.1 Purpose

This report aims to provide research on how to strategically organize, plan and structure the flow of internal logistics within an organization. The main objective is to adopt theories to evaluate current situation and provide empirical support of already existing theories.

The project is embedded in the most logistically challenging departments of the case study at Tropical Islands. The aim will be to serve as logistic consultants in order to analyse how a new in-house logistics department can be structured to create a beneficial solution for Tropical Islands. The main idea of the bachelor thesis is to contribute with scientific knowledge of improvements that can be achieved within internal logistics targeting companies operating within the service sector.

1.2 Research questions

The research questions will formally state the purpose and build the framework of the report. Throughout the report the research questions will be answered and illustrated with the use of a case study. The following questions have been formulated:

- How can the internal flow of goods be organized to achieve efficiency and maximize benefits for companies in the service sector?

In order to refine the understanding the following supporting sub-questions have been formulated that will create a link to the case study conducted:

- How is the current in-house logistic situation and how could the future be improved?
- What are the possible benefits and drawbacks of merging in house logistics in one new department?

The scope will include evaluation of the company's current situation regarding the in-house logistics, logistic solutions and how these can be merged into one department. The case study aims to provide support on how to improve the logistics flow within an organization.

1.3 Limitations

This research is conducted within the internal logistics of an organization, which is limited to the physical flow kept within the business and the relevant departments operating at the premises. Three different companies have been included in a benchmarking study. All companies were within the area of amusement parks, zoos and other similar tourist attraction, which may limit the generalization.

Furthermore the main case has been addressed to mainly focus on the logistics movements between the main storage and the departments within food & beverage and retail, which narrows the scope down. Moreover the data collection was conducted over a 2 weeks period, which may lack accuracy of the sampling of the internal flow of goods in terms of not considering high versus low season. Additionally, average data may not reflect day-to-day fluctuation.

During the process of writing this report the focus was not put on a centralised warehouse. The case study supervisor has clearly limited the scope and requested a solution suggestion other than that. Thus, a simple to adopt solution was presented in how to improve internal logistics.

2. Methods and materials

The foundation of this research is built on an abductive approach consisting of prior theoretical knowledge together with real life observations as well as theory matching to enable conclusions to be drawn (Kovac and Spens, 2005). A number of theories and frameworks were utilized and combined in order to achieve the main objective of this paper.

The research in this report originates from 3 main methods, a theoretical review, a case study and a benchmark. The theoretical review provides the frame of reference together with prior research made about the chosen topic, with the aim of answering the research questions and work as a foundation for the case study.

The case study at Tropical Islands, which is based in Germany was conducted over a 4 month period. This included 2 visits to the company, which consisted of interviews with different departments and staff, guided tours, questionnaires, and direct observations.

Tropical Islands (TI) structured the first visit beforehand. Through email contact and skype meetings information was exchanged and the company supervisor booked all relevant interviews. At first a guided tour was done with the purpose of presenting a holistic view of the organization and its logistic challenges. The tour was the basis for understanding the

structure of the flow of goods within the organization. To further comprehend, own observations were taken and a form of an unstructured interview was conducted through questions asked in an on-going conversation. This informal method is used to make the interviewee feel more comfortable which enhance the accuracy of the information provided, it responds better to the reality (Bryman, 1989).

Furthermore, interviews were organized to be held with each department that played an important role of internal logistics. The meetings with each department consisted of interviews with structured and open questions. To support the interviews, notes were taken and sometimes even recorded in order to avoid loss of information. To get the most accurate information most interviews were conducted in German to eliminate the risk of loosing information due to language barrier, which also allowed the interviewee to feel more comfortable providing as much detailed information as possible. Afterwards the interviews were translated into English and evaluated to analyse the current situation.

Moreover a supplementary data collection was conducted. Departments specific questionnaires, both qualitative and quantitative were developed and sent to the company supervisor for approval and forwarded to relevant staff. Referring to the mixed-methods research by Golicic and Davis (2012) both methods used allowed for accuracy in the data findings. The conducted data collection enabled the development of the solution suggestion in combination with the reviewed theory.

The second company visit required planning and structuring by the authors. Further observations included distance measurements between points of interest to create a network map. In addition the visit aimed to discuss up to date findings with the company supervisor as well as collecting the remaining data.

The benchmarking process was carried out by contacting relevant companies via email to obtain necessary information.

Further on the acquired information from all three methods were combined and analysed to reach the result and conclusion presented in this thesis.

2.1 Thesis outline

The outline of the thesis is structured into five parts. The following will allow the reader to grasp an overview of the problematic and get a better understanding when reading this report.

- Chapter one: Frame of reference
- Chapter two: Empirical findings
- Chapter three: Analysis
- Chapter four: Discussion
- Chapter five: Conclusion

3. Frame of reference

This section covers the theoretical background of the report, which further suggestions and conclusions will be drawn from. It aims to set the platform for the research and includes relevant topics gathered from literature studies and research previously conducted associated to logistics. This chapter presents the topics of: logistics, supply chain management, logistics, value stream mapping, milk run and swot analysis which are presented and explained in a way to set the basis for achieving the research objective. The focus is set on internal logistics within a business, which will further be analysed and presented in a case study.

3.1 Supply chain

The term supply chain is commonly used in terms of business and business performance. Christopher (2011) defines it as "the network of organisations that are involved, through upstream and downstream relationships, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer". Further on it is argued by Gattorna *et al.* (1991) that the chain should be viewed as a single entity in order to enhance business performance and overcome organizational boundaries. Harrison and van Hoek (2008) stress the importance of not only the physical flow but also the flow of information, which is an essential part to keep the chain intact. Supply chain management can further be divided into 5 core stones according to Vaaland and Heide (2007); workflow/activity structure, organisational structure, product flow structure, communication and information flow structure and planning and control methods. The aim is to manage all processes in an efficient & effective manner to reduce all waste that does not add value to the end customer (Christopher and Towill, 2002).

In this report the supply chain is viewed and kept within the operating organisation, i.e. the business itself and the different department operating within the walls of the organisation. It involves the physical flow of material from an internal logistic perspective, covering how supplies get delivered from the main storage to other relevant departments.

3.2 Logistics

Logistics can be describes as a strategic task according to Gattorna *et al.* (1991) and it is "The process of strategically managing the procurement, movement and storage of material, parts and finished inventory (and the related information flow) through the organization and its marketing channels in such a way that current and future profitability are maximized through the cost-effective fulfilment of orders" (Christopher 2005). The task of logistics is associated to Just-In-Time in terms of its purpose of delivering the right goods to the right place and at the right time (Gattorna *et al.,* 1991). Harrison and van Hoek (2008) argues that logistics serves the mission of managing the flows regarding how it should be planned, accomplished and controlled. The topic of logistics is related to supply chain management previously described and covers the purpose of optimizing the flow within a business (Christopher, 2005).

In this report the term logistics is identified as the process of strategically managing the flow of actives and processes within the walls of the organisation. Furthermore this thesis aims to cover the topic of internal logistics, i.e. the logistics tasks performed within the business and how these are coordinated between different departments, mainly organizations operating in the service sector. It is restricted to the internal supply chain and cover tasks such as internal transports, handling of material, storage and packaging (Jonsson, 2008). Moreover with the aim of creating an efficient flow of material as well as enhancing the overall business performance.

An essential factor when it comes to the internal logistics is the delivery performance, covering the responsibilities of speed and reliability (Stock et al., 1998). It is important for the logistics to be structured in a way that enables goods to be delivered with short lead time as well as being flexible, in order to be able to respond to unforeseen events and changes in demand. In this topic the end customer is in the own organization and represented as

departments, meaning that both the customer and supplier are in the same enterprise and operating within the walls of the business.

Owens and Warner (2003) describe the purpose as "to obtain and move supplies and equipment in a timely fashion to the places where they are needed, at a reasonable cost". Hereby it is mentioned that there is the necessity of inventory in most firms but considering limited reasons to why inventory is expected within a firm. Such reasons are set to be transportation efficiency, safety stock, storage capacity, and anticipation of demand.
The physical structure of the system is specifically important when talking about internal logistics. The following two things are described by Owens and Warner (2003) as vital information when structuring and organising logistics:

- principal and agent facilities
- transportation network and capabilities

In this thesis the principal and agent facilities refers to outlets and main storage where the goods are ordered. The transportation network serves to visualize the walking paths of the premises and the capabilities are reflected in capacity of the order fulfilment.

The system within logistics includes several factors that needs to be taken into consideration, and each and every single organization may need different approaches depending on the operating market, objective and purpose of the firm. However, Baker (2006) has identified 5 main components that needs to be reflected over in terms of internal logistic systems: building design, equipment, systems, staffing, process design.

- Building design denotes the physical attributes, such as storage space, width of walls, floor plan etc. These attributes can only be influenced when building new facilities, however by strategic planning and possible reorganization the features can be improved to optimize the logistic flow.
- Equipment covers the matter of handling of goods and information, i.e. transportation the goods from one location to another.

- Systems refers to software systems, such as ERP system etc. and how the flow of information is managed.
- Staffing refers to the utilization of staff (temporary and permanent) as well as covers the subject of concerns regarding health and safety etc. (Baker, 2006).
- Process design considers the holistic view of the flow of logistics, i.e. how space, equipment, staffing etc. need to be structured and organized in order to enhance the performance.

Many researchers within the topic of internal logistics Rouwenhorst *et al.* (2000), Baker and Canessa, (2009) indicates that further research of designing logistics system is required since it today lacks a general model for how it should be structured.

For this report the design of logistics system mainly focuses on the process design, which suggest how the in house logistics should be orchestrated. This enables the flow to be optimized and enhance the overall business performance.

