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## Preface

The thesis, *“Identification of Growth Restricting Bottlenecks in Skandinavisk Transport Kompagni A/S”*, is written by Master Degree student at Aalborg University (Copenhagen), Alexander Tofte and was prepared from the 1<sup>st</sup> of February 2017 and handed in on the 2<sup>nd</sup> of June 2017. The paper was written in collaboration with Skandinavisk Transport Kompagni A/S and was supervised by Professor Frantisek Sudzina, Aalborg University.

During the writing of this paper I have been working within the company daily, sharing the office with experienced people, but have also been seated within the university to be able to abstract from the rush occurring in a hard-working office.

I would like to thank my supervisor, Professor Frantisek Sudzina for his guidance and interest in my project, without which my project would have surely had a more diluted character. I would also like to thank Skandinavisk Transport Kompagni for allowing me to work in their organization and for taking the time to help me by letting me conduct interviews and gather information within the company.

## Abstract

The goal of this project is to aid Skandinavisk Transport Kompagni A/S to cope with an ongoing increase in customer inquiries, by locating growth restricting bottlenecks and provide solution suggestions for these. The research gathered in this assignment show that the management of Skandinavisk Transport Kompagni is operating without a clear structure of task and responsibility delegation. The CEO is taking on too many administrative tasks, on an equal basis with the lower level employees, which keeps him from focusing on the important tasks of a CEO. This management style and the disordered structure in the management affects the divisions of Skandinavisk Transport Kompagni, and especially the warehouse suffers from the missing managerial delegations. The warehouse manager has no more authority or responsibility than the ordinary warehouse employee, and observations show that the top management has a tendency of suppressing his requests of a change in the warehouse with the response that the issues he is describing does not exist. This has resulted in a warehouse without any structure, the employees don't know where the goods are located as there is no registration of the location of incoming goods. Furthermore, a

combination of a missing structure and a postulate that the warehouse is overbooked, results in goods which are placed on the floor between racks and in the transit which is meant for temporary storage of incoming and outgoing goods.

To aid Skandinavisk Transport Kompagni in overcoming the issues creating the bottlenecks, solutions for both the warehouse and the management situation is presented. The warehouse solution involves rearranging the layout of racks to free up more space for incoming goods. Together with this rearrangement an identification system is also suggested to keep track of the location of goods. To prevent the warehouse situation from reoccurring, a suggestion of restructuring the management is also presented. This restructuring will clarify the working tasks of every employee and delegate responsibilities from the top management to lower level employees cf. Greiners five phases of growth model.

It is assumed that the proposed solutions will relieve the pressure of the current customer situation and enable Skandinavisk Transport Kompagni to handle future issues. The warehouse solutions presented has the expected ability to provide an annual profit increase between 500.000Dkr. and 1.000.000Dkr.

# Contents

Preface .....	1
Abstract .....	1
Table of Figures .....	4
List of Tables .....	5
List of Pictures .....	5
1. Introduction .....	6
1.1 Scope .....	6
1.2 Aim .....	7
1.3 Problem Statement .....	8
1.3.1 Research Questions .....	8
2. Methodology .....	8
2.1 Introduction .....	8
2.2 Data Collection .....	8
2.3 Project Structure .....	9
3. Theory .....	10
3.1 Introduction .....	11
3.2 Five Stages of Growth Model .....	11
3.2.1 Greiner's Five Phases of Growth Model .....	12
3.2.2 Scott and Bruce Model for Small Business Growth .....	15
3.3 Leadership .....	18
3.4 Warehouse .....	21
Warehouse Automation .....	21
3.4.1 Lean .....	23
4. Company Description .....	25
4.1 Company Background .....	25
4.2 Company Layout .....	26
4.3 Company Process Flow .....	30
4.4 Goods Handling Time .....	31
4.5 Warehouse Equipment .....	31
4.6 Employees, Services and Customers .....	32
4.6.1 Employees .....	32
4.6.2 Services .....	33
4.6.3 Customers .....	34

5. Company Analysis .....	35
5.1 Warehouse Facility.....	35
5.1.1 Physical Issues.....	35
5.2 Management .....	38
5.2.1 Communication.....	38
5.2.2 Company Growth.....	39
6. Solution Proposals .....	40
6.1 Implement Lean in Warehouse .....	40
6.2 Implement Automation in Warehouse.....	45
6.3 Review Management Style and Structure .....	47
7. Cost-Benefit Analysis.....	50
8. Discussion.....	53
9. Conclusion .....	55
Further Research .....	56
References .....	58

## Table of Figures

Figure 1 - Remake of The Five Phases of Growth Model .....	13
Figure 2 - Manament Responsibility in the Different Phases – Illustrated by The Author.....	15
Figure 3 - A Model for Small Business Growth Remake.....	16
Figure 4 - Remake of the Vroom-Yetton Model .....	20
Figure 5 - Explanation of Acronym.....	20
Figure 6 - 5S Decision Chart - Adopted from Lecture (Rytter 2016), Remade by Author .....	24
Figure 7 - Illustration of the 5S and SOP - By Author.....	25
Figure 8 - Administration Layout .....	28
Figure 9 - Warehouse Layout.....	29
Figure 10 - Flowchart of STK Warehouse Operation .....	30
Figure 11 - Distribution of Customer Categories in STK Warehouse.....	34
Figure 12 - Distribution of Customer Relocation Storage Times .....	35
Figure 13 - Warehouse Before and After Restructure.....	41
Figure 14 - Improved Warehouse Layout .....	42
Figure 15 - Example of ID of Racks and Shelves.....	43

Figure 16 - Example of SOP for STK Warehouse .....	45
Figure 17 - Implementation of Automated Forklifts .....	46
Figure 18 - Management Setup, Current and Proposed .....	50

## List of Tables

Table 1 - Types of common AGV Guidance Systems - Adopted from Transbotics (Transbotics 2017) .....	21
Table 2 - Time Consumptions Per Customer Order .....	31
Table 3 - Warehouse Equipment.....	32
Table 4 - Employee Salaries.....	33
Table 5 - Annual Costs of STK Original Warehouse Layout.....	51
Table 6 - Annual Costs of the Suggested Warehouse Solution (1) .....	51
Table 7 - Annual Costs of the Suggested Warehouse Solution (2) .....	52
Table 8 - Annual Costs of the Warehouse Automation System .....	53

## List of Pictures

Picture 1 - Pathway between hallways, STK Warehouse .....	27
Picture 2 - STK Transit Overfull of Permanent Goods .....	36
Picture 3,4 - Blocked Hallways in STK Warehouse.....	37

# 1. Introduction

Small businesses are taking a paramount role on the international business market. The European Commission estimates that small/ medium sized companies represent 99% of all businesses in Europe (European Commission u.d.). According to the European Commission, new businesses are the key to ensure economic growth, innovation and job opportunities. Through the last five years, small/ medium sized companies are responsible for 85% of all new jobs and are now representing 66% of the total employment in the private sector. Despite the positive effect of small/ medium sized businesses on the economic, statistics from the Bureau of Labor Statistics (Survival rate of establishments u.d.) indicates that after 5 years of existence, approximately 44% of all start-ups were terminated.

The transportation and storage firm, Skandinavisk Transport Kompagni A/S (STK) is amongst the 56% that has survived the natural purge. After more than 25 years in business, the company now offers a variety of services, including storage hotel, Pick&Pack, traditional storage, etc. In addition, STK provides the main transportation of goods for larger companies, such as Elgiganten, Bauhaus, Leasy and Bolia.

Recently, STK has experienced a growth in customer inquiries, regarding their storage and transportation services. STK is already operating close to the limit of how many customers they can serve at a time, causing the management to fear a loss in income if the situation is not changed. Since the company cannot determine exactly what prevents a higher customer intake, they have through the last couple of years hired more employees to cope with the increase in customer inquiries. The company has come to realize that hiring more people without knowing the exact problem only works as a temporary bandage on an open wound and as the same situation continuously repeats, they are now considering the possibility that the bottlenecks is not entirely staff related.

## 1.1 Scope

Based on the customer situation, STK has requested an analysis of their transportation and storage division, as they suspect the issues to be located within these divisions.

To limit the focus of this paper, an initial investigation of what division the issues most likely rooted in was conducted. The investigation included interviews with the company COO, the warehouse manager and a transportation employee.

STK consists of overall three divisions – administration, transportation and warehouse. The COO states that according to him the issues are not in the warehouse, but more likely in the transportation division. Based on the same interview with the COO, it was determined that STK can activate 50 trucks at a time, to carry out transportation tasks, yet no more than 35 trucks are activated on an average day. Furthermore, the company has through the last year been implementing an app to ease the process of communication with the trucks. According to the COO, this saves the administration for copious amounts of time, as administrative employees no longer must spend time on the phone with the drivers, but instead can delegate the tasks through the app.

The interview with the transportation employee further clarifies that the transportation division has become busier during the last years, but that the increase in customer inquiries has not made a change noticeable to the drivers. Deliveries are on time and no customers are turned down.

The interview with the warehouse manager indicates that the assumption of the issues not being in the warehouse may be rushed. The warehouse manager makes it very clear that the warehouse could not cope with another customer increase as they are already operating on the limit of what is possible. The warehouse is overfilled, there is no clear structure in the stored goods and communication with the administration is lacking. Observations supports these statements, as the warehouse is full of goods, not only on the racks, but also on the flooring between the racks.

Based on these interviews it is assumed that the actual bottlenecks may be in the warehouse and not, as the company suspects, in the transport division. With this assumption, the focus of this paper will be to investigate the presence of bottlenecks in STKs warehouse.

## 1.2 Aim

The main objective of this project is to make the company able to handle more customers by locating potential bottlenecks, which is preventing STK from operating at its full potential. As a byproduct, an increase in customers will expectably lead to an increase in revenue and to an improvement in the company's competitiveness.



## 1.3 Problem Statement

STK wish to locate and decrease the bottlenecks that limits the company growth. Considering the current operating procedures at STKs warehouse division, how can the company prepare to cope with a future increase in customers?

### 1.3.1 Research Questions

1. What causes the bottlenecks within the warehouse?
2. What actions are required to eliminate/ reduce the bottlenecks?
3. Will it be economically feasible for STK to invest in a solution to cope with the bottlenecks?

## 2. Methodology

In this chapter, the general composition of the project approach will be described.

### 2.1 Introduction

The research in this project is based on a case study of the Danish transportation- and storage firm, Skandinavisk Transport Kompagni A/S, with a focus on company growth and bottlenecks restricting such. Defined by Robert K. Yin (2013), this study follows a sampling logic, with data from a sole source rather than a replication logic with multiple sources. In addition, a holistic single-case unit analysis study is used. Since the company haven't investigated further into the issues of bottlenecks prior to this assessment, an explorative approach is applied for this project at the initial research steps, to identify the issues that could possibly be causing the growth restricting bottlenecks.

To ensure a comprehensive understanding of the issues identified during the initial research stage and to allow a robust analysis of the root causes of the bottlenecks, this project will be supported by literature and theories regarding topics such as the role of leadership in small sized companies, growth in smaller firms, etc...

### 2.2 Data Collection

Robert K. Yin (2013) explains that to obtain data triangulation, a research must be based on multiple data sources. Data triangulation is the concept of cross verification of data to validate findings during an investigation, hence instead of looking at the issues from only one direction, another direction is added. Thus, the research of this paper is based on qualitative research methods including:

- Interviews with employees and the company management
- Direct observations of management office and warehouse operations
- Participating observations of the warehouse

### Interview

The interviews with the warehouse employees and the management are performed independently from one another and answers will be anonymous if requested by the employee. The purpose of interviewing both departments is to determine if a shared opinion, regarding the causes of the bottlenecks, exists.

### Observations

To support the data extracted from the interviews, observations of the management office and the warehouse will be conducted. The observations may release additional information about the employees and the managements daily routines, that the interviews neglected.

### Participation Observations

The participating observations are conducted by assuming the role of a warehouse employee. The purpose of interaction with the work tasks is to get a better understanding of working procedures, the difficulties the employees meet while handling the goods, and to be able to measure the time spend on the various operations.

## 2.3 Project Structure

To ensure correlation between the problem statement and the work conducted within this paper, a project structure has been developed. The project structure serves as a guideline for the project.

1. Pin down expected project goals with Skandinavisk Transport Kompagni A/S
2. Develop problem statement and research questions
3. Collect relevant data
4. Map relevant processes
5. Write down identified issues
6. Literature reviewing on these issues
7. Provide list of possible solution suggestions

## 8. Conduct cost/ benefit analysis

### 3. Theory

This chapter will provide a basic understanding of the issues that STK experiences by reviewing relevant theories on the area. In addition, educationally obtained knowledge will be applied throughout this paper to provide a more adequate explanation of the theories. The theories included in this paper is, amongst others, the effect of leadership within smaller companies and the lean thinking methodology as a mean to solve organizational issues.