3.3 Milk run

Milk-run or also called dynamic milk- is defined as a method of delivery to maximise the available capacity usage and minimise the rounds of logistic movement. Instead of different suppliers delivering their own goods, all suppliers are hereby connected and seen from a holistic perception. Figure 1 visualises hub-approach organised transport systems. Where figure 2 uses the same example to visualises a milk run orientated transport delivery system with the improvements given in distance (savings of 285m). The major difference between both systems is how the individual outlet organises their demand fulfilment. Within the hub-approach each outlet plans and arrange their own pickup of goods (Tuomola, 2014), where on the other hand milk-run strategy benefits from combined delivery processes which allows for more efficiency, stable processes, and fast delivery of goods

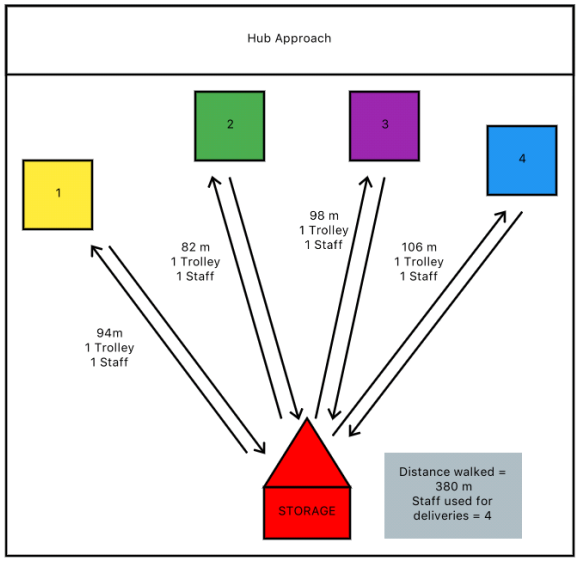


Figure 1 - Hub-Approach delivery of outlets

(Klenk and Galka, n.d.). This can be achieved through more frequent smaller rounds/runs between multiple suppliers and focal firm. Even between supplier connections become possible. The term dynamic changes the viewpoint from a strictly time orientated concept (time constraint) to a more demand focus that considers each supplier and its need for goods (Guizzi *et al*., n.d.). This form of delivery and the connected theoretical knowledge has its origin in the dairy industry. Milk was both collected and distributed in a round trip connecting the supply chain. Milk was collected from different farmers on a daily basis and delivered to a central milk processing firm, and then delivered to multiple end customers in closed looped rounds.

The procedure of milk-run theory can be described in the following seven steps according to Piontek (2009):

1. Identify volume and weight of each location that is frequently needed.
2. Identify transport limitations like weight and volume according to the relevant transportation type.
3. Selection of milk-run possible locations in regards to specific conditions of each individual location.
4. Define milk-run parameters to time requirements and frequencies of milk-runs needed.
5. Pinpoint and assess alternatives to milk-runs.
6. Specify network of mil-runs according to parameters in point four, identify milk-run eventuality plan (in case-of).
7. Implement milk-runs consistent with schedule, location and flow map, controlling specifications.

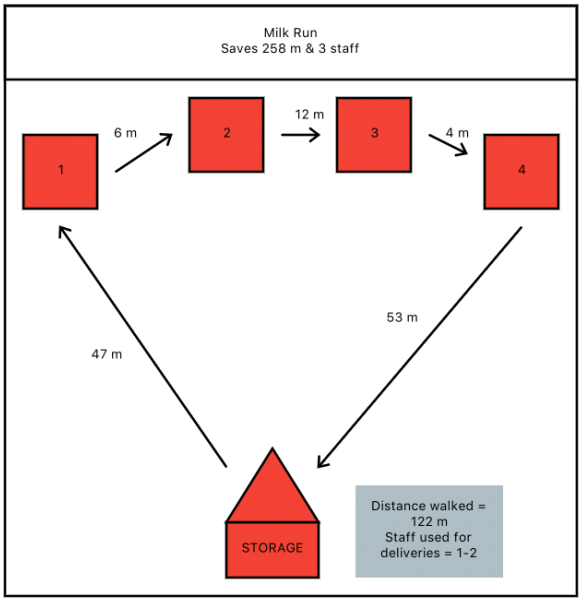


Figure 2 Milk-Run delivery of outlets

The main benefits of milk-runs have been identified in various literature to be a higher exploitation of the mode of transportation and the therefore reduction of transportation cost and the elimination of waste, as well as a gain in flexibility towards logistic transportation endeavours (Patel and Vadher, 2014). Niemeyer and Wildemann (2010) say that a cost

reduction of 30% can be achieved and a capacity deployment can increase to an average of 90%.

In addition, a more sustainable delivery method with a reduction on environmental impact is automatically accomplished (Patel and Vadher, 2014). Nevertheless, the disadvantages of milk-run should not be ignored and have been discussed in the literature. Such weaknesses are that this theory is not applicable to all parties in the supply chain, the dependency on road conditions in the network increases, and the number of runs can increase due to poor planning of the milk-runs and lead to a hydra-paradox effect that costs increase instead of reduce. If such drawback would occur and a prioritised round would have to be implemented the cost will temporary increase. However, it is more effective to allow a special express delivery. Assuring a running production line is vital to eliminate the risk of production stop, which would be of greater cost than express deliveries (Nilsson, 2008).

Furthermore, Patel and Vadher (2014) divide the milk-run concept in both internal and external form of logistic processes. Therefore, one can see from an in-house logistics standpoint all different departments within the firm as the suppliers that request goods to be delivered as well as goods that have to be picked-up.

Adding to the benefits previously mentioned warehouse stock will decrease which leads to more lean stock management, and also delays in deliveries and pick-ups are minimised due to a more effective coordination of the goods within a firm.

In this thesis milk runs aims to combine several transportation of goods to the operating outlets at the premises. It will be used, in combination with other theory, to create the main solution suggestion for improving the internal flow of goods and reaching efficiency.

3.3.1 Route optimization

When dealing with milk-runs it is important to plan daily routes, transportation and timing (Patel and Vadher, 2014). The purpose of route optimization is to reduce operational cost, increase efficiency and enhance customer service (Lordache et al., 2012)

Factors that are taken into considerations are quantity, timing, shortest route planning, scheduling of pick ups and deliveries etc. Furthermore it is used both in external and internal logistics and according to Catalano Ruriani (2004) The first step to get started on the route optimization is to identify the needs and constraints of the business and then either through mathematical calculations or by obtaining a software system find solutions. Secondly the optimal solutions are required to be revised according to business needs. This can either be day to day demand fluctuation or on a longer time frame that suits the constraints.

3.4 Value stream mapping

Value stream mapping is a method to visualize the activities of a process, from start to finish. The objective is to generate a holistic view of all processes that can further on be illustrated in a map. The map aims to provide information of all actions that take place in order to fulfil the process (Jones and Womack, 2000). In contrast to some other existing tools and methods VSM takes the management and information systems into account that are essential to support the processes (Krishna Jasti and Sharma. 2014).

Moreover value stream mapping is a technique that aims to document, evaluate and further improve the flow of both material and information that is necessary to complete the process from beginning to end. VSM can be described as “a simple but effective method used for the illustration and redesign of the value streams” (Haefner et al., 2014). This also helps to illustrate the value added and non value added activities as well as providing the “blueprints” for possible improvements and implementation plans while simultaneously involving the staff (Rosentrater and Balamuralikrishna 2006).

The method often requires direct observations in order to collect the data and get the most accurate description of the current state.

To get started it is important to understand the strategic need for a seamlessly functioning flow as well as identifying the primary product families or services. Once this is done the drawing of the current state begins, i.e. the current value stream mapping. To better understand the map numerous symbols are used to illustrate the different processes and activities (Jones and Womack, 2000). The objective of the current state drawing is the basis for identifying where most improvement can be achieved. Once the current state has been

drawn the future state of the VSM should be sketched, representing the ideal condition, using the symbols previously mentioned (Linköping University, n.d.).
VSM can serve as a tool for organizations to identify and analyse the current flow of materials and activities that are included in a business, both from an internal as well as an external perspective. Further on a detailed actions plan is created for the implementation.

In this thesis the value stream mapping aims to illustrate the current internal logistics processes in the case study. The concept serves to provide the reader with a holistic view, which further simplifies the analysis on how improvements can be applied.

3.5 VMI

Vendor managed inventory is a replenishment system where the manufacturer is accountable for the distributors levels of the inventory. The supplier is responsible for the delivery of the goods, the quantity and the timing of refilling the stock levels (Chunyuan *et al.,* 2015). The VMI approach revolves around optimizing the supply chain performance and aims to take the pressure of the vendor as well as lower the inventory (Tarikere *et al.,* 2012). The VMI serves to provide a relationship, equally beneficial for both sides and in order to serve its purpose the sharing of information between the 2 parties is essential. According to Sari (2008) this is a vital factor in order to maintain the flow of logistics, in terms of restocking and how often this should be done.

In this thesis VMI aims to provide a channel to optimize the flow of logistics in a business. Further on the tool is used to simplify the process from an internal perspective in combination with milk runs (Frahm, 2003).

3.6 SWOT

Swot is a key concept for any business analysis and planning and aims to identifying strengths, weaknesses, opportunities and threats. The strengths and weaknesses represent the internal aspects of a business while opportunities and threats represents the external factors. The objective is to analyse each of these 4 factors to further identify the pros and cons of implementation of a change which will help the company on deciding whether continuing or not continuing with the project (Tonnquist, 2012).

In this thesis the SWOT analysis aims to visualize the strengths, weaknesses, opportunities and threats of the suggested solution. This enables a generalization of the findings in the case study.

4. Empirical findings

In this section the organisational background will first be described followed by a description of the current situation of each department analysed. This will allow the the identification of problems and allow the reader to connect and understand the theory that is connected to the future recommendations.

4.1 Company background

Tropical Islands (TI) is Europe's biggest indoor holiday park operating year around with tropical conditions that interests' customers on a global scale. It is located near Germany's capital, Berlin, in the heart of Europe, which makes it easily accessible to its customers. From an architectural viewpoint it is the world's biggest freestanding hall and was originally build for the construction of a zeppelin in the year 2000. When this project failed a foreign investor bought the building and connecting land to build a world-class tourist attraction. It was then reconstructed and opened in late 2004. Now Tropical Islands offers relaxation and much more to its 1 million annual visitors from all over the world. It is 66.000 m2 large and employs about 600 people, which makes it the region's most important employer. It has 133 tents, 194 Hotel rooms and also offside camping accommodation, 7 Restaurants and additional Bars, Saunas, a walking track through a rainforest as well as a beach area for customers to explore. All this creates great logistical challenges within the so called dome and outside for instance the camping/mobile home area. At this point departments like F&B and the retail shops are fully responsible to structure and organise their own logistic tasks. This Report will apply the previously mentioned knowledge to come forward with suggestions in how the logistics task can be organised and structured in a centralised form to allow efficient and effective movement of goods within Tropical Islands. This improvement is vital to assure cost to decrease and current tied up capital to flow more easily.

4.2 Current situation

The logistic challenge in the case study lies within the distribution of incoming goods to different internal departments. A large number of different goods is received on a day to day basis, is then stored in various storage areas, and must finally be delivered to different outlet areas at the right time and the right quantity. The main storage area lies in the centre of the dome and has a capacity of 744 m2 and is mainly used to store goods used by the F&B and retail department. Figure 3 is a visualisation that shows the main flow of goods within the company. Storing goods in a central warehouse is required since on side storage of each outlet is restricted in size and is designed for daily usage only. This makes day-to-day delivery between the main warehouse and the outlets necessary. Within the case study two sites can be seen, one is the main tourist attraction representing the dome and the other is located on the outside area. The arrows illustrate the flow of goods and how they are distributed internally between the departments as well as the mode of transportation. The conducted case study has several storage areas throughout the premises. Due to the historical background, many shelters were built in the Second World War. Nowadays they are used for storing goods that are not used on a daily basis. Figure 3 visualises those as offsite storage areas.

The next sections will examine the current situation on the studied company as well as describe each department in connection to figure 3. The figure aims to provide a holistic view of the case study and can further be applied by companies within the same operating field. In order to understand figure 3, it is important to know that each department and outlet can be applicable to multiple departments in the case study.

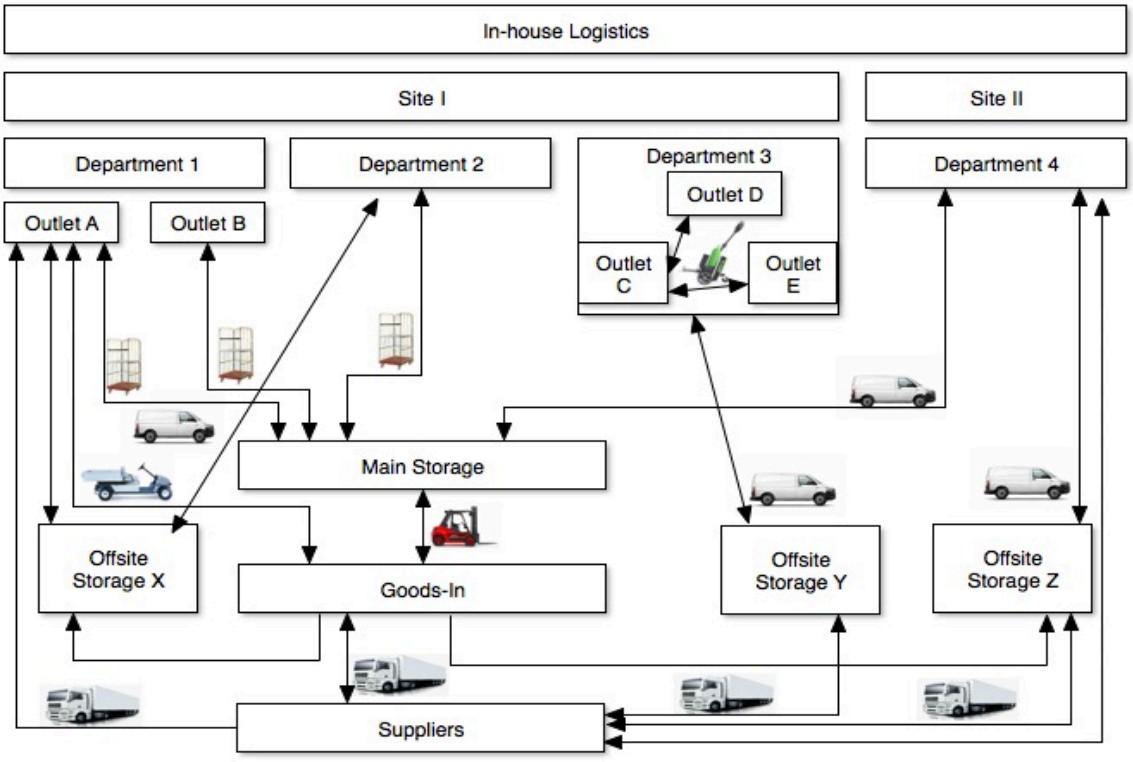


Figure 3 - The current situation of flowing goods at Tropical Islands

Main Storage

The main storage is located inside the dome and the team consists of 9 people. On an average day 4 - 5 staff are working depending on the forecasted amount of customers. Their main responsibility area lies within storing and packing goods for different departments operating inside the dome. The main storage consists of different storage areas, divided either by category of food or outlets such as:

- Non-food storage
- Spirit storage
- Food storage
- Drink storage
- Storage for cleaning, chemicals etc.
- Milk products
- Fruit & vegetables
- Retail
- Storage for events

The department staff usually receives orders from the outlets/departments the night before which enables them to prepare and pack all items onto the trolleys the day after. Goods are then ready to be picked up some time during the morning or afternoon by the relevant department. In figure 3 the Main Storage department is visualised and communicates with the relevant "Departments 1,2,4" either directly or through "Outlets". Goods are received through "Goods-In" and are stored in the main storage and further on distributed to the relevant outlet. Current issues are identified to be lack in communication resulting in wrong packed orders and lack in organization, i.e. when departments return the trolleys etc. Additional issues that were pointed out throughout the interviews were the amount of checkpoints that are done on several locations, i.e. Goods-In, main storage and by the relevant outlet.

Food & Beverage

This scope covers the number of 17 food & beverage outlets, divided over 9 restaurants and 8 bars. This is visualised in figure 3 as "Department 1" with its different "Outlet B". To further understand the figure, "Outlet B" represents all outlets in that department. Currently each and every outlet is responsible both for the ordering of the goods and the pickup from the main storage. Other flow of goods consists of goods that are stored offsite and can be represented as "Offsite Storage X" which is not of regular usage (e.g. furniture).

Identified goods that are moved between outlets and main storage are food, beverage, kitchen utensils and restaurant relevant laundry. The ordering of the goods gets done the night before by each outlet and are further prepared the next day by the staff working in the main storage. The next morning the items are ready for pick up and each outlet sends the appropriate number of staff accountable for both the pickup as well as controlling that all requested items has been placed on the trolley. Depending on the order size, either staff goes twice or more staff is sent for the pickup of goods. Frozen groceries aren't being put on the trolleys until the responsible person from each outlet arrives to the main storage, which results in extra waiting time. Normally pick ups are done once a day from Monday - Sunday, but if some good are missing or if times allow some outlets may go twice a day. Special product deliveries such as pots and pans etc. are distributed separately. Further Identified flows are the pick up of beer kegs, which the fire department may support after requested. Moreover since each outlet is responsible for pick ups and controlling items this results in time not being utilized for the actual tasks they are hired to do. Additional issues such as health and safety may arise due to

heave lifting, the arrangement of the walking path etc. The current arrangement of flow of goods, i.e. the amount of trolleys that gets distributed each day may result in disturbance for customers. Noise and the multiple movements through customer areas can be viewed as such disturbance. A large amount of customers will further influence the delivery times in high seasons.

Retail

The retail department consists of four shops located next to each other. In figure 3 the retail department can also be visualised as “Department 1” with different “Outlets A”. The flow of goods consists mainly of goods that are picked up from the main storage but also through VMI, goods that are only stored on site, and offsite storage used for no regular used goods (e.g. furniture). Another accountability of the retail outlets are the five vending machines which are located in three different locations. The identified average amount of refilling the vending machines is on average 4 times a week. Since no electronic system for the vending machine is available each refill requires two runs, one to check the quantity and one to refill. Further on the pickups of goods for the retail shops, that have been ordered the previous day from the main storage, are usually organized between 8 and 9 o’clock as well as 13 to 14 o’clock. As shown in figure 3 the mode of transportation for this department consists of trolleys (specific type differs from picture). However, the retail department has slightly larger trolleys and therefore vary from the others. Three trolleys are available and the department tries to use them as efficient as possible with a minimum amount of empty runs (e.g. return of trolleys on the way to lunch). However, empty runs do happen especially in the evening when they must be returned for packing by the main storage the following morning. Currently if delivery help is needed it is provided by the main storage. The fire department is used only when the outlets are being refurbished or on other special occasions. Problems identified are similar to those in the F&B department, such as the arrangement of the walking path and noise factors disturbing customers. Moreover, there is limited amount of staff in the main storage who knows the location of retail goods, which can create complication in order packing.

Housekeeping

Next will be an analysis of the logistic processes and tasks from the housekeeping department. Within the dome (including attach) at Tropical Islands there are a total of 194 rooms and 133 tents, 98 of which where cleaning is outsourced. In addition to the dome there is the camping with 83 mobile homes and tepees (tents) which is however under the management of the camping department. In figure 3 the housekeeping department can be visualised as “Department 3” with different “Outlets C-E”. The flow of goods consists mainly of goods that are picked up from Tropical Islands own laundry and the outsourced laundry, which is visualized as the “Offsite storage Y”. Each of the outlets has also a limited storage area on site. Other goods necessary for the housekeeping (e.g. spare parts for hotel rooms) are planned and managed through both the care-taker/dispatcher and the fire brigade. Those goods can be stored on other offsite storage areas.

The main tasks of housekeeping lie within the room cleaning, laundry cleaning by the company owned laundry (bed line is leased), and the delivery of laundry and guest-water to each location. The major logistics tasks hereby are of course the laundry, toilet paper, guest water, etc., which belongs to the routine delivery process, which includes recycling of bottles and rubbish rounds as well. Laundry, such as tablecloth and kimonos, is also delivered to various pick-up and drop-off locations within the dome (including restaurants & sauna). The modes of transportation are divided in laundry rounds with a van (capacity of 6 trollies) and in-dome logistics with Movexx (capacity up to 5 trollies simultaneously). Multiple runs of both transportation modes are required throughout each day. A pallet truck (with a capacity of six trolleys) is also available but currently not in use. The department are currently experiencing logistic issues regarding unstructured delivery routines and transportation of outsourced/leased laundry to and from dome, i.e. the movement between “Offsite Storage Y” and the dome. As for all movements inside the dome the problems identified are the same as stated earlier in the F&B and retail, path arrangement and noise factors, which are disturbing customers.

Caretaker

The caretaker department operates inside the dome and the responsibilities lie within all kind of repairs conducted for the different departments in Tropical Islands. Different materials and goods like screws are used and stored in their own small storage area inside the dome. The

logistic flows are relatively small in comparison to the other departments. The organizing of the staff water delivery is on of the identified flows that lies within the responsibility area of the caretaker department and includes the supply to all departments. Routines are set that relevant departments order staff water via telephone on a frequent basis. Once the order has been received the delivery will be planned and conducted by the handyman of the caretaker department. On average a total of 40 crates are delivered in a 2 to 3 week time span.