The theory section of this paper provides a basic understanding of the barriers that companies might encounter during a growth phase, and how to deal with these. Though based on the situation at STK, this chapter reflects general issues and can therefore be applied to other companies, in an analogous situation as STK.

#### Definition of Small Business

To apply the right theories and to avoid any misunderstandings of the term, it is important to define the requirements of being a small business. The explanation given in this paper combines the requirements stated by the American Committee for Economic Development and the U.S SBA (Small Business Administration). The American Committee for Economic Development lists the terms of being a small business as:

1. *Management is independent. Usually managers are also owners*
2. *Capital is supplied and ownership is held by an individual or small group*
3. *Area of operations is mainly local. Workers and owners are in one home community, but markets need not to be local*

The U.S SBA has provided a list of numerical standards, stating the maximum size of a company before it leaves the small business category. The list defines standards within every section of business, such as transportation, warehousing, etc. As this paper is focused on the Danish transportation and storage firm, STK, the numbers in the table below states the standards of only this business section, but the complete list of size standards can be found on the U.S SBAs official homepage (SBA 2012).

Section	Truck Transport	Warehousing
---------	-----------------	-------------

NAICS Codes	484110, 484121, 484122, 484210, 484220, 484230	493110, 493190
Size Standards in million dollars	\$27.5	\$27.5

NAICS stands for North American Industry Classification System, and is the standard used by American Federal statistical agencies.

### 3.1 Introduction

According to the article “*Why Small Businesses Fail to Grow*” (Goltz 2012), the 56% of the businesses that do survive the first 5 years are not guaranteed survival, as there are more ways for a business to fail than to be terminated. A business can fail to reach its full potential, fail to improve or just fail to grow. Business speaker and company owner Jay Goltz (Ibid.) has suggested ten reasons of why some small companies fail to reach their full potential while others succeed. These reasons are (1) the complacency of the owner/ manager, (2) the importance of hiring the right people, (3) a lack of standards and control within the company, (4) the company’s attitude towards its customers, (5) the access to new technologies, (6) how a company market its products, (7) the need to adjust the product to the market, (8) the lack of investment to support the growth, (9) the stubbornness of the owner to overcome tough situations and (10) the leadership style of the owner.

Mel Scott and Richard Bruce (1987) also manifest the conviction that not all small firms that survive the first years will grow into large companies. As an explanation of why some small companies does not grow, they state: “[t]his is due either to the nature of their industry or simply the personal desires or ambitions of the owner/ manager”. This statement builds on the idea that not all businesses needs to grow but can choose to initiate a growth phase if the firm desires so.

Whether a company has entered the growth phase deliberately or instinctively, it involves some crises which must be overcome to continue the growth (Scott and Bruce 1987).

### 3.2 Five Stages of Growth Model

The manager of a company is the key to successfully make a business grow. On the other hand, the manager can also be the greatest opponent to growth. Every new business is built to handle a certain amount of pressure (customers, orders, operations...), and as the pressure grows, the company grows with it. At some point the company has reached the

level of how much pressure the current structure can handle. If the management regret to accept that a change in the structure is necessary, the company will either stop growing or be extinct by the pressure (Goltz 2012). Though the business is mature enough to initiate a growth or move into new markets, the manager might be caught in the past by referring to a business structure which was effective years ago (Greiner 1998). Greiner (Ibid.) explains that this behavior is based on the psyche of the human brain as we tend to act upon what we have experienced rather than what lies ahead. As a counter move, Larry E. Greiner has developed a five-phases of growth model to help companies map the issues of business growth and with this understanding overcome the problems before they occur. To accompany Greiner, M. Scott and R. Bruce (1987) has acknowledged the Greiner model but has added a slightly different interpretation. Both models will be presented within this chapter.

### 3.2.1 Greiner's Five Phases of Growth Model

The model (Figure 1) is parted in 5 sections each indicating a different evolutionary and revolutionary phase. Growing companies tend to pass through all phases. In the beginning of every phase, the company will experience an evolutionary period with steady growth and high stability, while changes and instability in the organizational structure will occur when getting closer to the end of the period (Greiner 1998).

The steady growth period in the model is referred to as evolutionary stage as, according to Greiner (Ibid.), companies who survive a crisis, shown at the end of each stage in the Five Phases of Growth model (Figure 1), will continue growing for four to eight years after the crises without greater changes in the management pattern. The crisis in the model is referred to as revolution periods, and is expected to occur after times of smooth evolution, as organizational growth, according to Greiner, cannot be assumed to be linear. The revolution brings with it turmoil in the company management as practices that had earlier proven successful, suddenly cease to perform. To overcome the crisis, it is eminent that the management develop a new organizational practice to replace the outdated one. If the company fails to do so, it will either dissolve or dramatically decrease the growth rate.

The phrasing above the line in The Five Phases of Growth model (Figure 1) indicates the smooth evolutionary periods, while the phrasing below the line indicates the occurring issues leading to the revolutionary periods.

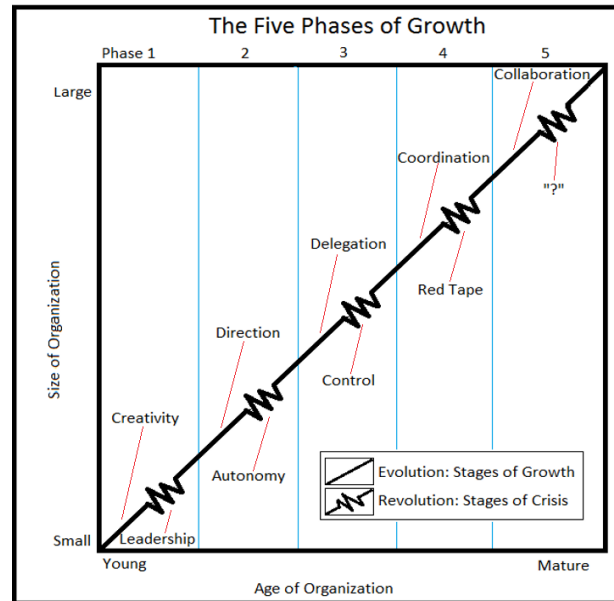


Figure 1 - Remake of The Five Phases of Growth Model

Based on the article “*Evolution and Revolution as Organizations Grow*” by Larry E. Greiner (1998), the following model description is adopted and rephrased.

**Phase 1: Creativity** – The focus in a newly started company is to attract customers and develop a product. The founders of the company act on intuition and puts all their effort into making and selling the new product and not into management activities. The communication with the employees is regular and casual, as the employees are working in close collaboration with the founders. This creative way of managing the company is important to get the company off to a good start, but as the company grow it also becomes the very problem. The production increases together with the number of employees to a size which cannot be controlled solely by the founders nor with the casual communicational tone. The founders find that they become burdened with unwanted managerial responsibilities, nonetheless try to act as they did when the company just started, by pushing away management tasks. This leads to the first revolution, the crisis of leadership. The company needs a strong manager with thorough knowledge about company leadership who can introduce new business techniques. Finding this individual can lead the company from the revolution of phase 1 into the evolution of phase 2.

**Phase 2: Direction** – With the right manager the company can enjoy a period of continuous growth with a new structure introduced. With the new structure comes specialized job positions, and a separation of marketing from manufacturing activities. Accounting systems

are introduced and new work and budget standards are adopted. The new manager assumes most of the responsibility for the company and the gap between lower level employees and management increases as the hierarchy of titles built up. This structure leads the company to further growth, but as the company matures the lower level employees attain greater knowledge of how to operate the machines or about the market trends than the management. The employees are then parted between following orders and taking their own initiative. This brings forth the second revolution, the crisis of autonomy. The solution adapted by most companies is to delegate more responsibility to lower level managers in the individual departments. This action leads to the adoption of decentralized methods.

**Phase 3: Delegation** – The period of delegation erupts from the success of delegating the responsibility from one top manager to the different department managers. Lower level managers with more authority can penetrate larger markets, allow shorter responds time to customers and develop new products. But, by allowing field managers to control their own units, the crisis of the third phase initiates. Rogue managers who run their departments without sharing coordination plans, technologies, money and personnel with the remaining organization. The top managers face an issue regarding the lack of control over the autonomous field managers leading to the third revolution, the crisis of control. Those companies who successfully survive the revolution of control finds solutions in special coordination techniques.

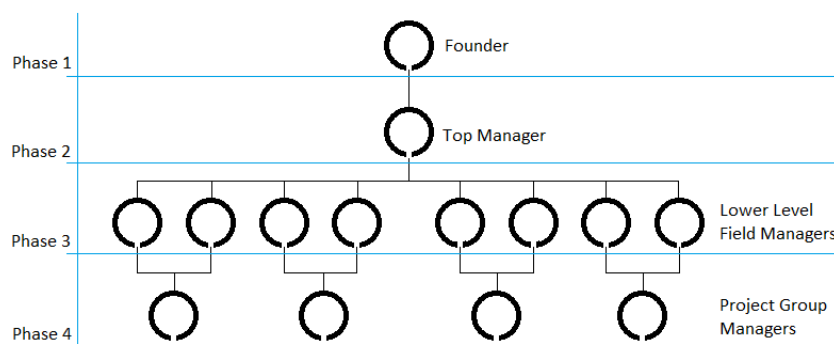
**Phase 4: Coordination** – The evolution of the fourth phase is secured using formal systems to achieve uniformity within the organization. To attain uniformity in the company, the decentralized units are fused into larger project groups and new employees are hired to the headquarter to work on maintaining a new companywide control system. Some of the technical functions are moved from the project groups into the headquarter, while the daily operating decisions remains at the project group managers. To pass the feeling of unity to the employees the option of buying company stocks often becomes available. The purpose of the coordination systems is furthermore to make field managers look outside their own unit and though these managers still have great responsibilities they learn to answer for their actions to the headquarter. All these new systems lead the company into the final revolution - the red-tape crisis. The implemented systems result in field managers getting orders from higher level managers who are not familiar with the local market. Procedures tend to take

priority above problem solving, and innovation stops. The company has grown too large to be managed by an official and inflexible system.

**Phase 5: Collaboration** – To exploit the full potential of the company’s employees by embracing the divergence in their knowledge, a new system stanchions. The new system builds on collaboration and the company is managed through spontaneity instead of formal systems and procedures. The evolution of the 5<sup>th</sup> phase is built around a flexible approach to management which leads to quicker problem solving. Teams are joint across jobs to handle specific tasks. Educational programs are introduced to assign behavioral skills to the managers to attain better teamwork. Bonus rewards are adjusted to team achievements instead of individuals.

According to Greiner (1998), phase 5 is not the last phase, and the crisis of phase 5 has not yet been stated.

The figure below illustrates the delegation of responsibility through the Five Phases of Growth model.



*Figure 2 - Manament Responsibility in the Different Phases – Illustrated by The Author*

### 3.2.2 Scott and Bruce Model for Small Business Growth

The Model for Small Business Growth developed by Scott and Bruce (Figure 3) focuses solely on small business growth, which differentiates it from Grainer’s model (Figure 1). The model serves as a diagnostic tool to analyze the present position of the company and to plan what will be required to develop from one stage to the next. It presents the crises and strategies which should be considered at every stage of growth (Scott and Bruce 1987).



	Stage 1. Inception	Stage 2. Survival	Stage 3. Growth	Stage 4. Expansion	Stage 5. Maturity
<b>Stage of Industry</b>	Emerging, Fragmented	Emerging, Fragmented	Growth, Some Larger Competitors, New Entries	Growth, Shakeout	Growth/ Shakeout or Mature/ Declining
<b>Key Issues</b>	Obtaining Customers, Economic Production	Revenues and Expenses	Managed Growth, Ensuring Resources	Financing Growth, Maintaining Control	Expense Control, Productivity, Niche Marketing if Industry Declining
<b>Top Management Role</b>	Direct Supervision	Supervised Supervision	Delegation, Co-ordination	Decentralization	Decentralized
<b>Management Style</b>	Entrepreneurial, Individualistic	Entrepreneurial, Administrative	Entrepreneurial Co-ordination	Professional, Administrative	Watchdog
<b>Organization Structure</b>	Unstructured	Simple	Functional, Centralized	Functional, Decentralized	Decentralized Functional/ Product
<b>Product and Market Research</b>	None	Little	Some New Products Development	New Product Innovation, Market Research	Production Innovation
<b>Systems and Controls</b>	Simple Bookkeeping, Eyeball Control	Simple Bookkeeping, Personal Control	Accounting Systems, Simple Control Reports	Budgeting Systems, Monthly Sales and Production Reports, Delegated Control	Formal Control Systems, Management by Objectives
<b>Major Source of Finance</b>	Owners, Friends, Relatives, Suppliers Leasing	Owners, Suppliers, Banks	Banks, New Partners, Retained Earnings	Retained Earnings, New Partners, Secured Long-Term Debt	Retained Earnings, Long-Term Debt
<b>Cash Generation</b>	Negative	Negative/ Breakeven	Positive but Reinvested	Positive with Small Dividend	Cash Generator, Higher Dividend
<b>Major Investments</b>	Plant and Equipment	Working Capital	Working Capital, Extended Plant	New Operating Units	Maintenance of Plant and Market Position
<b>Product-Market</b>	Single Line and Limited Channels and Market	Single Line and Market but Increasing scale and Channels	Broadened but Limited line, Single Market, Multiple Channels	Extended Range, Increased Markets and Channels	Contained Lines, Multiple Markets and Channels

*Figure 3 - A Model for Small Business Growth Remake*

Equal to Larry E. Greiner's Five Phases of Growth model, The Model for Small Business Growth is based on five stages, with a crisis between each stage. M. Scott and R. Bruce (1987) has defined the crisis and related solutions as follows.