Guest Service

The guest service is located inside the dome and the identified logistics task performed by this department are the lost & found items as well as information brochures for the guests. The average amount of lost & found they receive is about 5 items each week, depending on the amount of guests. In figure 3 the guest service department can be visualised as "Department 2". The flow of lost & found goods is within a special storage area within the dome, once requested by the customer the department prepares the goods and sends them directly via Goods-In. Brochures are ordered and delivered via the fire brigade which are stored offside.

Fire Brigade

The fire department is located outside the dome and their involvement in the performed logistics tasks mostly concern the transportation of items between different outlets and departments. The logistics responsibilities are identified to be the internal mail delivering, transportation of flyers between the main storage and the guest service and delivering of employee food to the camping site. Further on as previously mentioned the department also covers the movement of furniture and beer kegs when requested. In figure 3 one can visualise the fire brigade as the mode of transportation (arrow) that is used to support different logistic movements when and where needed.

Camping

The camping site is located outside the dome and therefor it has its own storage, in addition to the main storage located in the dome. The camping works as a separate department that is organized within it self. It is located about 1 km from the dome and if offers accommodation in mobile homes, caravan space and tents. Further on the department consists of a reception with a connecting shop and breakfast area. In figure 3 the camping department can be

visualised as “Department 4”. The deliveries of groceries are usually done by the suppliers and the unpacking is further on done by the camping staff and stored at the camping site. Local products are delivered through vendor managed inventory. Permanently used items necessary for the “Site II”, such as screws etc. required by the handyman is kept at the camping site whereby supplementary items needed for the site is picked up at the main storage.

Goods-In

The goods in department is situated right outside of the dome and is responsible for recording all incoming as well as outgoing goods (see figure 3). Upon arrival of suppliers the department is liable for quality as well as quantity checks of the received goods. Once approval is given goods are temporarily stored on site (e.g. refrigerated/frozen goods must be moved right away). The goods get then picked up either by the relevant department, the main storage staff or in some cases by the fire department. Agreement with some suppliers exists where good get delivered straight away to the relevant storage immediately, e.g. camping. However all deliveries is recorded at Goods-In. The mode of transportation varies with each delivery and ranges from a forklift to golf-cars.

4.3 Network and visualization of all departments

A measurement of distance walked was conducted to illustrate the current situation from a holistic point of view of Tropical Islands. Appendix 1 gives a visualization of the studied case in a map, marked with distances represented in metres. Further on table 1 presents each outlet with the average demand and the respective metres walked to and from the main storage. An average of 40 trolleys is leaving the main storage on a daily basis. Taking the limitations into consideration 38 trolleys could be identified to belong to the retail and F&B department. Measurement from each of the relevant outlets were taken to the main storage and summed up in order to calculate a total distance walked each day to fulfil the demand. The calculations shows that 5 906 metres is currently walked. It is important to mention that the data is an average amount and does not represent any form of demand fluctuation.

Outlet → Main Storage	in meter	Outlet → Main Storage	in meter
Lagoon (1 Trolley)	113	Palm Beach Kitchen (3 Trolley)	37
Borneo (2 Trolley)	85	Jabarimba Bar (1 Trolley)	160
Moody/Kalmoha (1 Trolley)	160	Jabarimba Kitchen (2 Trolley)	160
Palm Beach Bar (3 Trolley)	37	Staff Kitchen (2 Trolley)	198
Asian Wok Bar (1 Trolley)	196	Mondial Ami (1 Trolley)	41
Asian Wok Kitchen (2 Trolley)	196	Mondial German (2 Trolley)	49
Tropino (1 Trolley)	198	Mondial Pizza (2 Trolley)	47
Tropical Garden Bar (1 Trolley)	295	Mondial Beverage (1 Trolley)	53
Tropical Garden Kitchen (1 Trolley)	295	Retail Surfers (1 Trolley)	220
Breakfast Bar (1 Trolley)	160	Retail Sailors (1 Trolley)	+20
Breakfast Kitchen (5 Trolley)	160	Retail Candy (1 Trolley)	+41
		Retail Book (2 Trolley) [individual demand in retail might change within]	+32

Table 1 - current demand of outlets in trolleys & distance to main storage for delivery

4.4 Benchmark

The benchmark examines the internal logistic flow of 3 MLEs (Medium and Large enterprises) operating in the service sector, i.e. within the similar field of the main case study such as amusement parks and zoo's. The companies are located in different locations in Europe and are either in the process of implementing a new internal logistics department or already have a department handling the flows of goods and information within the premises. The purpose of the study was to gain a holistic view of how other companies work with their logistics flows within the organization, and how these are optimized and structured around the storage area. Further on the study aims to provide support for the research question and the objective of this thesis. All of the three cases that were investigated already have a central storage where most of the daily usage of goods is stored, such as food and beverage, retail etc. The objective is that the storage is responsible for the deliveries of goods to the relevant departments, i.e. delivery of food to a restaurant etc. The ordering of goods were organized

differently between the cases, either by using software systems or by having each relevant department filling in a form of what goods they would need next day that were further on delivered to the main storage. In some cases the supplier delivers straight away to the relevant department, i.e. the supplier drives directly to a restaurant to deliver the food. Moreover the received supplies are stored in the main storage and further on distributed internally by the logistic department. Transportations of goods are done by either trucks, golf cars or Movexx between one or several times a day dependent on the amount of customers they receive each day. Rush orders were either picked up at the main storage or delivered, dependent on the amount of employees available at the storage and the urge of the goods needed. Further on each case had some kind of organized way of handling the flow of goods between outlets located at the premises

5. Analysis

In this chapter the results of the empirical findings are brought into connection with the research question. Developing a structured view of internal logistics in connection with theoretical aspects and a framework for the improvement of internally flowing goods will give an understanding of the importance of the questions asked in this report.

The central objective of this thesis has therefore been to contribute to an constructive but also critical viewpoint of how milk run logistics can be used to develop an efficient and effective logistics department within a business. A structure into two parts will allow the reader to clearly follow and understand the relation between the case study and the theory. The first part will describe the suggested solutions for the main case study that was conducted at Tropical Islands. Followed by the second part, that aims to give a general view of how the internal flow of logistics can become more efficient for companies related to the reports topic. Knowledge gained from the theoretical findings and several other aspects learned from the case study were necessary to reach the conclusion.

5.1 Improvement suggestion of logistics flow

The internal logistics can be viewed as a supply chain within the walls of the organization and should be planned in a efficient and effective manner (Christopher and Towill, 2002). The aim is to optimize the physical flow of goods. Therefore, important for the physical structure of an internal logistics department are the storage facilities (source), the delivering points (outlets), and both connected in a transportation network. As Baker (2005) previously mentioned several components needs to be taken into consideration in terms of internal logistics and the suggested improvements have been developed to mostly address the process design. The empirical findings presented in section 4 enabled the problems to be brought to the surface and pointed out where most improvements could be achieved. Moreover the concept of milk runs have been studied, analysed and further on theoretically applied on the case study to address the issues presented in the empirical findings. By utilizing the theory of value stream mapping the current situation could be visualized in section 4 and when combined with the theory of milk runs the following figure 4 was developed to illustrate the suggested solution.

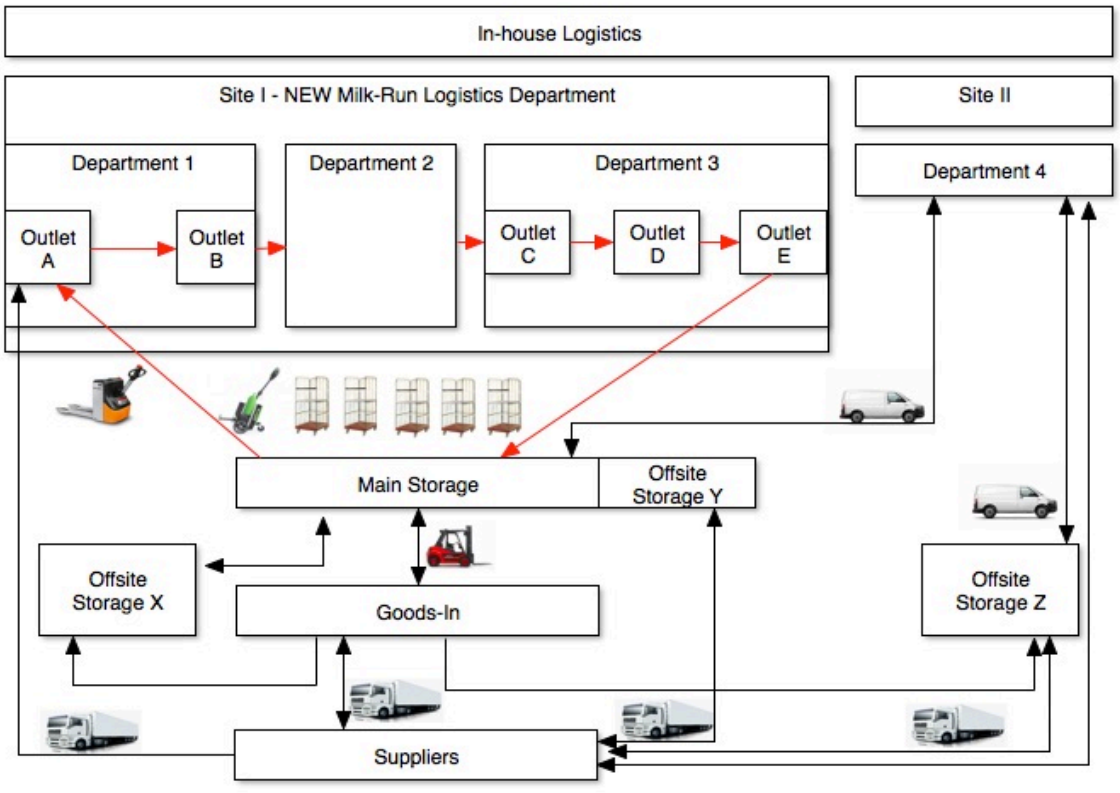


Figure 4 - The suggested improvement of flowing goods in form of Milk-Runs at Tropical Islands

The figure aims to illustrate the suggested physical flow of goods within the organization and how they can be orchestrated to achieve efficiency. Similar to figure 3 the black arrows are representing the flow of goods. Improvements implemented through milk run logistics are visualized by the red arrows and a larger capacity of trolleys moved can be achieved by the utilization of the appropriate equipment (example Movexx). If necessary and possible off site storages (e.g. offsite storage Y) can also be moved around in order to minimize the logistic flows.

The storage department is suggested to be merged into the new logistics department and handle all distribution of goods to the relevant departments. Combining the deliveries allows for more efficiency, stable processes and fast delivery of goods (Klenk and Galka, n.d). Probably the most important benefit is to reduce time and distance travelled between outlets and departments. When considering time in the case of TI it is important to consider high versus low season. Most distances travelled at TI are through customer areas due to the special conditions of the building. Therefore the time used to move goods from point A to point B is highly dependable on the amount of guests in the dome. Hence customer value will also increase since most flows of goods are handled in guest areas and minimized travelled distance would consequently less disturb customers.
In the case of TI most obvious improvements were identified to lie within the F&B and the Retail department. When the analysis at the case study took place data was collected over a short time period. With the received data, that each department collected, average values of flows of goods were calculated. It is very important to mention that the collected data does not reflect every day flow fluctuation at the company, as previously mentioned seasonal variation has a big impact. However, software implementations are further described and those can handle day-to-day and season to season fluctuation for companies who faces internally logistics challenges. The implementation structure of the milk runs is suggested in the next paragraph and will be further explained.

5.1.1 Network mapping

According to the collected data and the calculations of the average demand a Milk Run proposition has been calculated and structured to illustrate the saving in terms of metres. Table 2 represent the 9 milk runs necessarily to fulfil daily demand and stands also in consideration with time constraints and capacity. The milk runs have also been structured

under consideration of hygiene restrictions, i.e. food outlets with frozen goods have a higher priority than retail shops and are therefore delivered first. In consideration to the shortest route calculations the capacity of 5 trolleys cannot always be maximised in order to reach efficiency and therefore a total of 9 milk runs are necessary for the demand fulfilment. The calculations show that the milk runs require a total distance walked of 2829 metres which results in a total of 3077 metres in walking distance saved. In total over 52% can be saved when implementing milk runs.

When considering improvements one might think that it is necessary to measure times. However due to the observation limitations this was not done, hence measurements were taken in distance (in meters). However, the information that 1000 meters takes approximately 20 minutes to walk was provided by the company. The conversion in time takes the following into consideration:

- Staff pushing trolleys while walking
- Opening and closing of doors
- Uneven walkways through customer areas (seasonal differences must further be considered)
- Climate conditions at TI

Information used in table 1 & 2 therefore result in the following:

- Hub-Approach: 5906m → 118,12min
- Milk-Run: 2829m → 56,58min
- Savings: 3077m → 61,54min (~52%)

Additionally, one must consider the drop-off and pickup of trolleys at the different outlets that the milk runs supplies. Therefore both the time and the distance measurements do not represent actual data on how long the complete operations require to fulfil the deliveries. Nonetheless, the improvements become clearly visible regardless of the additional considerations.

Milk Run	Departments (Demand in trolleys)	Distance in meter
A	Main Storage → Tropical Garden (2)→ Retail Book (2) → Retail Candy (1) → Main Storage	737
B	Main Storage → Asian Wok (3)→ Retail Surfers (1) → Retail Sailors (1) → Main Storage	560
C	Main Storage → Palm Beach (3)→ Main Storage	74
D	Main Storage → Palm Beach (3)→ Main Storage	74
E	Main Storage → Mondial Beverage (1)→ Mondial German (2) → Mondial Ami (1) → Main Storage	110
F	Main Storage → Mondial Pizza (2)→ Borneo (2) → Lagoon (1) → Main Storage	226
G	Main Storage → Jabarimba (3)→ Moody/Kalmoha (1) → Breakfast (1) → Main Storage	320
H	Main Storage → Breakfast (5) → Main Storage	320
I	Main Storage → Tropino (1)→ Staff Kitchen (2) → Main Storage	396
Total	**38 Trolleys**	**2829**

Table 2 - Milk-Run delivery distance with demand of outlets

The internal logistics at TI is suggested with the implementation of milk runs in combination with other tools such as VMI to for instance take pressure of the new logistic department. The following points describe how the milk runs should be structured at TI.

- The demand of each outlet should be used to calculate daily most efficient routes.
- The logistic departments would start a shift with the responsibility to pack the orders they have received from the different outlets. This is similar to the main storage current situation. It is important to follow time constraints when packing orders in order to allow on time deliveries to outlets.

- Orders should be checked and approved by a dispatcher. Using a dispatcher would allow the different outlets to rely on correctly packed orders.
- Once the first capacity of 5 trollies is packed the first milk run would start to move and deliver goods to relevant departments. At the same time the remaining staff would assure that remaining orders are packed onto trollies.
- When the logistic staff would arrive at the different outlets an exchange of full with "used" trolleys would take place. ("used" trolleys are trolleys either empty or with goods going back to the main storage)
- The milk run would continue to the next department until it has delivered all trollies.
- As a final step the milk run would return to the main storage.
- Depending on the time constraints of the next delivery, either a new milk run would start or the "used" trolleys would be unpacked. The outlets are able to send garbage and recycling with the "used" trolleys back to the main storage.
- Ruched orders can be conducted by golf cars to assure fast deliveries, i.e. wrongly packed or forgotten orders by departments (those should be kept to an absolute minimum).

Moreover this will allow the staff at the different outlets to focus on other work related tasks and further enhance customer service. The benefits of the milk runs for each department will further be explained.

Recommendations of creating an internal logistics department can be represented as a three-step solution as figure 5 illustrates. The milk run can first be implemented to the food & beverage and retail department, as previously mentioned in the limitations. This allows the company to analyse the performance of the milk runs are highly developable and can further on be extended to other departments. Consequently the second step would be to take over tasks from other departments and implement into the milk runs such as the delivering of staff lunch to and from the camping etc., (handling the mail between departments, delivering laundry to and from the dome as well as the movement of goods to and from the different shelters located around the area.) The last step is to build a centralized storage building where all goods for each and every department are stored, such as food, furniture, tools etc. which requires extended and detailed planning.

Figure 5 - Implementation suggestion split in three parts

The following subsections are organised in the same structure as section 4.2, but also according to figure 5. This will allow the reader to follow and understand the case study more clearly. Benefits and possible drawbacks for each department are described.

5.2 Step one of implementing Milk-Run

This section aims to provide an overview of what logistics task that are included in Step 1 in figure 5. This step includes the F&B and the retail department and are further explained below.

Main storage

Implementing the new logistics department would mainly take place in the main storage department and is suggested to merge together with the new logistic department. Currently conducted logistic tasks, such as for instance packing orders, would stay within the responsibility of the department. Milk runs will require a tight schedule and detailed planning as described by Nilsson (2008). Benefits for the department will however overcome the planning pressure. The department will profit by a greater amount of staff available which would reduce the risk of staff shortage. Cross training all staff, would then minimise the risk of false packed orders. A greater variety of work for the logistics staff could also increase motivation, as well as a more balanced work life. This would consequently increase health and safety conditions.

Food & Beverage

The improvements when implementing a milk run delivery are identified to be the most within the F&B department. From the perspective of this report the F&B department has the highest volume in goods movement. Inefficiency were found to be within the delivery method of the individual outlets of the department. The implementation of milk runs like described under the main headline in this section could achieve an increased efficiency in the delivery and pickup of goods, if implemented and planned correctly. Each outlet would gain time through deliveries that are now taken over by the logistic department. Also possible waiting time for approval in the main storage is eliminated. This tasks would be taken from the department and completely handled by the new logistics department. Especially for some outlets in this department, the health & safety conditions for the often employed female waitresses and bartenders would improve due to the appropriate man power as well as the more efficient form of transportation that is electronically supported. A suitable amount of staff could be planned into the milk run system in order to handle heavy deliveries such as beer barrels or water crates. As seen in figure 6 certain outlets are left out in the milk runs, this is due to the limited opening hours. The flow of goods is marked with broken arrow lines. In high season, when open, it is suggested that relevant outlets distribute goods internally from the closest point of delivery or that the outlets are further included in the milk runs going to outlet nr X.

The benefit in time saving in each outlet could be used in different ways. One possible option is to extend opening hours of the outlets if needed. Another possibility to use gained time is to save labour hours in the departments. Time could also be used to enhance customer service, or extend office hours for managers to eliminate false orders which would cause system nervousness.

During the interview process it was made clear that the packing of order is not always handled correctly. In order to use a milk run system it would become more and more important to pay close attention from all sides to eliminate nervousness risk for the milk run efficiency. Possible improvements such as a penalty system and/or a centralized dispatcher position, that takes all responsibility, is suggested. All risks and strength are further defined in the SWOT analysis in section 5.6.

Additionally within the F&B department the hygiene of the food products must be considered. Currently there are no temperature isolation trolleys used. Depending on how the milk runs are structured it might be necessary to invest in isolation for frozen and chilled goods when delivering to the individual outlets. Another advantage of isolated trolleys will be when the delivery to the outlet is fulfilled, but staff is not instantly available for unpacking.

Retail

The Retail department is set to be the second biggest department when talking about flow of goods. Unlike the F&B department the pickup of goods is not handled individually by each of the departments but more as a team. However, integrated milk runs will merge the logistic flows and more efficiency can be accomplished. VMI is already implemented to some extent and is recommended to be kept as it is to take the pressure of the new department.

A suggestion is to review the special retail transportation trollies. It is suggested to use a standard form of transportation to simplify deliveries. Empty runs will also be avoided since more trolleys are available.

Deliveries to vending machines would be difficult, but not impossible to integrate to the logistics department. However in this study it is recommended to keep the responsibility of refilling the vending machines within the retail department. The flow of goods to the vending machines are marked with broken arrow lines in figure 6. One possible improvement is seen in the vending machine itself that is currently not connected to the ERP system. Once a connection would exist the demand could be identified from the logistics team in order to take over the delivery as well. Customer service would also increase because more accurate data can be collected and missing goods in vending machines could be minimized through an integrated milk run round.

The benefit in time saving in the retail department is similar to the F&B department. During the interviews the question of what the extra time would be used for was also asked. Answers of more office time for managers and an increased customer service were given. However in order to increase a holistic improvement for efficiency, a certain percentage of time saved must also be applied by the distinctive outlets.