**Stage 1** – The crises: Profit, administrative demands and lack of time. To solve the crisis of stage 1, the founder of the company will have to change his management style, as the company at this point have grown too large for one man to handle. A formal record keeping system, in form of a database or equal is required to keep track of data such as customer orders. The founder will have to hire new employees to delegate supervisory tasks.

**Stage 2** – The crisis: Augmented convolution of expanded distribution channels, change in competition and information pressure. As the company grow, new customers are required, most likely from new geographic areas and segments. When expanding the company to new geographic areas more supervisory delegation is necessary, which demand a change in the firm's practices. By entering new areas, the company engages with new competition. With different markets and more competition, a further need for control arises and the company need to focus on price-competition. Price-competitions requires cost control through a cost control system. The company will have to hire a full-time bookkeeper to handle the new system.

**Stage 3** – The crisis: The entry of larger competitors and the demand of expansion into new markets or products. When the company grows, larger competitors with a larger financial foundation will try to outcompete the business, most likely through a pricing war. Two possible action are available to maintain the market share: first one is to compete on differentiation, by developing a specialized product. This solution will keep the company in stage 3. The other option is to respond in kind. For the company to be able to offer the same prices as the larger firm, a decentralization of the company is necessary to handle the more diverse operations. This will lead the company into the 4<sup>th</sup> stage.

**Stage 4** – The crisis: Necessity of external focus. As the company matures further, sales increases and the possibility to compete against competitors with the help of differentiated products decreases. The company now need to move from an internal product focus to an external customer focus to keep providing products, which differentiates from the competitors. At this stage, the distance between the founder and the top management increases as

the founder has now been ‘exiled’ to the position of planner and watchdog while the experienced managers run the company.

**Stage 5** – As in the five-phases of growth model by Larry E. Greiner (1998) the model of small business growth does not imply a crisis for the fifth stage, but also claims that the company will keep growing. The company has reached a size where loans are no longer necessary or rare, and the firm is about to leave the small business definition. According to Scott and Bruce (1987) the founder of the company will often be attempted bought out of the company at this stage.

### 3.3 Leadership

Leadership is, of P. G. Northouse (2004) “A process whereby an individual influences a group of individuals to achieve a common goal”. Several leadership styles exist, but common for all is that a leader can either be shaped by or shape the culture of his organization. An example is the transactional and the transformational leadership styles. The transactional leaders adjust their leadership to match the existing rules, norms and procedures of the organization (Bass and Avolio 1993). This leadership style is effective, as leaders following this ideal draw a clear picture of what is expected by the employees, how the stated goal is reached and what the reward will be to accomplish the tasks (Waldman, Yammarino and Avolio 1991). The transformational leader type act differently by understanding the existing culture of the organization, then developing a renewed version with a new vision (Bass and Avolio 1993). According to the journal ‘Leading in the 1990’ (Waldman, Yammarino and Avolio 1991) the transformational leadership style is mostly seen at the top end of companies who demands a leader with the ability to change and improve his working unit. The journal further states that the transformational leadership style should be interpreted as a supplement to an organization who requires change and not as a replacement of other leading styles, like the transactional leadership style. The transformational leadership style is characterized by four i’s(Ibid.), being; (1) Individualized consideration: To exploit the full potential of every employee the leader is paying attention to the needs of the individual instead of treating all employees alike. (2) Intellectual stimulation: A transformational leader will try to make employees think about old problems in innovative ways, by changing the way the employees think about technology, technical issues and even personal attitudes. A good leader will furthermore listen to the employee’s ideas and problems to achieve the

best solutions. (3) Inspirational motivation: To inspire and motivate the employees is an important task, which will make the employees work more focused. This requires effective communication skills together with a vision shared with the employees about where the unit is heading. Another tool used by leaders is to make pep-talks or reduce workload from the most burdened employees. (4) Idealized influence: A transformational leader can achieve great power and influence over his employees by showing them respect and by making them trust in the vision of his ideas through completing the stated goals. A leader who can make his employees realize that if the entire unit works at full potential, all will benefit. Idealized influence combines the three other I's with emotional attachment between the employees and the leader.

Beside the concrete classification of leadership styles mentioned above, a more general categorization exists. This categorization parts the leaders as either people-orientated or task-orientated (Adeyemi-Bello 2001). Tope Adeyemi-Bello (Ibid.) states that the people-orientated leaders are interested in maintaining a good relation to the employees by creating a friendly working environment, where the employees have the possibility to interact with their manager and propose changes to the way things are done. He further states that the task-orientated leaders oppositely are mostly interested in the unit's goals and how to achieve these. The working environment is formal and leaders in this category tend to distance themselves from the employees. Through time it has been discussed which style is most effective, and Bass (1981) suggests that a combination will provide the most optimal solution as individuals react differently on the assorted styles, some like to have a concrete goal and then be rewarded when achieving that goal whereas others prefer a more relaxed working environment and the reward is the work itself. The theory presented by Bass is consistent with the Fiedler Contingency Model (Vroom og Jago 2007), carried out by psychologist Fred Fiedler. This model investigated the effectiveness of the two distinctive styles in different situations and concluded that half of the situations responded best to the task-orientated management style while the other half responded best on the people-orientated style.

To determine which leadership style is most suitable for a given situation, the Vroom-Yetton Model (1973) can be applied. This model exploits the method of decision trees to map the different possibilities (Figure 4).

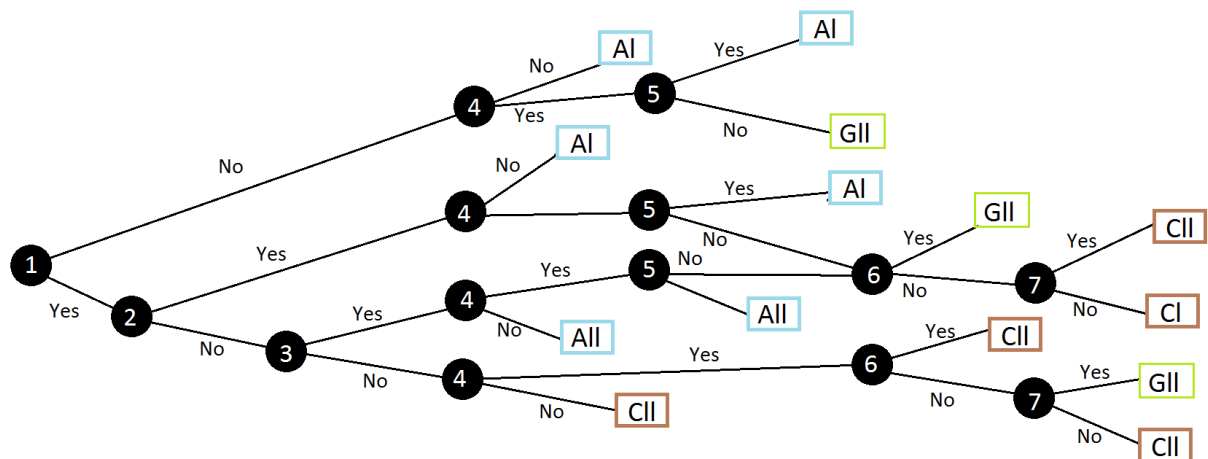


Figure 4 - Remake of the Vroom-Yetton Model

To use the model above, seven questions need to be asked. The white number in the black circles in the model above indicates the question asked. Based on the original model by Vroom and Jago (Ibid.) these questions are: (1) Is there a quality requirement? (2) Do I have sufficient information to make a high-quality decision? (3) Is the problem structured? (4) Is acceptance of the decision by subordinates critical to its implementation? (5) If I were to make the decision by myself, is it reasonably certain that it would be accepted by my subordinates? (6) Do subordinates share the organizational goals to be obtained in solving the problem? And (7) Is conflict among subordinates likely in obtaining the preferred solution?

To understand the result of the model, the figure below will explain the acronyms.

Acronym	AI	All	CI	CII	GI
Meaning	Autocratic Type 1	Autocratic Type 2	Consultative Type 1	Consultative Type 2	Group-based Type 2
Explanation	The leader makes the decision alone	The leader collects information from some follower then makes decision alone	The leader shares the problem to relevant followers individually, then makes the decision alone after hearing individual input	The leader shares the problem to relevant followers as a group, then makes the decision alone after hearing group input and discussion	The leader presents the problem to followers as a group and seeks ideas from them through brainstorming. The leader accepts the decision by the group without forcing his idea

Figure 5 - Explanation of Acronym

### 3.4 Warehouse

#### Warehouse Automation

In warehouses worldwide, many previously manual processes, such as fetching goods for departure, bringing goods from the incoming trucks to the storage location, etc. has been automated to reduce the cost of human labor (Nalpantidis 2015). These automated systems make use of automated guided vehicles (AGVs) for simple tasks which does not require advanced decision making (Le-Anh and De Koster 2006). The traditional AGV systems are fixed to a specific predefined guide-path, whereas the more modern AGVs are equipped with smart, self-learning software which makes it easier to change the route, without changing the facility layout (Ibid.). The robotic firm Transbotics, which has specialized in AGV systems since 1981, provides a description of the mostly used AGV guidance types (Transbotics 2017):

Guidance	Function	Advantages	Disadvantages
Laser	Reflective strips mark out multiple reference points in the operation area. A laser on the AGV detects the points and uses them for navigation.	The guide path is easy to change. The system can be expanded without changing the facility	The reflective strips are vulnerable to the harsh warehouse environment, and needs regular cleaning to allow laser detection
Magnetic Spot	A grid of magnetic pieces is attached to or in the floor to guide the AGV. A sensor on the AGV detects the pieces and follows a predefined route.	The grid allows free movement and the path can easily be changed.	The magnetic sensors need frequent recalibration.
Magnetic Tape	The path is marked on the floor with a magnetic tape. A path sensor is mounted on the AGV and the AGV cannot deviate from the route.	The path can be changed easily and quickly.	If the tape is broken the AGV stops. The tape might release from the floor and may need epoxy coating.
Inductive	The floor is opened and a conductive wire is cast in. A sensor on the AGV detects the path.	Continuous path unaffected by the environment conditions.	Path change is expensive and time consuming. Expansion of the system is difficult.
Natural Navigation	Area is mapped in the AGVs memory drive. The AGV navigates by laser scanning the environment.	Implemented without changing the facility. Response well to environment changes. Short installation time and effective operations.	

*Table 1 - Types of common AGV Guidance Systems - Adopted from Transbotics (Transbotics 2017)*

General for all AGVs are the common benefits that the automated system brings fourth when implemented in a company. Explained by the ‘Automated material handling system’ company CONVEYCO (Benevides 2016) supported by the analogous corporation Bastian Solutions (Solutions 2015) these benefits are; (1) Increased safety – the AGVs are designed with human safety as a top priority, and is equipped with numerous sensors, lasers, cameras and other types of sensors. This enables the AGVs to stop if any obstacles are detected in its path. On the contrary, human operated machinery, such as e.g. a forklift, does not have the same degree of safety mechanisms and the safety is guaranteed only by the operator. The AGVs can also operate in hazardous environments, where it is e.g. too cold or too hot for humans. (2) Increased accuracy and efficiency - Humans make mistakes, AGVs don’t, so by replacing the human worker with the AGVs the risk of inaccurate workflow is removed. Furthermore, the humans are limited on the daily working hours, whereas the AGVs can operate 24 hours a day. (3) Dynamic system design – Where it took numerous working hours to relocate a conveyor belt, the AGVs can be reprogrammed in a matter of minutes. The need of several workers moving around physical equipment is also eliminated as the AGVs are wirelessly programmed and reprogrammed. (4) Easily expanded – after the initial AGV control system is in place, further AGVs can be added to support an expansion in business operations. Using an overall control system allows a company to start a fleet consisting of only one or two AGVs and then add more when necessary without repaying the initial costs. (5) Reduced labor costs – By replacing human labor with AGVs the company will have to pay only a single expense in buying the AGV, whereas a human worker is an ongoing expense which requires healthcare, insurance, taxes, salary increase etc.

To fulfill the understanding of the AGV, CONVEYCO (Benevides 2016) also defines the disadvantages with the automated solution; (1) Possibly high initial investment – AGVs are expensive and though they reduce labor cost, on short term it will most likely be more expensive to implement the new system than to hire new personnel. On the long run the company will benefit from the investment, but smaller companies may not have access to large enough capital. (2) Only appropriate for repetitive tasks – as the AGV is programmed to perform a certain task, it would be too expensive and time consuming to reprogram it several times to handle different tasks. Instead a forklift and human labor would be favored in these situations.

### 3.4.1 Lean

Lean is an improvement philosophy developed at the car manufacture Toyota, by chief engineer Kiichiro Toyoda during the 1930's. The philosophy is founded on the hypothesis that everything can be improved using the right tools. The use of the Lean tools assumes to add value to a service or product, by eliminating 'Muda' (Melton 2005). 'Muda' is the Japanese word for waste and refers to the seven wastes of Lean – (1) defects, (2) over production, (3) waiting, (4) transport, (5) inventory, (6) over processing, (7) motion (Rytter 2016). In the pioneering book by Womack and Jones (2003) the purpose of Lean is described as follows:

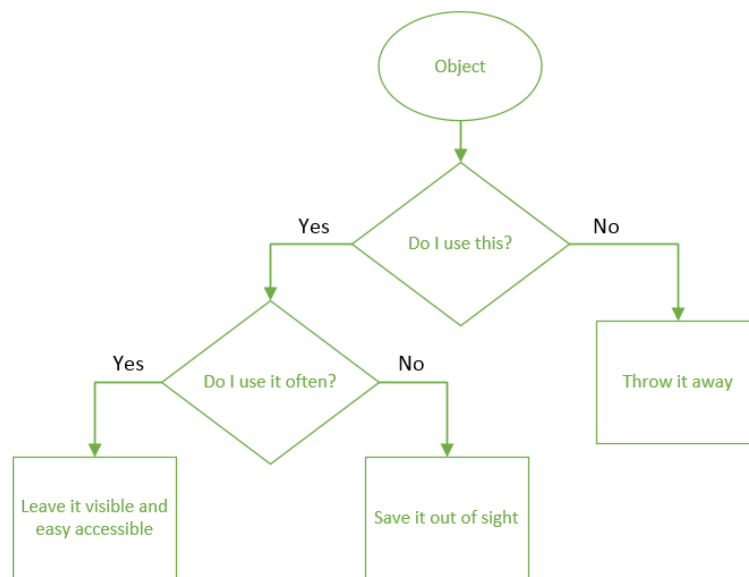
*“It provides a way to specify value, line up value-creating actions in the best sequence, conduct these activities without interruption whenever someone requests them and perform them more and more effectively. In short, lean thinking is lean because it provides a way to do more with less and less – less human effort, less equipment, less time and less space – while coming closer and closer to providing customers with exactly what they want.”*

The Lean methods included in this chapter is a small selection of a much larger collection, and serves to provide an understanding of a possible solution to the issues at STK's warehouse. The methods used is the 5S and the Standard Operating Procedure (SOP).

The 5S stands for; sort, set in order, shine, standardize and sustain, and provides a system which ensures a clean, disciplined and well-ordered working environment (Chapman 2005). According to Chapman the 5S system can help a company to prevent problems such as augmented lead-time, reduced productivity, augmented operative costs, deadline overdues, ergonomic issues, failure of equipment and unseen safety issues, by following the idea that there is a place for everything and everything is in its place. By implementing 5S, the company ensures a workplace which is always tidy and where the necessity of searching, spending excessive time walking around to avoid obstacles and a bad utilization of space is eliminated (Ibid.).

To achieve the desired organization, a simple decision chart can be followed to clean up a workspace (Figure 6).

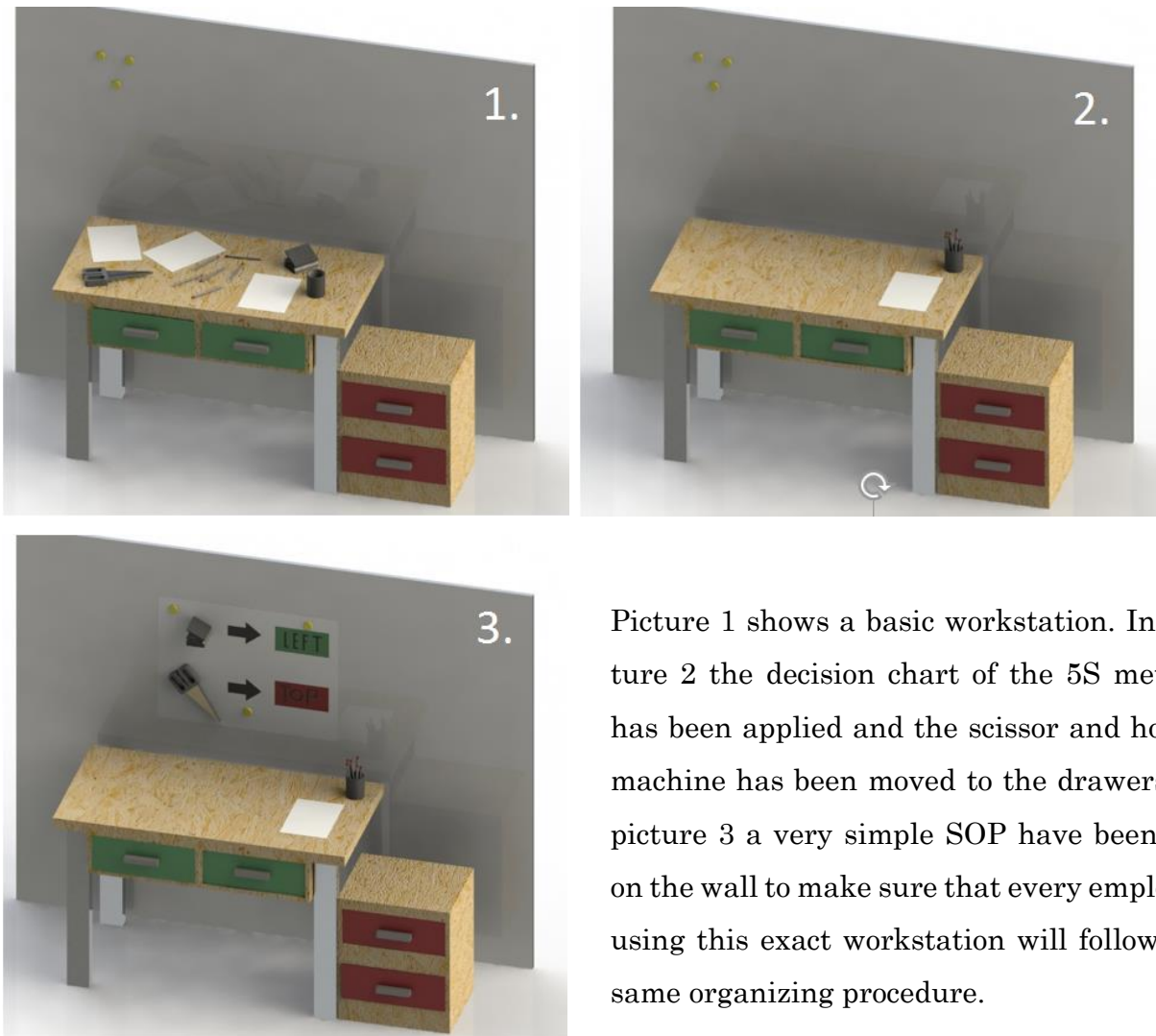




*Figure 6 - 5S Decision Chart - Adopted from Lecture (Rytter 2016), Remade by Author*

An illustration of a concrete example of use of the 5S method, is shown in figure 7.

The Standard Operating Procedure (SOP) is a method used to control the outcome of an operation by developing a step-by-step tutorial for the operators (Anderson 1999). The SOP is not meant to teach the employees how to do their job, but to provide the employees with a guide on how to standardize the outcome of the task they perform (Rytter 2016). To avoid misunderstandings between the SOP and the employees, it is advised that the SOP contains the element of visualization (Ibid.). An illustration combining the 5S method and the SOP is shown and explained below.



Picture 1 shows a basic workstation. In picture 2 the decision chart of the 5S method has been applied and the scissor and holing machine has been moved to the drawers. In picture 3 a very simple SOP have been put on the wall to make sure that every employee using this exact workstation will follow the same organizing procedure.

*Figure 7 - Illustration of the 5S and SOP - By Author*

## 4. Company Description

To identify the bottlenecks in STK this paper will present both an objective description of the company, including employees, services, etc. but also a subjective description of the concrete issues noticed by the author, based on observations and research regarding the company. This section will provide a thorough description of the company without any interpretation.

### 4.1 Company Background

The company Skandinavisk Transport Kompagni A/S was initially formed by CEO Rasmus Asger-Hansen more than 25 years ago. Later COO Erik Petersen was hired, and today Asger-Hansen and Petersen runs the company as equals. The company is operating

within the industry of storing and transporting goods for both private and corporate customers, with its primary market in Denmark, but the company is also transporting goods to surrounding countries. Amongst other services STK provides, with its capacity of 50 trucks, is the service of relocating goods for private and companies, the delivery and installation of home appliances, transportation of close to everything stretching from ordinary deliveries like refrigerators to special transportation of airplane parts. In addition to the transportation services, STK offers the services of storing goods in diverse ways. The company offers a Pick&Pack solution where the customer e.g. stores a pallet in the warehouse and are then granted free access to come and pick units from the pallet or get STK to deliver units from the pallet to locations of the customer's own choosing.

## 4.2 Company Layout

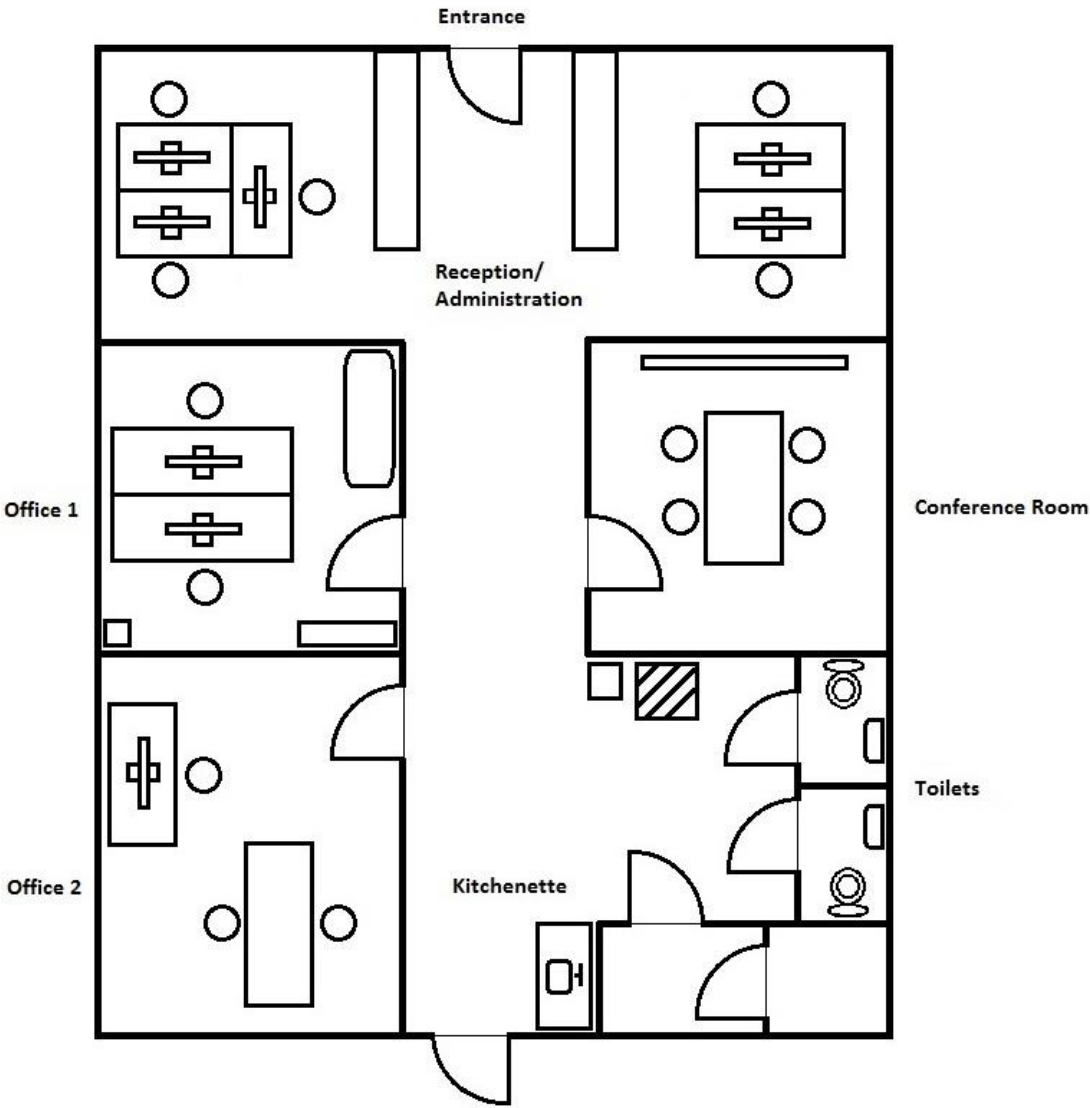
Skandinavisk Transport Kompagni consists of two main buildings, an administration building (Figure 8) and a warehouse building (Figure 9). The administration building handles all incoming orders through phone calls, emails and direct contact. Drivers arriving with goods to the warehouse must go to the administration to pick up labels for the goods before bringing it to the warehouse. This facility is located a few meters from the warehouse building. The warehouse is divided into two departments, as shown in figure 9; one department is occupied by one of STK's largest customers, the furniture company Bolia. Bolia pays STK to handle all their activities in the area, including storage of furniture, contact with customers and shipping of goods. As this warehouse department is operating under a system implemented by Bolia, and therefore unavailable for STK to store goods in, it will be excluded from the analysis and solution chapter of this paper.