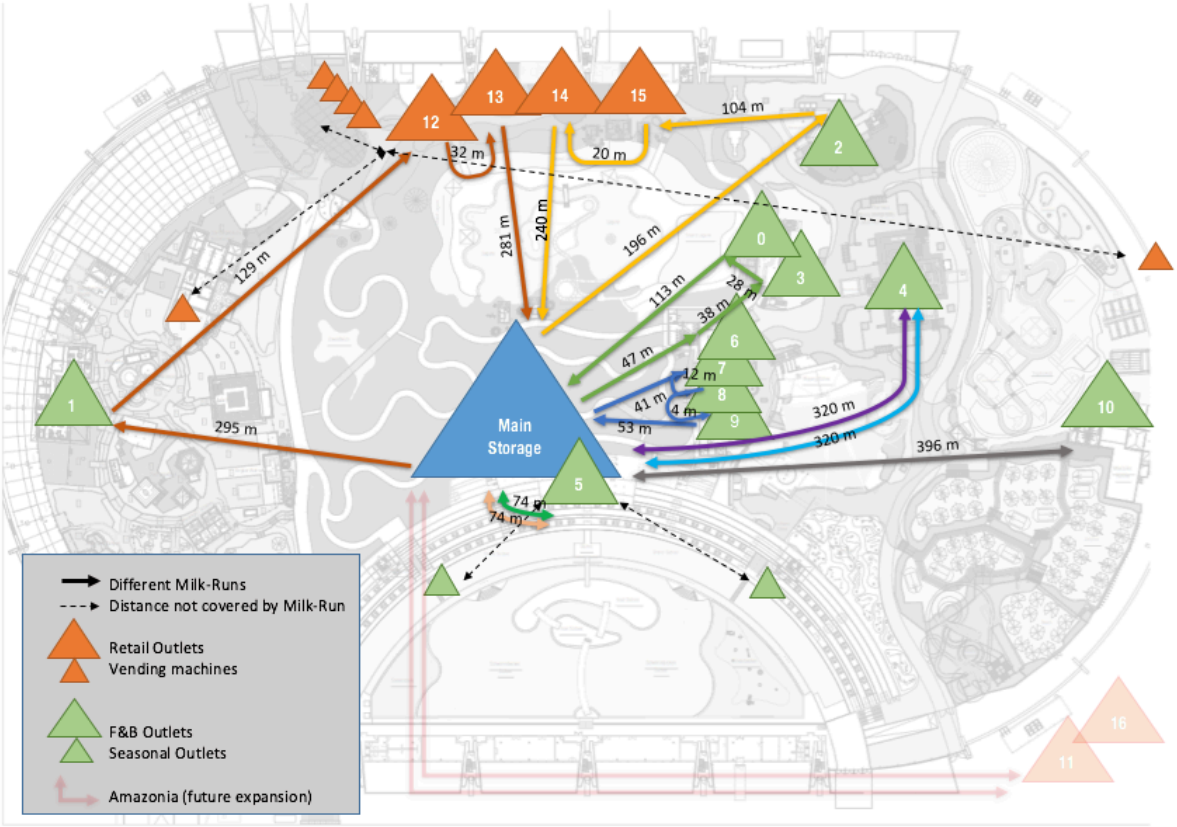


Figure 6 - Milk-Run at Tropical Islands visualised in a network map

5.3 Step two of implementing Milk-Run

This section aims to provide a brief description of what logistics task that can be included in Step 2 from figure 5. This step includes all other departments analysed in this case study and are further explained below.

Housekeeping

As suggested under the main headline in this section a milk run structure could be applied separately once benefits and drawbacks have been fully identified from the first implementation phase. This department are currently organized in a way that can be compared to milk runs, however, a more organized form of delivery should be planned and structure to allow a more efficient flow of goods. Creating a detailed network map that includes all housekeeping outlets will be necessary to find the most efficient route. The logistics tasks that could be taken over and integrated in step 2 are the guest water delivery and the movement of laundry between "Off site Storage Y" and the dome. The outsourced laundry is as described

currently delivered to the named off site storage. It is suggested that the storage is moved closer to the dome to minimize distance for goods moved. In both the current figure 3 and the improved figure 4 this is also visualized.

Caretaker

Identified logistic tasks that can be partly included in the logistics department are the staff water deliveries. The staff water order conducted by the F&B and retail department is recommended to be done by the logistic milk run deliveries. However, other departments might be kept by the caretaker department. Benefits will lie within efficiency of deliveries because the delivery between main storage and F&B as well as retail department can easily be combined with their staff water supply. Other logistics flows within the department are irrelevant due to their own storage location.

Guest service

No tasks could be identified for the logistic flow that would enhance the efficiency for guest service department. However, in the future the delivery of brochures currently conducted by the fire department could be integrated in milk run procedures.

Fire brigade

Identified logistics tasks that could be taken over from the fire department and integrated in step 2 in figure 4 are the delivering of mail between the dome and the buildings outside the dome as well as the delivering of staff lunch to the camping department. In addition the movements of goods to and from the off site storages i.e. the shelters as well as the movement of the beer kegs would also be performed by the new logistic department.

Camping

The camping department is currently using VMI to some extent as well as having the benefits of suppliers delivering directly to the camping site, which takes the pressure of the logistic department once integrated. Therefor this should be continued. Tasks that would be taken over by the new department is the movement of goods between dome and camp site.

Goods-In

The Goods-In department is suggested to work in close relation with the new logistic department. The movement of all goods that are stored in the main storage will be performed

by the new logistic department in the same way it is currently handled by the main storage. Other incoming goods will have to be evaluated if they can be delivered by the logistic department or if they are kept as currently by the relevant responsible departments.

5.4 Step three – centralizing all logistics into one

Step 3 is a long term goal and is currently developed by Tropical Islands. As mentioned in the delimitations the company requested a logistic solution that could be applied in the short term to improve the logistic flows. When building such centralised warehouse it is important to find a strategic location on the premises to allow the most efficient flow of goods. However this thesis is not putting any further focus on step 3.

5.5 General Analysis

The aim of this section is to present a framework on how the internal flow of goods can be improved in order to maximise benefits. The following aspects are included to justify the analysis:

- *Identifying flow of goods*
- *Implementing Milk run*
- *Software system solution*
- *VMI & other methods*
- *The five components*
- *SWOT*

An efficient delivery system has to be developed that brings goods on a routine milk run to different locations on a demand based operating principal. Most research and theory in the field of internal logistics has been done from a manufacturing point of view. Unlike in manufacturing however there is no line assembly and goods requested by the outlets vary in size, quantity, frequency and condition. One example to mention is the challenge of combining food and non food goods within the delivery. Certain goods like frozen or refrigerated goods must of course be delivered to the food-outlets with highest priority. Therefore, it is important to design a milk-run distribution that keeps all constraints under consideration.

An efficient utilization of available staff as well as their overall factor knowledge for company wide department requirements is vital for the development of the logistics department. This concern is fundamental for the functioning of the whole firm. Such newly formed logistic department must therefore be flexible and easy to adjust to changes in order utilize the great potential benefits that it will bring.

Logistic services and the connecting costs become more and more important when it comes to the level and quality of customer service. The ultimate price determined is linked to such costs and focus should lie in an efficient and effective way of logistics transportation within the supply network (Niemeyer and Wildemann, n.d.). Further the explanation of different tools and concepts are explained that aims to improve the internal flow of goods

5.5.1 Identifying flow of goods

Identifying the flow of goods is essential to get the scope of the internal logistics and finding potential inefficiencies in the system. Further on data collection is a key step in the process to find constraints and other limitations that may affect the planning and structuring of the logistics department. As Baker (2006) previously mentioned in the frame of reference there are 5 components that need to be taken into consideration when optimizing the inbound logistic flow; building design, equipment, systems, staffing and process design. Strategic planning and utilization of these 5 components need to be organized in way that will ensure a more efficient flow of goods. The organization should be viewed as a supply chain that is kept within the walls of the business and the 5 components need to be orchestrated in a way so they work together with each other and remover possible constraints that may arise, for example through having the right equipment for transportation of goods the issues that may arise from building design can be eliminated to some extent.

5.5.2 Milk run

Many companies operating in the service industry with several outlets can benefit from implementing milk runs. The aim of combining several deliveries into one can save a tremendous amount of both walking distance and the equivalent time used in the distribution of goods as previously shown in the case study. Milk runs can be applicable to most companies within the service sector. Various kinds of departments can be connected in the milk run deliveries to show the capacity maximization that can be achieved.

Addressing the components by Baker (2006) the use of the right equipment is essential in order to perform the milk runs. This in combination with the right staffing (Baker, 2006) is the key of designing the process in order to execute the milk runs. Milk runs can usually be implemented to all kinds of departments to increase efficiency. However further recommendations is to implement the method/tool to some parts of the business and then further expand it to a bigger scale, involving more departments to ensure the harmony of the flow of goods and that everything is working accordingly.

5.5.3 Software system

To utilize and best address the concept of milk runs different software systems can be applied in order to optimize the planning and finding the best optional route to provide the different outlets with the goods needed. By implementing a software solution time consuming task can be eliminated, such as complex planning of routes and networks, which often requires an extent usage of labour. Depending of the complexity of the internal logistics flow of the organization, the price range may differ in order to fulfil the needs of the business. However the cost of implementing a software solution can overcompensate the cost that otherwise would have arisen from the extent planning needed. Further on the software solutions can eliminate the risk of wrong and late deliveries and therefor also enhance the overall customer service. As previously mentioned by baker (2006) system is one of the 5 components that need to be considered when working with internal logistics. The system can further on "assist" other components, i.e. implementation of a software system will simplify the process design and requires less staff to be used.

5.5.4 VMI & other methods

As stated in the empirical findings VMI can be implemented to take the pressure of the logistic department and the suggested milk runs. Unfortunately other risks may arise such as late and wrong deliveries by the supplier. However dependent on to what extent VMI is implemented within the business other benefits may overcompensate the risk, such as saved space in storage. As stated in the empirical findings presented in both case study A & B, some companies have their suppliers deliver directly to an outlet operating at the premises. For an example the suppliers deliver directly to the restaurants, which remarkably simplifies the milk

run process, taking the pressure of the department as well as reducing the inventory levels at the main storage.

5.5.5 The five components

The necessity of an efficient flow of goods within the service industry is of great importance in order to both be cost efficient as well as maximize customer service. The 5 elements previously mentioned by Baker (2006) that need to be taken into consideration when designing the new department are building design, equipment, systems, staffing and process design. Even though it's not always possible to address all of these components they can be utilized and synchronized in a way that can enhance the overall business performance.

5.6 SWOT

The SWOT analysis implies the internal strengths and weaknesses as well as the external opportunities and threats of implementing a new in house logistic department in a business operating in the service industry. The SWOT considers aspects that may increase the performance such as milk runs, software systems and VMI.