The other warehouse department is solely operated by STK, and consists of 115 pallet racks. Each rack is 300 cm wide, 600 cm high and 110 cm deep and can be adjusted to hold from one to three shelves. Each shelf can contain three times one standard euro pallets (1200mm x 800mm) with a total weight of 1000 kg. In figure 8 the blue markers indicate racks with three shelves, where the yellow markers indicate the racks with only two shelves. The racks with only two shelves serve as a pathway between the hallways (Picture 1).



*Picture 1 - Pathway between hallways, STK Warehouse*

# Administration Building





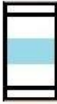


	Computer
	Chair
	Table
	Copy Machine
	Toilet
	Zink
	Kitchen Table
	Archives
	Pallet Rack 4 Shelves
	Pallet Rack 3 Shelves
	Bolia Showroom
	Garbage Can

Figure 8 - Administration Layout

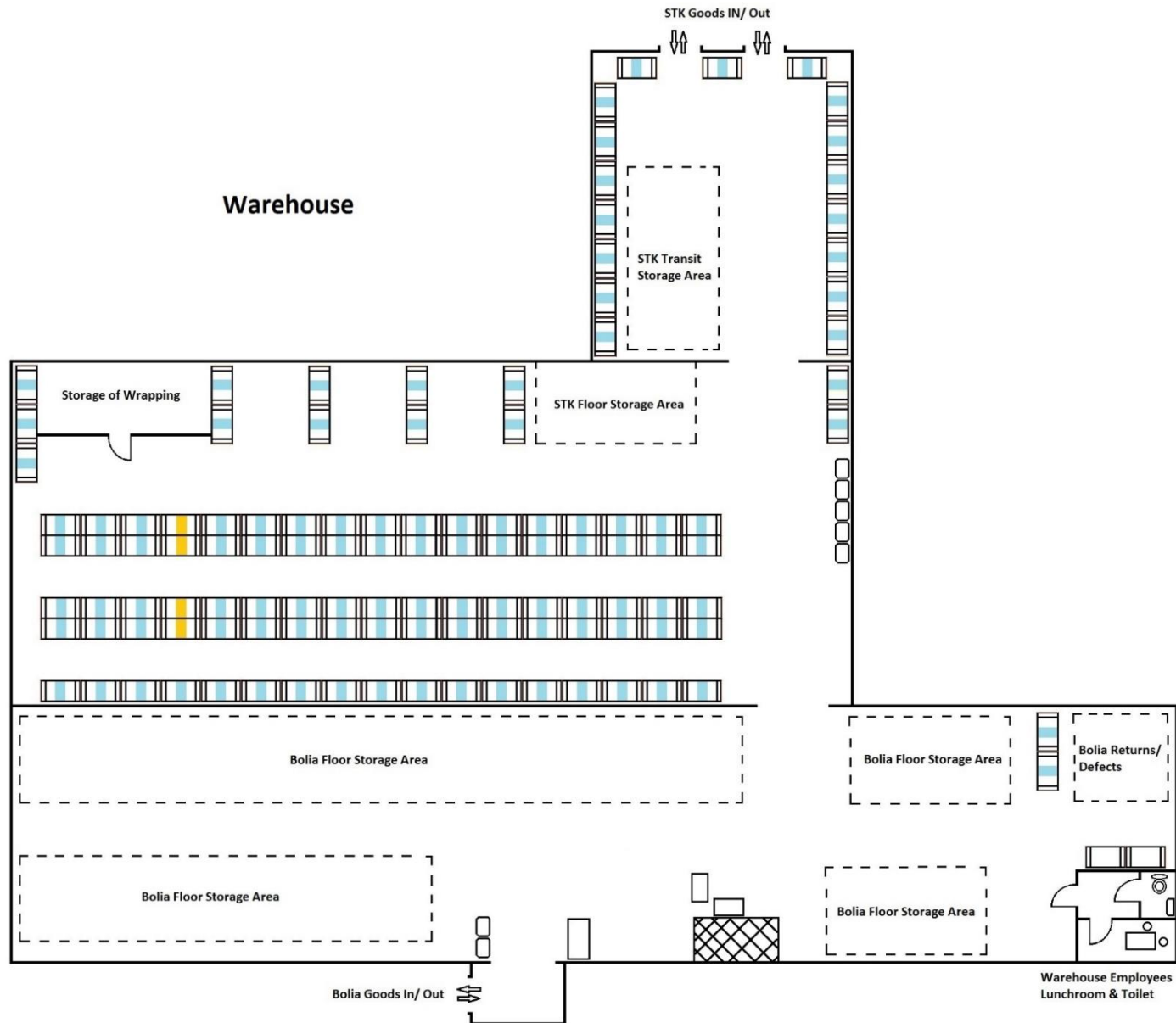


Figure 9 - Warehouse Layout

### 4.3 Company Process Flow

To map how STK handles customers and incoming goods, a flowchart has been developed with all related decisions.



Figure 10 - Flowchart of STK Warehouse Operation

#### 4.4 Goods Handling Time

Through observations and participating observations, the time of handling a customer order was determined. To ensure correct data, each step was observed three times and an average was calculated. As customer batch sizes varies, the processes of physically handling the goods are calculated for one pallet.

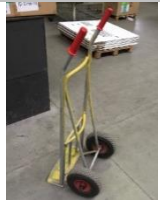
Time	1. Observation		2. Observation		3. Observation		Average	
Unit	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.
Office Serves Customer	06	20	07	15	08	55	07	30
Office Handles Data	05	27	07	58	07	13	06	53
Sends Mail to Warehouse	01	10	02	04	01	53	01	42
Warehouse Receive Goods	05	32	01	12	02	41	03	08
Goods Controlled	02	21	03	41	01	49	02	37
Bringing Goods to Location	05	26	09	41	07	54	07	40
Finding Goods in Warehouse	15	12	04	24	09	17	09	38
Bringing Goods to Transit	02	12	0.0	59	09	14	04	08
Changing Data in System	02	45	08	14	07	11	06	03
Sending Billing to Customer	03	01	02	45	03	47	03	11
Load Truck	02	12	01	11	0.0	56	01	26
Total Time Per Order							53	57

*Table 2 - Time Consumptions Per Customer Order*




As the table shows, the average total time for handling one customer order is 53 minutes and 57 seconds.

#### 4.5 Warehouse Equipment

To clarify the warehouse bottlenecks and to perform price calculations, this chapter provides an overview of the equipment used in the warehouse.

Equipment	Number of Units	Unit Price (Dkr.)	Total Price (Dkr)	Note	Picture
Hand truck	6	1.250	7.500		



Lifter	10	2.750	27.500		
Electrical Pallet Truck	2	27.000	54.000		
Reacher Truck	1	2.250/ month		Leasing, 5 years.	

*Table 3 - Warehouse Equipment*

## 4.6 Employees, Services and Customers

### 4.6.1 Employees

48 out of 50 trucks at STK is not owned by the company but by the individual drivers. CEO Rasmus Asger-Hansen tells in an interview (appendix 1) that this franchise business model lowers the expenses at STK as they do not pay salaries, reparations, gasoline, insurances or any additional costs related to truck downtime. STK gets a percentage of the driver's fee as compensation for finding and linking the drivers with the customers. Based on this setup, the following employee costs will not include the 48 trucks.

The staff and their respective salary is shown in the table below. The employee salaries were determined through conversations with the employees.

	Number of Employees	Hours pr. Week / Employee	Average Hourly Wage Pr. Employee (Dkr.)	Average Monthly Wage Pr. Employee (Dkr.)	Total Monthly Wage (Dkr.)	Total Yearly Wage (Dkr.)
<b>CEO</b>	1	45	325,00	58.500	58.500	702.000
<b>COO</b>	1	45	325,00	58.500	58.500	702.000
<b>Operation Manager</b>	1	45	250,00	45.000	45.000	540.000
<b>Distribution Assistance</b>	1	45	200,00	36.000	36.000	432.000
<b>Warehouse employee</b>	2	37	144,00	21.312	42.624	511.488
<b>Driver</b>	3	37	150,00	22.200	45.880,00	550.560
<b>Total</b>	9		1.394	241.512	307.224	3.686.688

*Table 4 - Employee Salaries*

As indicated in the table above, STK spends 3.686.688 Dkr. on annual employee wages.

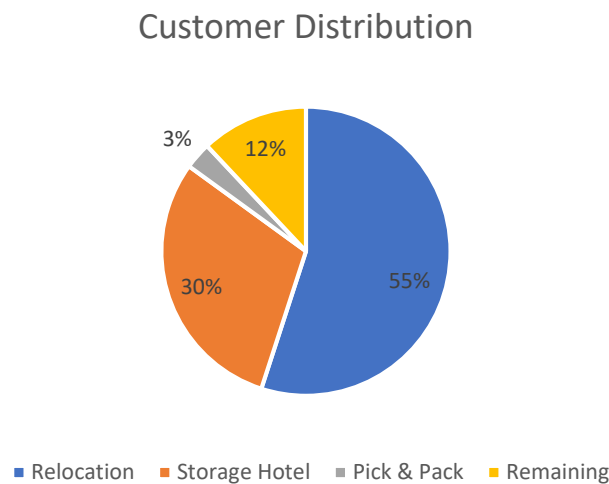
#### 4.6.2 Services

The services provided by the warehouse division is (1) ordinary storage of goods for privates, (2) ordinary storage of goods for companies, (3) Pick&Pack solution for both privates and companies, (4) storage hotel. The Pick&Pack option allows the customer to store x number of pallets with x number of units on each pallet. When the customer needs one or more units from the pallets, he can either choose to show up to personally to find the units he needs or pay STK to find and ship the desired unit. This service allows smaller companies to store product without having to make a big investment in starting their own warehouses. The warehouse hotel service is provided only to companies and allows the company to store larger amounts of product which STK will then ship on to the company's customers. For example, the company Biltrema ordered more products from their factory than the store could hold. As a solution STK offered to hold the excessive 80 pallets in their warehouse, and every time Biltrema needed to either fill more products on the shop shelves or to ship directly to the customer, STK was paid to perform the given task.

At STK there are no time regulations for how long a customer can store goods, if the monthly payment continues. If a customer fails to pay, the goods are restraint until the missing sum is paid. If the customer refuse to pay or are unable to do so, the goods will be sold and STK keeps the profit to cover some of the missing expenses.

#### 4.6.3 Customers

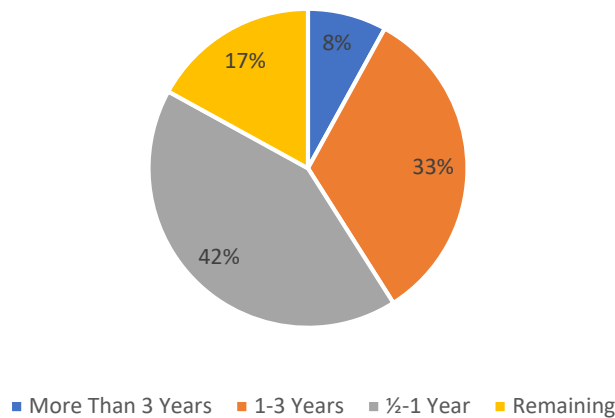
STK operates with a variety of customer segments, including both privates and companies. To determine which customer segment constitutes the majority of STKs customer's a registration of the warehouse goods was conducted. The data extracted from the registration was confirmed by the administration. The company divides the customers in four groups corresponding to the services provided; (1) relocations, (2) storage hotel, (3) Pick&Pack, and (4) remaining. The remaining category includes goods which does not fall under any of the other categories such as goods which are stored temporarily and shipped of prompt. The warehouse is currently holding goods from 47 customers, distributed as follows:



*Figure 11 - Distribution of Customer Categories in STK Warehouse*

According to the chart, the main customer group in STKs warehouse is individuals who are storing goods while relocating. To look further into the segment of relocations, the customers in this segment has been divided in four new categories based on how long they are expected to keep their goods stored in the warehouse. This estimate was conducted in collaboration with the operational manager.

## Relocation Storage Time



*Figure 12 - Distribution of Customer Relocation Storage Times*

Combining the results from both charts indicates that the most common customer at the STK storage division is individuals who are storing goods for 6-12 months during a relocation.

## 5. Company Analysis

This chapter aims to present the issues observed at STK regarding the warehouse and the top management.

### 5.1 Warehouse Facility

Warehouse manager Thomas Hvid states in an interview (appendix 1) that the warehouse at the current moment is overbooked and that another increase in customer inquiries would make the system collapse. A collapse could result in a huge downtime period while the warehouse is being reorganized and the issues are being investigated and corrected. A downtime would potentially cost the company both customers and money, as no new customers could be handled while the warehouse is shut down and no orders could be shipped out or brought in. To enable STK management to act and correct the problems before a shutdown is necessary, the key issues discovered during the investigation of the warehouse have been brought forth.

#### 5.1.1 Physical Issues

The key physical issues discovered regards (1) an overfilled transit area, storing goods which are not supposed to be in this area, (2) hallways blocked by goods in the flooring area,

making it impossible for the employees to pass with the Reacher truck, or get the goods on the shelves behind, (3) no sufficient identification of the racks and shelves in the warehouse and (4) no predefined way for the employee to determine where to place incoming goods.

The transit area is a temporary location where incoming goods are placed before being brought to the permanent storage location while the truck is being unloaded. Outgoing goods are likewise positioned in the transit before being loaded on a departing truck. Though this area is meant only for storing goods while loading and unloading trucks, it is full of goods with no clear pickup date (Picture 2). According to the warehouse manager, the goods in this area are goods with an expected pickup date on one week or less. Observations indicate that the goods are not being removed within a week, as the current batch have been left in the transit for more than 8 weeks.



*Picture 2 - STK Transit Overfull of Permanent Goods*

During an interview with STK COO, Erik Petersen (Appendix 1), it was clarified that the management was not aware of the transit situation, as they expect the warehouse employees to handle these things without involving the management more than most necessary. Observations at the transit indicates that the goods stored at the transit complicates the inbound and outbound logistic processes of loading and unloading the trucks, as the area is already occupied.

Within the warehouse itself, pallets with goods are also placed in erroneous locations. Observations has shown that goods are placed between the racks instead of on the shelves in the racks (Picture 3, Picture 4). An informal conversation with the responsible employee clarified that the goods were placed between the racks as the free spaces in the warehouse were very limited and the items were to be shipped out shortly after, so he judged it would be better to leave it on the floor instead of finding a location on the racks. Observing the fetching of goods in the warehouse quickly revealed an issue caused by the floor-goods. As the employee needed to pick something from the racks behind the floor-goods, he was forced to first remove all the floor-goods in front of that rack to another location (on the floor) to make room for the Reacher truck. This operation took 10 additional minutes. In addition, the employees must find alternative routes to get passed the blockage of the hallways.



*Picture 3,4 - Blocked Hallways in STK Warehouse*

The pallets on the floor are in total blocking 24 of the 115 racks in the warehouse, making it difficult and time consuming to reach customer goods on potentially 72 shelves.

The third issue identified is related to the racks, as there is no identification on these. It is not possible to look up the position of goods in the warehouse, as there exists no records of the locations neither in the warehouse nor in the administration. When a warehouse employee needs to fetch goods for departure, he must remember where he placed the goods or find and ask the employee who originally placed it. If the responsible employee has forgotten the location or is ill, the 115 racks are being manually searched for the items. Warehouse employee Andrew states in an interview (Appendix 1) that it sometimes happens that he

must spent up to two hours on locating a single item in the warehouse, as he must manually look through all the goods. The missing identification of the racks entails that it is impossible to implement an organized system to look up the goods.

The absence of a structured system leads to a situation where goods are placed randomly in the warehouse with no predefined guidelines to determine which goods goes where. The employees are in charge of deciding where the goods are placed. According to Andrew it is most common to place the goods in the first available location. He further states that if the warehouse employees have the time they attempt to place the goods according to a self-invented structure by placing goods which are leaving the warehouse first closest to the transit and goods which are being stored for a longer period furthest from the transit. The initial registration of the warehouse, performed by the author during the identification of customers, indicates nonetheless that there is no clear structure.

## 5.2 Management

Through interviews with warehouse employees and the top management, issues regarding communication between the company departments were uncovered. Even with issues as clear as the ones presented through this project, a solution is unachievable if the management denies accepting the existence of the exposed issues. Therefore, this chapter will focus on the missing communication between the warehouse and the management, and on potential company growth restrictions caused by these issues.

### 5.2.1 Communication

Observations at STK has shown that the company is having no scheduled meetings with the warehouse employees, and that the warehouse appears to be a blind spot to the top management. An interview with the company COO revealed that the management is convinced that the warehouse is not posing a risk to the company. Regardless, the warehouse manager explains how the management several times have been informed about issues at the warehouse throughout the years, while doing nothing. He tells that though the customer intake has increased in a steady flow the last five years, no change has been applied to the warehouse or the warehouse operations. He further states that firstly, when the problems started to occur, he presented the issues that he encountered in the warehouse to the top management. Regrettably they kept ignoring these inquires and kept downplaying



the importance of the issues, so he stopped sharing the key information regarding warehouse issues with the management. As a result, the management believes that the warehouse is running smoothly, though nothing seems to be further from the truth.

When asking the warehouse manager directly about the consequences of another increase in incoming goods, the answer is clear; “The warehouse would not be able to cope with a further raise of customers as everything is already hanging by a thread”. In contrast, when asking the top management if there are any issues in the warehouse, the answer is oppositely clear; “No, the warehouse has no factual issues as far as I am concerned”.

### 5.2.2 Company Growth

The observations within the STK administration and warehouse has led to an understanding of the company’s position in Greiner’s growth model. The company has successfully survived the first phase of the growth model, the phase of creativity. Though the company has emerged from phase 1 to phase 2, this was done in an alternative way, which can prevent the company from further growth in a later stage if not changed. According to Greiner, the crisis of the first phase is solved by hiring an experienced manager to lead the company, but in STK the founder, Rasmus Asger-Hansen who started the company based on his interest in helping people to move goods from diverse locations, has abandoned or merged his primary interests with the desire to stay in control of the company. The company entered the second phase and as the firm continued to grow, more staff was hired to deal with specialized tasks such as budgeting, marketing and operations control. Due to the inexperience of the CEO the structure in the company was unclear, and the newly developed job positions was mixed together to save capital. A concrete example from STK is the operational manager, Ole Holm who was hired to perform the job of process optimization. A conversation with Ole Holm reveals that after a period of 2 month he was moved from the tasks of process optimization to instead handle customer inquiries, which was not previously a part of his skillset. By delegating work tasks outside the field of competence, the employee will likely notice issues differentiating from the task given, as his knowledge is greater in that certain area. Though the employee is holding a greater knowledge about the issues occurring than the CEO, he will only be able to monitor the situation and not make any changes which leads STK into the second crisis, the crisis of autonomy. The CEO managed to erupt from



this crisis by sharing a part of the management responsibility with the COO and the operational manager, but keeping the authority to make the final decisions. With the new sharing of responsibility STK continued to grow during the third phase, but before completing this phase a culmination of events has prevented STK from reaching the fourth phase. These events are both management orientated and apparently also size conditioned. The CEO and founder prevents the exit of the third phase by restraining the control as he has done through the initial phases, instead of accepting his new role as an observant who monitors the company and only deals with larger issues. The size issue is referring to the warehouse, whose capacity would not allow a further customer intake which would ultimately be the result of the company entering the next growth phase.

## 6. Solution Proposals

To support STK in removing the restraints of company growth, this chapter will be presenting possible actions corresponding to the issues presented during the analysis chapter. The suggestions presented will in the warehouse division be focused upon the implementation of Lean management solutions and the possibility of implementing an automated system to support the manual workers in placing and fetching goods. In the management, the solution suggestions will be orientated around the management styles used by the top management at STK and a possible restructure of the existing hierarchy to free up time from the CEO and place more responsibility at lower level managers. The restructuring will aid to define the responsibilities and tasks of the individual employee.

### 6.1 Implement Lean in Warehouse

The purpose of implementing Lean in the warehouse is to add a structure, which makes it easier for employees to find the goods and thereby serve the customer faster, but also to free up space in the warehouse for additional goods. Initially, before presenting the Lean methods recommended for STK, a physical restructuring of the warehouse layout is recommended. An example of such a layout is presented in the figure below to the right. To stress the effect of the restructure, the old layout is shown in the figure to the left as comparison.

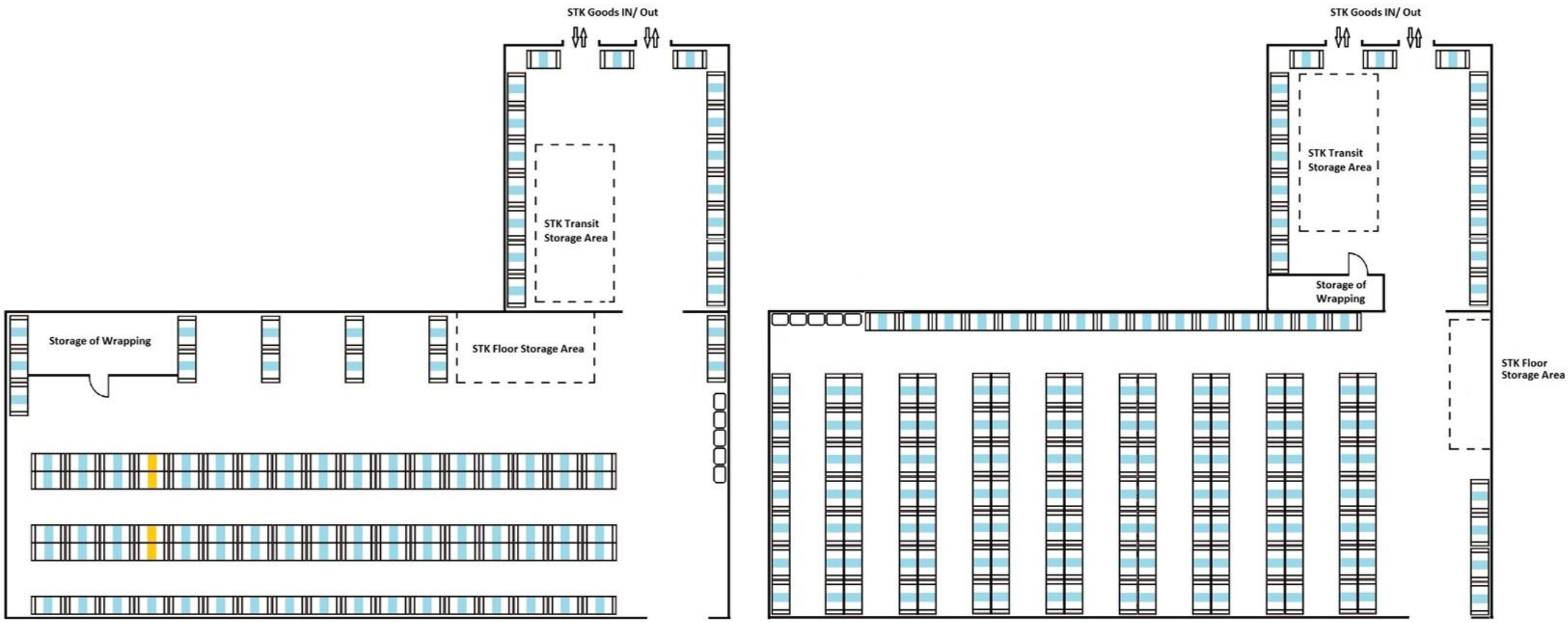
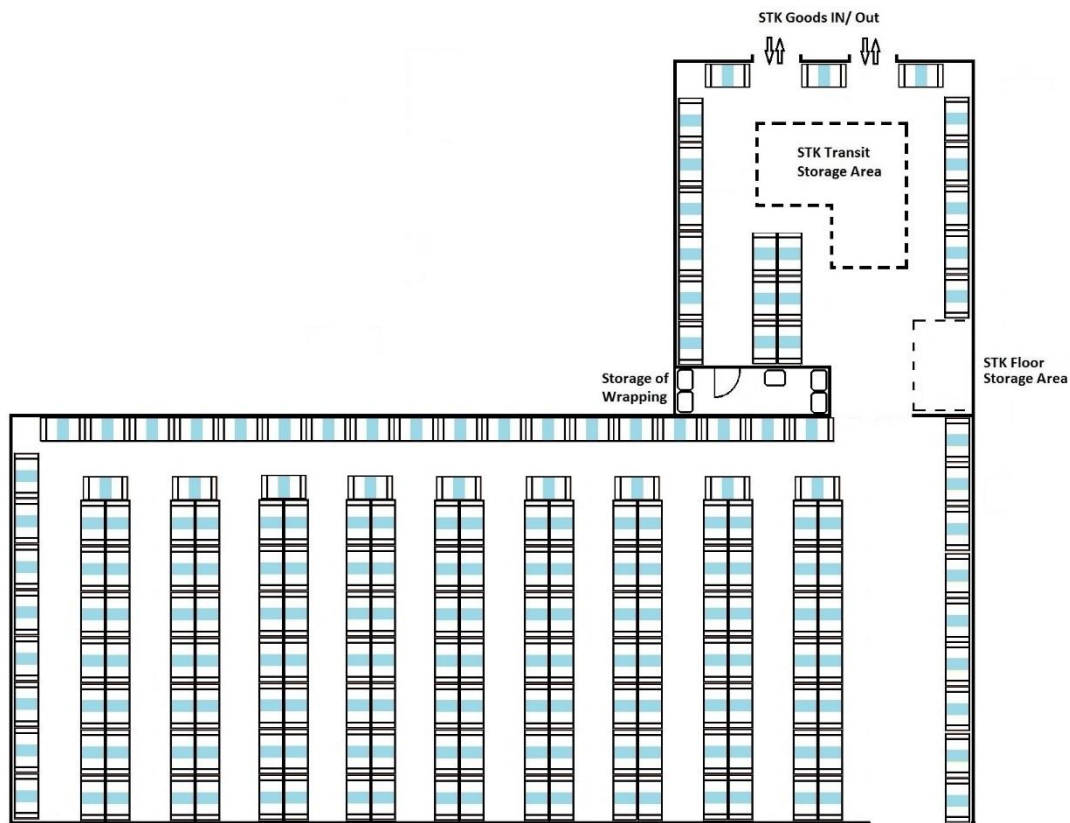