		STRENGTHS	**WEAKNESSES**
INTERNAL		• **Cost & Time efficient** • **Better utilization of labour (skills)** • **Better planning of flow of goods** • **Higher customer service** • **Better communication** • **Better frequency** • **Multiple trolleys movement transportation** • **Developable**	• **Requires advanced planning** • **Extra request(specials)** • **Seasonal fluctuation** • **Short term prioritization** • **Machine/Movexx breaking down** • **Frequency of re-planning**
		OPPORTUNITIES	**THREATS**
EXTERNAL		• **Acquire an optimization Software system(milk runs - less time consuming in planning)** • **VMI** • **Supplier deliver on campus**	• **Wrong supplier deliveries** • **Late supplier deliveries** • **Further regulations / restrictions on hygiene**

Figure 7 - SWOT analysis on suggested improvements on internal logistics

5.6.1 Strengths

As seen in the figure 7 the strengths are identified to be cost efficient, better utilization of labour, ex. A cook is higher to cook, which in terms enhance customer service. As shown in the case study a tremendous amount of time can be saved, in terms of distance walked and eliminating unnecessary waiting time in the storage. Furthermore the new department enables better planning of goods, due to better communication and more frequent deliveries. The ability to combine transportations and carry more goods through milk runs resulting in efficient use of time in delivering goods. Additional internal logistics department are highly

developable since they can be adopted to a small scale of the business and then further expanded to other parts.

5.6.2 Weaknesses

The weaknesses standing out from the SWOT are clearly identified to be the necessity of frequent advanced (re)planning of the delivery routes of goods if seasonal fluctuation is present. The reliability of transportation machines (like Movexx) is essential for the flow of internal goods. If such tool would break down it could be wise to have back up to not interfere with the system. Extra, forgotten, or short term prioritised orders will also negatively affect a milk run based logistic system since advanced planning establishes schedules that then must be changed. Time and labour resources are also necessary for planning the logistics department tasks. However, once a routine has been established this weakness should have less negative impact.

5.6.3 Opportunities

Fortunately, the opportunities can overcome most weaknesses. By acquiring a company that provides software system solutions to optimize the flow of goods the advance planning can be eliminated. Furthermore this results in enhanced prioritization as well as better response to seasonal fluctuation. By partial use of VMI and by constructing agreements with suppliers to deliver directly to the relevant outlet, i.e. food to a restaurant time can be saved and takes the pressure of the in-house logistics department.

5.6.4 Threats

The main threat to an internal logistic department would resolve the external supply of goods. Wrong or late deliveries would affect the structuring of daily routines in the system.
Other outside threats are always present from higher forces, such as government restrictions and regulations etc.

6. Discussion

From the theory, empirical findings, and analysis one could say it is of great importance to structure the flow of internal logistics strategically in order to achieve efficiency. This section aims to further discuss the opportunities and possible drawbacks that arises when changing logistics within a business. Further recommendations are given that are important to mention within this report but have been kept out of the scope due to time restrictions.

As stated in the analysis there are many benefits when companies have their logistics organised in one centralized department. It is essential to consider both the physical flow as well as the flow of information when structuring such department. Information systems such as ERP and other software system would improve the communication as well as simplifying the ordering process of goods. This would also allow the data to be more accurate of what goods are needed every day as well as having a structured organization of what is stored where.

Another point were we felt the need to discuss further is the knowledge of staff in connection to cross training. We see great improvement potential when staff are trained appropriately and have widespread knowledge of their department. Therefore it is recommended to rotate positions within the logistics department. This allows the logistic staff to obtain knowledge about all departments and storage location, which in terms minimize the risk of confusion, wrong deliveries as well as building up a stronger team. Knowledge of the staff would be evenly spread and benefits for the whole business consequently arises. Throughout the interviews in our case study we have heard the issue that staff is not trained appropriately. Other literature is suggested to be studied in order to find the relevance of cross training staff.

The three-step implementation allows potential problem or data inaccuracy to be brought to the surface and be prevented before applicable on a bigger scale. However, the order of the milk run has to be considered by the company and may change when implemented. Another suggestion is to consider re-planning/negotiation of delivery times in cooperation with each outlet. Flexible delivery times will help the milk run system to be dynamic and more flexible. Milk run systems are highly developable and should be easily expandable. When businesses expand with further outlets it is recommended to re-plan the milk run system and recalculate

according to the network plan. Once new outlets are up running further data should be collected and analysed in terms of investigating if the forecasted demand is accurate. In the case of TI a new outside area is opening and will include one retail as well as one F&B outlet. In this case however special conditions in transportation regulations made it impossible to integrate those outlets into existing milk runs.

Another part worth mentioning is the required amount of staff necessary to implement milk runs. During implementation step one we suggest to monitor the occupancy of logistics staff closely. The identification of the exact time needed to fulfil milk runs will either allow to add point to the milk run rounds or it will require to hire further staff to reach the needed demand. Additionally, the time saved by all outlets must be appointed to be filled with either new tasks or saved. When appointing new tasks an evaluation must clearly show that value such as customer value increases to such extent that the benefits overcome the extra staff employed by the logistics department.

In order for a functioning logistic department a manager should be appointed to guide and lead the team. Such manager could have the responsibility of dispatcher, which would be accountable for checking all goods. Benefits lie within the minimization of quality and quantity check points. However, it can be discussed and argued for that staff will double check goods anyway in order to not being held responsible if orders are inaccurate. Therefore it should further be investigated if a dispatcher is needed or not.

As presented in both case study and the benchmarking the concept of milk runs highly depends on the possession of a machine (e.g. Movexx), that enables the movement of several deliveries in one. The solution presented in this thesis is built on this requirement. Therefore further recommendations is to invest in such transportation and possible invest in more machines in case of breakdown or other unforeseen events.

From a logistic point of view it is recommended to oversee internal company boundaries to find the best possible and most efficient solution. In reality however company boundaries may collide with certain optimizations.

The collected data has been measured in metres and further on calculated into estimated time measure in minutes. Measurements in metres are more accurate than times due to that timing depends on the amount of people at the premises as well as if there might be any disruption that may cause delays or longer distances to walk.

One can argue if benefits should be measured in time or metres. Unlike metres time can fluctuate according to the amount of customers during different seasons and is more accurate to reality. Therefore this thesis used time calculation based on the specific case of Tropical Islands. Every organization must consider their own time restrictions.

7. Conclusion

This sections serves to present the conclusions of the scientific contribution conducted in this study as well as addressing the targeted market that the research was aimed for.

The main purpose of this thesis has been to gain a deeper understanding of how the internal flow of goods should be structured and organized to maximize benefits. The frame of reference has built up the needed theoretical knowledge in order to conduct a research and perform Caste study A and further investigate the cases presented in the benchmarking. The empirical findings have contributed to draw conclusions on how to best design a competitive internal logistics department and how a company can benefit from this.

The theoretical framework presented definitions and descriptions of the characteristics of logistics from an internal point of view. Relevant literature was studied to introduce and present how the physical flow of goods could be organized. This knowledge developed a demonstration of the concept of milk runs and the improvements were made evident in the case study. Other tools were also mentioned that support the base of internal logistic improvement decisions.

The case study emphasized that there was a great demand and necessity of utilizing the concept of milk runs to achieve efficiency within the internal flow of logistics. By combining the theory with the empirical findings such improvements were presented. The final outcome of the case studied demonstrated possible milk run solutions and how these should be orchestrated by including constraints like capacity, time, and equipment to give a flexible

form of improved internal logistics. The findings clearly state that over 52% in distance walked can be saved.

Moreover, the small benchmarking survey aimed to demonstrate how other businesses with in a similar field of the case study work with internal logistics. The result identified that the focus on internal logistics has great potential to reach improved efficiency performance since great focus was put on the internal structure of flowing goods. However the findings are rather limited due to restricted information that was received through the benchmark but helped strengthen the suggested solutions for this report. The focus was put especially with regards to companies operating in the service industry. Consequently, companies within this sector facing the same problems can benefit from the suggested solutions.

The general conclusion to be drawn from this thesis is the need to strategically organize the flow of internal logistics to improve efficiency and enhance competitiveness. It was made evident that planning is essential in order to successfully implement the milk runs. Other tools could be utilized to further eliminate drawbacks that might occur. The overall study attended to provide solutions to companies operating within the same industry, hence further research is needed to obtain a holistic view.

8. References

Baker, P. (2006) 'Designing distribution centres for agile supply chains', International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management, 9(3), pp. 207-221.

Baker, P., Canessa, M. (2009) 'Warehouse design: A structured approach', European Journal of Operational Research, 193(2), pp. 425–436.

Bryman, A. (1989) Research Methods and Organization Studies, New York: Routledge.

Catalano Ruriani, D. (2004) Selecting a Load and Route Optimization System, Available at: http://www.inboundlogistics.com/cms/article/selecting-a-load-and-route-optimization-system/ (Accessed: 28th April 2016).

Christopher, M. (2011) Logistics & Supply Chain Management, 4 edn., Harlow, Great Britain: Pearson Education Limited.

Christopher, M. (2005) Logistics and Supply Chain Management - Creating Value-Adding Networks, 3 edn., Harlow, GreatBritain: Pearson Education Limited.

Christopher, M., Towill, D. R. (2002) 'Developing Market Specific Supply Chain Strategies', The International Journal of Logistics Management, 13(1), pp. 1-14.

Frahm, S. (2003) Vendor managed inventory (VMI): Three steps in making it work, Available at: https://scm.ncsu.edu/scm-articles/article/vendor-managed-inventory-vmi-three-steps-in-making-it-work (Accessed: 23rd April 2016).

Gattorna, J., Day, A. and Hargreaves, J. (1991) 'Effective Logistics Management', Logistics Information Management, 4(2), pp. 2 - 86.

Golicic, S.L., Davis, D.F. (2012) 'Implementing mixed methods research in supply chain management', International Journal of Physical Distribution & Logistics Management, 42(8/9), pp. 726 - 741.

Guizzi, G., Revetria, R., Chiocca, D. and Romano, E. (n.d.) ‘A dynamic milk nun in weee reverse logistics’, Genoa, Italy: University of Naples, Federico II.

Haefner, B., Kraemer, A., Stauss, T. and Lanza, G. (2014) 'Quality value stream mapping', Variety Management in Manufacturing — Proceedings of the 47th CIRP Conference on Manufacturing Systems, 17, pp. 254-259

Harrison, A., van Hoek, R. (2008) Logistics Management and strategy, 3 edn., Edinburgh Gate, England: Pearson Education Limited.

Hong, X., Chunyuan, W., Xu, L. and Diabat, A. (2015) 'Multiple-vendor, multiple-retailer based vendor-managed inventory', Annals of Operations Research, 238(1), pp. 277-297.

Jasti, N.V., Sharma,A. (2014) 'Lean manufacturing implementation using value stream mapping as a tool: A case study from auto components industry', International Journal of Lean Six Sigma, 5(1), pp. 89-116.