Figure 13 - Warehouse Before and After Restructure

The concrete benefit of the changed layout is that the space is being exploited better, increasing the total number of racks from 115 to 154, an addition of 39 racks. This adds 117 additional shelves which can each hold 3 pallets of goods, allowing STK to store 351 more pallets compared to the previous layout. The new layout contains hallways between the racks of the same dimensions as the previous layout, 3m.

Another option is available, which will potentially provide even more pallet space. The layout is presented in the figure below.



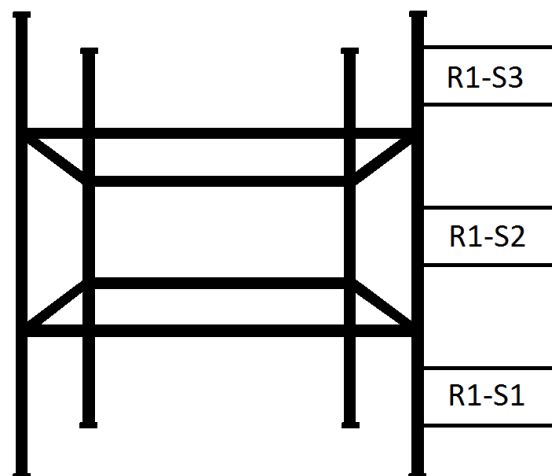
*Figure 14 - Improved Warehouse Layout*

This layout demands that STK exchanges the Reacher truck, which they are currently leasing, with another manually operated electric forklift, a suggestion being the FAS<sup>1</sup> with the same specifications but with smaller dimensions. The Reacher truck requires 3 meters to pick up a pallet of the rack whereas the new forklift requires only 2 meters. The purchase of the new forklift will allow the racks to be closer (2.2m) which is freeing up space for

<sup>1</sup> [https://www.alibaba.com/product-detail/Warehouse-small-electric-forklift\\_60282379672.html?spm=a2700.7724838.0.0.nssvoG](https://www.alibaba.com/product-detail/Warehouse-small-electric-forklift_60282379672.html?spm=a2700.7724838.0.0.nssvoG)

additional racks. The warehouse rack capacity will change from the initial 115 to 190, resulting in additional 687 pallet spaces. A disadvantage of this layout is the investment required in purchasing the new forklift. Calculations for all layouts will be presented during the cost-benefit analysis chapter.

To optimize the yield of the change, STK is recommended to apply the Lean method 5S while changing the structure. The 5S can provide STK with a standardized system, which ease the process of finding the goods. Making the process of finding goods easier will cut the time used to find and bring goods from location to the customer, and easier for the employees to locate specific goods. Before engaging with the 5S's a structured identification system of the racks is necessary, as it would be pointless to sort the goods if there is no preference of location correlating with the different goods. It is therefore recommended to apply an identification system, numbering the racks and shelves. The ID could be applied as indicated in the figure below, where R1 stands for Rack 1, and S1,2,3 refers to the shelf number.




*Figure 15 - Example of ID of Racks and Shelves*

After implementation of the proposed identification system, the company can apply the 5S method. This requires the company to remove all goods from the warehouse, implementing the proposed ID system and then replacing the goods according to a predefined structure. The structure could be outlined so that goods stored for a brief period will be placed closest to the transit, and goods stored for an extended period will be placed furthest from the transit. In this way, the company saves time on transportation, as the goods which are more often moved is placed closer to the transit. While replacing the goods in the newly structured

system, it is further recommended that the company note the location of all goods in their system, to make it easier to find goods both from the administration and from the warehouse itself.

The Lean method additionally includes a scheduled cleaning of the warehouse. How often the cleanings are necessary is based upon the machines operating in the warehouse, as dust may reduce the lifetime of the operational equipment. Due to the occupational environmental considerations, it is recommended to clean the warehouse minimum once a month. The scheduled cleaning also involves the tooling and equipment of the warehouse, to ensure that all machinery is ready to use when needed. To make certain that the improvements are sustained the company is required to develop a standardization of the new initiatives. The standardization will lead to a continuously structured warehouse, where goods of the same category is placed in the same positions, and machinery will be placed in the correct location after use. To assist the employees in following the applied standardization, several SOPs could be applied to the different areas of the warehouse, explaining different processes. As the warehouse has shown a tendency to be disordered, with no structure of the stored goods, an SOP for the placing of goods has been developed for STK (Figure 16). By using images in the operation description, it is harder for the employees to misunderstand the procedure which results in less errors. For the best effect, the SOP should be mounted close to the operation area in a visual position. In addition to the visible location, a supervisor must inform all employees about the signs and their meaning, to clarify any questions the employees may have.



Skandinavisk Transport Kompagni  
 Area: Warehouse

### Standard Operating Procedure

Where to place the incoming goods in the warehouse

When placing goods in the warehouse, please follow the following steps:

1. Scan barcode on goods (1)
2. Note the storage time category of the item (0-12 month, 12-36 month, 36 month -) (2)
3. Locate area corresponding to the storage time
4. Place goods on available shelf
5. Note rack AND shelf ID of the storage location (3)

Storage Date: 01/01-2017

Estimated End Date: 01/01-2020


Estimated Storage Time: 36 month (2)

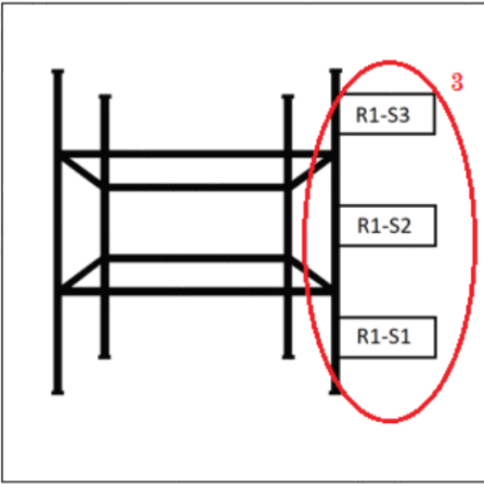
Order ID: 123456789

Pallets: 1

Dimensions: 500mmx500mmx500mm

1





Written By: A. Tofte

Checked By: A. Tofte

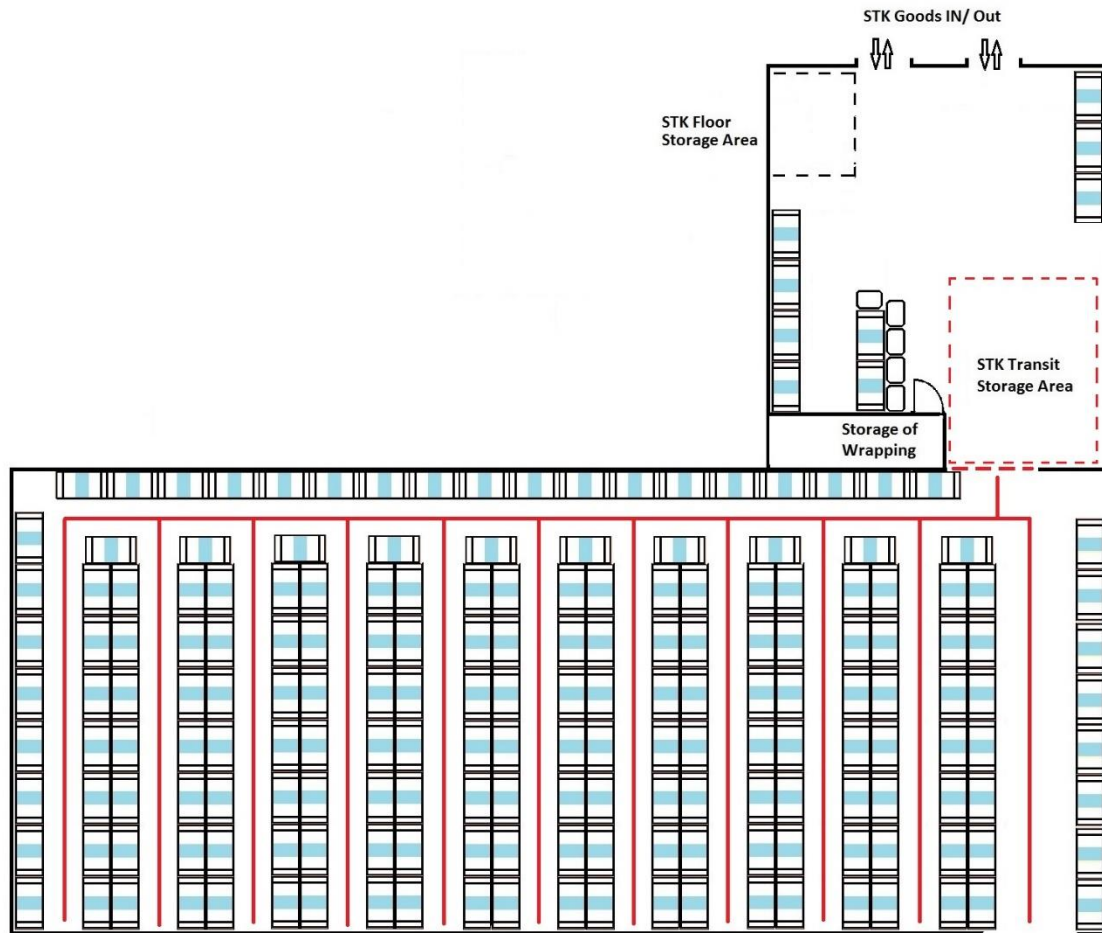
Authorized By: A. Tofte

*Figure 16 - Example of SOP for STK Warehouse*

## 6.2 Implement Automation in Warehouse

The suggestion within this chapter is based upon the research presented in the theory chapter combined with knowledge obtained through the course of automation. According to the forklift consulting firm, Adaptalift Hyster (2013), an automated guided forklift can operate in hallways as small as 2 meters from pallet to pallet, which is 1 meter less than the operation space required at STK now. By conducting a transformation of the traditional manual operations to fully automate the main part of the warehouse, the rack count can be increased from the existing 115 to 193 racks (Figure 17). This increase of 78 racks adds an

additional 234 shelves to the warehouse freeing up room for an extra 702 pallets. The room for the additional racks was freed by reducing the corridors from 3 meters to 2 meters and applying the restructure mentioned in the previous chapter.