Jones, D., Womack, J. (2002) Seeing the Whole: Mapping the Extended Value Stream, Cambridge, England: Lean Enterprise Institute.

Jonsson, P. (2008) Logistics and Supply Chain Management, 1 edn., Berkshire, Great Britain: McGraw-Hill Education.

Klenk, E., Galka, S. (n.d.) Analysis of parameters influencing in-plant milk run design for production supply, München, Germany: Technische Universität München.

Kovács, G., Spens, K.M. (2005) 'Abductive reasoning in logistics research', International Journal of Physical Distribution & Logistics Management, 35(2), pp. 132 - 144.

Krishna Jasti, N.V., Sharma,A. (2014) 'Lean manufacturing implementation using value stream mapping as a tool: A case study from auto components industry', International Journal of Lean Six Sigma, 5(1), pp. 89-116.

Linköping University (n.d.) Value stream mapping, Available at: https://www.iei.liu.se/q/lean_varden/filarkiv/UD2/Värdeflödesanalys/1.130542/VSM_Limerick.pdf(Accessed: 6th May 2016).

Lordache, V., Cormos, A.C., Nemtanu, F.C. and Lopez, V.R.T. (2012) ' Minimizing costs through Transport Route optimization using up-to-date road traffic information', Valahian Journal of Economic Studies, 3(3), pp. 85-92.

Nilsson, A. (2008) Opportunities for the implementation of a milk run system - A case study at Haldex Traction, Lund, Sweden: Lund Institute of Technology.

Owens, R.C., Warner, T. (2003) Concepts of Logistics System Design, Arlington, U.S.: Deliver.

Patel, M. B., Vadher, J. A. (2014) 'Implementation of milk run material supply system in vehicle routing problem with simultaneous pickup and delivery', International Journal of Application or Innovation in Engineering & Management (IJAIEM), 3(11).

Rosentrater, K.A., Balamuralikrishna, R. (2006), 'Value stream mapping - a tool for engineering and technology education and practice', Fort Wayne, USA: Proceedings of the 2006 ASEE IL/IN Conference.

Rouwenhorst, B., Reuter, B., Stockrahm, V., van Houtum, G. J., Mantel, R. J. and Zijm, W. H. M. (2000) 'Warehouse design and control: Framework and literature review', European Journal of Operational Research, 122(3), pp. 515-533.

Sari, K. (2008) 'Inventory inaccuracy and performance of collaborative supply chain practices', Industrial Management & Data Systems, 108(4), pp. 495 - 509.

Sari, K. (2008) 'On the benefits of CPFR and VMI: A comparative simulation study', International Journal of Production Economics, 113(2), pp. 575–586.

Schulze, L., Wüllner, A. (2006) ‘The Approach of Automated Guided Vehicle Systems’, IEEE International Conference Proceedings of Service Operations and Logistics and Informatics, IEEE, Shanghai, pp. 522 - 527.

Stock, G.N., Greis, N.P. and Kasarda, J.D. (1998) 'Logistics, strategy and structure: A conceptual framework', International Journal of Operations & Production Management, 18(1), pp. 37 - 52.

Tarikere, T., Niranjana., Stephan, M. and Nguyena, W & S.M. (2012) 'Prerequisites to vendor-managed inventory', International Journal of Production Research, 50(4), pp. .

Tonnquist, B. (2012) Project management , 2 edn., Stockholm, Sweden: Sanoma utbildning.Krishna

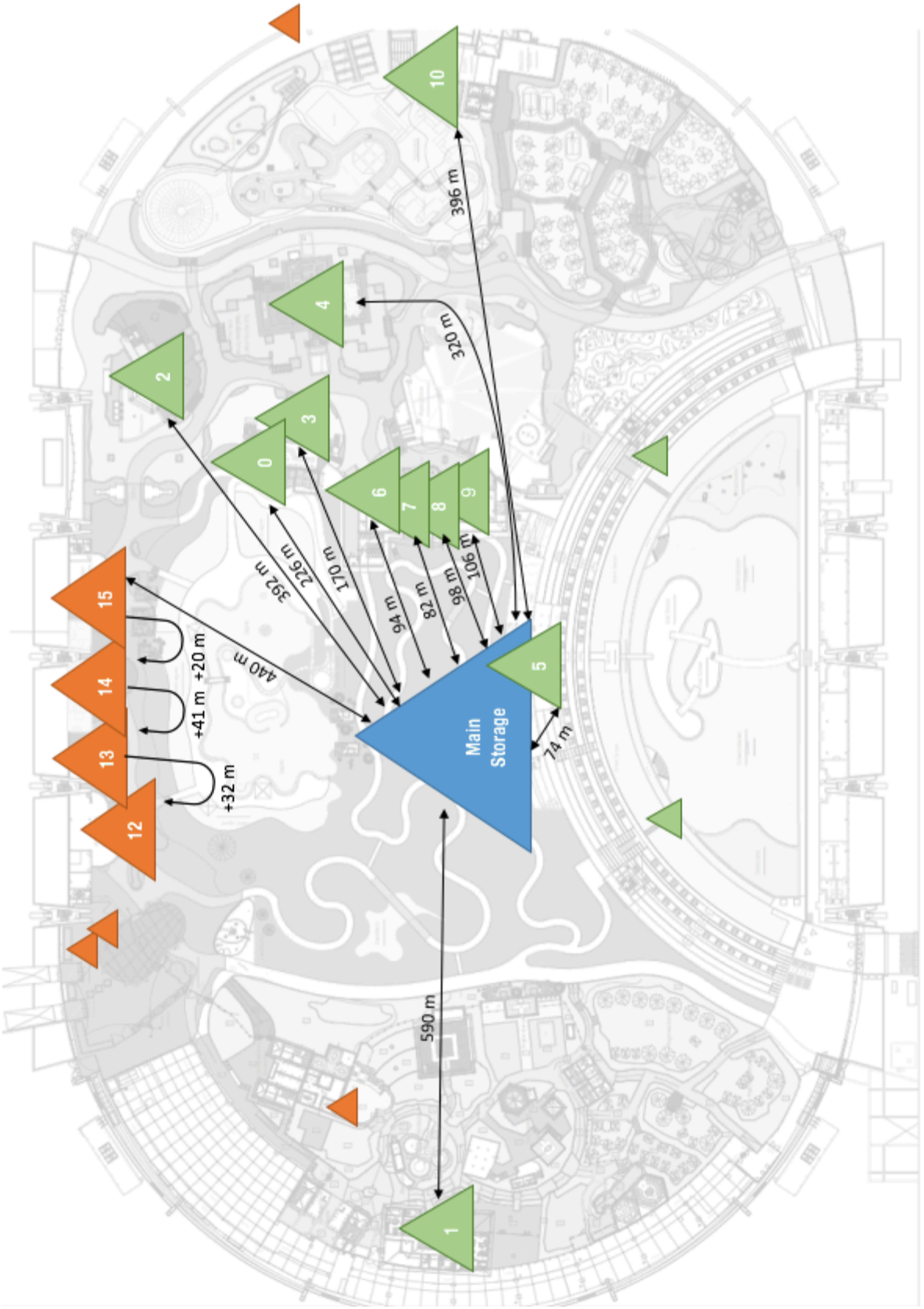
Tuomola, E. (2014) ‘Introducing an effective inbound logistics concept to the automotive industry’, Saukkonen, Finland: JAMK university of applied science.

Vaaland, T. I., Heide, M. (2007) 'Can the SME survive the supply chain challenges?', Supply Chain Management: An International Journal, 12(1), pp. 20-31.

Von Piontek, J. (2009) Bausteine des Logistikmanagements : [Supply Chain Management, E-Logistics, Logistikcontrolling], 3 edn., Herne, Germany: Verl. Neue Wirtschafts-Briefe.

Wildemann, H., Niemeyer, A. (2010) Das Milkrun-Konzept: Logistikkostensenkung durch auslastungsorientierte Konsolidierungsplanung, : TCW GmbH & Co.KG.

Appendix 1 –
Network Map on current situation walked between each outlet and the main storage



Appendix 2 –

Data collection (including number index for appendix 1 & figure 6)

Departments	01. Apr	02. Apr	03. Apr	04. Apr	05. Apr	06. Apr	07. Apr	08. Apr	09. Apr	10. Apr	11. Apr	12. Apr	13. Apr	14. Apr	15. Apr	16. Apr	17. Apr	Trolley/Day	Average m to main storage
F&B																			
(0) Lagoon	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	113
(3) Borneo	3	2	0	1	2	2	3	2	2	1	1	1	1	1	1	1	2	2	85
(4) Moody/Kalmoha	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	160
(5) Palm Beach	4	3	1	2	2	3	2	1	6	2	1	5	3	1	4	2	2	3	37
(-) Aloha	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	99
(-) Kaikala	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99
(2) Asian Wok Bar	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	196
(2) Asian Wok Küche	2	2	2	2	1	1	1	2	2	1	1	2	1	2	2	2	2	2	196
(10) Tropino Bar	1	0	0	1	1	0	1	1	1	1	2	3	2	0	0	1	1	1	198
(1) Tropical Garden Bar	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	295
(1) Tropical Garden Küche	1	1	1	1	1	2	1	1	1	1	1	1	2	1	2	0	1	1	295
(4) Frühstück	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	160
(4) Frühstück Küche	6	6	5	5	5	5	5	6	6	5	2	3	1	4	3	5	5	5	160
(5) Palm Beach Küche	4	5	2	2	1	2	5	4	4	3	1	3	3	2	2	3	2	3	37
(4) Jabarimba	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	160
(4) Jabarimba Küche	3	4	2	2	2	2	2	2	2	2	1	2	1	1	2	1	2	2	160
(10) Perso Küche	2	3	3	2	2	2	3	3	3	2	2	2	2	2	2	2	2	2	198
(7) Mondial Ami	3	2	1	0	1	0	2	2	2	1	1	2	1	0	1	1	1	1	41
(8) Mondial Deutsch	4	3	3	0	1	1	2	2	2	1	1	1	1	1	1	1	1	2	49
(6) Mondial Pizza	2	3	2	2	1	2	2	3	2	2	2	2	1	2	2	1	1	2	47
(9) Mondial Getränke	0	1	1	5	0	0	0	4	0	0	0	4	0	2	0	0	0	1	53
Merchandice	5	4	3	6	4	6	10	2	4	2	4	5	4	6	7	4	2	5	220
(15) Surfers																			0
(14) Sailors																			20
(13) Candy																			41
(12) Book																			32