*Figure 17 - Implementation of Automated Forklifts*

The red dotted lines in the figure above indicate where the warehouse is parted between fully automated and semi-automated. The semi-automated part of the warehouse is where the AGVs are operating within the same area as the human workers. In this layout, the transit has been transformed to an exchange area, where STK employees place the goods unloaded from the trucks. The AGVs pick it up and transport it to a location decided upon by an algorithm with a location-definition equal to the storage structure mentioned in the Lean chapter. The constant red line in figure 17 indicates the route of the AGV in the warehouse. The AGVs will be computer controlled, so that the administration can prepare an order from the office and the AGVs will then execute it. The administration is open 24 hours

a day, opposite the warehouse which is only operating from 8am to 4pm, so the administration can tell the AGVs to prepare a given order for the warehouse employees so when the warehouse employees meet in the morning, the goods has already been brought to the transit. This saves time for the warehouse employees who instead of using time on finding goods in the warehouse and bringing it to the transit before loading the trucks now only must focus on loading and unloading trucks. To present the concrete time benefits of implementing the AGV, the time consumed on fetching goods by the warehouse employees' contra the automated guided vehicle is compared. The time consumption of the AGV is based on the datasheet of a AGV model DF-40 (2009), stating that the specific model can travel with a total load of 1800 kg in a speed of 1 meter/ second. The average distance in the warehouse is 39 meters from the transit (78 meters out and back). The AGV spends an average of 1 minute and 18 seconds on driving back and forth. The manual workers spend approximately 30 seconds on raising the fork and lifting down the pallet, this time is included in the average time used by the employee and will also be added to the time of the AGV as this process is equally time consuming. For the AGV, the total average of fetching one pallet of goods is then 1 minute and 48 seconds. The average manual time for fetching one item is 13 minutes and 46 seconds (presented in chapter 4.4). Based on the data presented, the AGV handles in average the operation of fetching goods 11 minutes and 58 seconds faster than the warehouse employees, working under the current structure.

In conclusion, the AGVs will allow STK to store 702 extra pallets while saving 11 minutes and 58 seconds on bringing one pallet of goods from a location in the warehouse and to the transit.

### 6.3 Review Management Style and Structure

To obtain the best results and ensure a smoothly running company, it is important that the top management of STK seek to adjust their management styles to fit the employees. The observations at STK clearly showed a gap of communication between the top management and the warehouse. This gap seems to originate from the leadership style, which observations has shown to be highly autocratic as the CEO and COO are taking company-wide decisions without including representatives from the different divisions of the company. This management style would be effective in a newly started company, where the entire company was operated under one roof and the founder/ manager would be involved



in all processes and therefore would be capable of taking decisions based on the knowledge obtained by supervising the operations. But as the company has grown and have been parted in different division with external locations, the top management is not aware of the extend of the issues in e.g. the warehouse. To enable further company growth with a solid company core, it would be advisable for STK to change from the autocratic management style to a more transformational consultative style. By changing the management style, the company will achieve an improved communication with the warehouse division as decisions affecting the warehouse will be based on employee conversations and not the intuition of the top management. A simple suggestion of how to change the management style is to set up weekly/ monthly meetings with the warehouse manager to discuss the situation in the warehouse. The meetings will clarify any issues in the warehouse and the warehouse manager and the company top management can together come up with a workable solution. Together with the implementation of elements from the transformational leadership style, STK could also benefit from basics of the transactional management style, which motivates employees with bonuses if concrete goals are reached. At the current time STK is not having a bonus arrangement and the warehouse employees do not benefit from an increase in customers. As an addition to the recommended actions, to project a sense of loyalty to the warehouse employees it is suggested to give more responsibility to the warehouse manager, as he works in the warehouse every day and know the issues at hand. By giving him the power to make decisions in warehouse related issues, the warehouse would start working as an individual unit, with its own hierarchy, which allows the top management of STK to focus on more relevant companywide issues.

A modification of the administration itself would also be required if the company desires to erupt from the third stage of the company growth model. Now the tasks and responsibilities of the employees are unclear, and this creates uncertainty. If the founder Rasmus Asger-Hansen wishes to hold his position as the company CEO, and not hire an external manager to take over the role, it requires a restructure of the management with a new, more clear definition of responsibility and working areas.

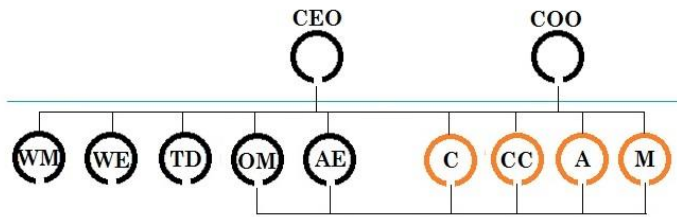
In the current management setup, the CEO and COO are working as equals with various overlapping tasks. These tasks include answering the phone on equal basis with the secretaries, handling everyday issues regarding the truck drivers, checking the goods in the

warehouse, etc... The employees are having a tough time working out who they should come to with issues, as the top management outwardly is handling the same tasks as lower level employees. This creates insecurity amongst the employees and takes up unnecessary time, in finding the correct manager. It furthermore takes up valuable time from the CEO who is ought to handle the key responsibilities of the company. These responsibilities are (Trammell 2014); (1) guiding STK towards the company vision/ goal, (2) balancing the company resources, most importantly investments and employees, as the CEO should act as an overseer of the company operations and raise the capital needed for the company together with matching the right employees with the right job positions. (3) building a good culture in the company to make it a good place to work. (4) take decisions in all aspects of critical issues and (5) serve as an interface between the company and external stakeholders. If the company desires to engage the fourth stage of growth in Greiner's model of company growth, it is recommended that the CEO of STK work on changing his focus from handling everyday activities to instead primarily focus on the five key responsibilities mentioned above.

As an extension of the misplaced responsibilities of the CEO, STK has employed an Operational Manager (OM), who's only visible responsibility involves receiving phone calls from the drivers when they have issues finding the right customer, or similar issues. These tasks are identical to the tasks performed by the secretaries in the administration. The OM has management experience from previous job positions and has knowledge on how to run his own unit. It would therefore be advisable to move the everyday-issue communication of the truck drivers to the administration and let the OM handle more relevant tasks such as delegating the assignments to the drivers, hire new drivers, oversee the education of the inexperienced drivers, etc. As STK is a small company, the OM could also be overseeing the warehouse, as a superior to the warehouse manager.

In figure 18 a rough sketch of the delegation of responsibilities and work tasks in STK is presented. Furthermore, a proposed management setup is presented which could create more structure throughout the entire company, and if carried out correctly potentially lead to a massive company growth.

Current



 Job Position

 Task

CEO = Chief Executive Officer

COO = Chief Operating Officer

OM = Operational Manager

WM = Warehouse Manager

WE = Warehouse Employees

AE = Administrational Employees

TD = Truck Drivers

C = Complaints

CC = Customer Contact

A = Accounting

M = Marketing

Proposed

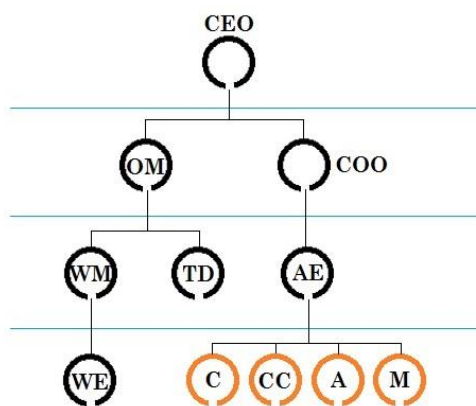


Figure 18 - Management Setup, Current and Proposed

If STK choose to follow the suggested setup above, the administration may be overburdened as they are not used to handle all the administrative tasks and it may be necessary to hire additional personnel for this department.

## 7. Cost-Benefit Analysis

To show the yield of the presented warehouse solutions, a cost-benefit analysis has been conducted. To stress the concrete economic benefits of the warehouse improvements, this analysis is only indicative and focuses solely on the costs within the warehouse, without considerations of remaining parts of the company. The analysis compares the costs of the original layout with the costs of the optimized warehouse layouts and the automation of the warehouse. The analysis is focusing on potential income based on storage capacity and assumes that STK will be operating with a full warehouse. The table below shows the turnover

of the original warehouse layout. All calculations and source data can be found in appendix 2.

Costs		Annual Costs
	Warehouse Employee Salary	kr. 552.960,00
	Equipment Wear	kr. 32.040,00
	Warehouse Rent	kr. 288.000,00
	Employee Insurance	kr. 36.000,00
	Equipment Leasing	kr. 27.000,00
<b>Total Expenses</b>		
		Kr. 936.000,00
<b>Total Income</b>		
	Customer Storage	kr. 1.534.500,00
	<b>Total Revenue</b>	<u>kr. 598.500,00</u>

Table 5 - Annual Costs of STK Original Warehouse Layout

As the table indicates, STK operates the warehouse with an approximate annual profit of 600.000Dkr. The table below show the expected profit based on the solution of restructuring the warehouse without any change of equipment.

Costs		Annual Costs
	Warehouse Employee Salary	kr. 552.960,00
	Equipment Wear	kr. 32.040,00
	Warehouse Rent	kr. 288.000,00
	Employee Insurance	kr. 36.000,00
	Equipment Leasing	kr. 27.000,00
<b>Total Costs</b>		
		kr. 936.000,00
<b>Income</b>		
	Customer Storage	kr. 2.061.000,00
	<b>Total Revenue</b>	<u>kr. 1.125.000,00</u>

Table 6 - Annual Costs of the Suggested Warehouse Solution (1)

Enabling STK to store the additional pallets have provided an increase in annual profit, compared to the original setup, corresponding to 526.500Dkr. To fully utilize the warehouse an option of changing the large Reacher truck with a smaller model was suggested. This resulted in a further increase of profit as shown in the table below.

Costs		Year 1	Year 2
	Warehouse Employee Salary	kr. 552.960,00	kr. 552.960,00
	Equipment Wear	kr. 51.480,00	kr. 51.480,00
	Warehouse Rent	kr. 288.000,00	kr. 288.000,00
	Employee Insurance	kr. 36.000,00	kr. 36.000,00
	New Forklift	kr. 54.000,00	kr. 0,00
<b>Total Ex-penses</b>			
		Kr. 982.440,00	Kr. 928.440,00
<b>Tota Income</b>			
	Customer Storage	kr. 2.565.000,00	kr. 2.565.000,00
	Total Revenue	kr. 1.582.560,00	kr. 1.636.560,00

*Table 7 - Annual Costs of the Suggested Warehouse Solution (2)*

As this suggestion required an initial investment of 54.000Dkr. on buying the new truck the table is showing the annual costs over two years. The calculations show that by replacing the Reacher truck and adding additional racks to the warehouse, STK can increase the annual profit by 1.038.060Dkr.

The last solution presented for handling the warehouse situation involved implementing an AGV forklift in the warehouse. The calculations are based on one AGV but depending on how the customer segment will respond when more space is freed it may be necessary to implement more AGVs.

Costs		Year 1	Year 2
	Warehouse Employee Salary	kr. 552.960,00	kr. 552.960,00
	Equipment Wear	kr. 32.040,00	kr. 32.040,00
	Warehouse Rent	kr. 288.000,00	kr. 288.000,00
	Employee Insurance	kr. 36.000,00	kr. 36.000,00

<b>AGV</b>			
	AGV Price	kr. 405.400,00	kr. 0,00
	Setting up AGV System	kr. 170.000,00	kr. 0,00
	Maintaining System	kr. 20.000,00	kr. 20.000,00
<b>Total Ex- penses</b>			
		kr. 1.504.400,00	kr. 929.000,00
<b>Total In- come</b>			
	Customer Storage	kr. 2.587.500,00	kr. 2.587.500,00
	Total Revenue	kr. 1.083.100,00	kr. <u>1.658.500,00</u>

*Table 8 - Annual Costs of the Warehouse Automation System*

The calculations show that after two years the automated system is expected to provide an annual profit of 1.060.000Dkr. compared to the original setup.

As STK is a small company an initial investment of approximately 500.000Dkr. is very high, therefore it is strongly suggested to implement solution suggestion number two, as the effort and investment is minimum and the profit is high. If the company is not interested in spending money on improving the warehouse, it is recommended to choose solution number one, where the effort is low and the initial investment non-existing and the profit is high.

## 8. Discussion

In this chapter, the recommended solutions will be discussed, with the purpose of illuminating the consequences that the changes may inflict on STK. Together with the discussion of the consequences of implementing the suggestions, a discussion of the corollaries of not acting upon the presented issues will also be presented. As a final debate, relevant limitations encountered through this project and the effect of these will be discussed.

Skandinavisk Transport Kompagni A/S is a small company whose management has a predominantly practical understanding of how things works/ should work. A practical approach may work fine in the beginning of a company's existence or in the sub-units of a business, but the primarily practical approach in the top management can prevent the company management from understanding the full extent of the issues presented by lower level units. This was clarified at several occasions during the writing of this project as e.g. the top management denied the existence of the issues in the warehouse with the explanation that they

haven't noticed any issues. This obsolete approach to the management of a business might pose an issue in the understanding of the benefits of some of the presented solutions. Especially the recommendations of restructuring the management and redelegate responsibilities to lower level managers may be rejected by STK, as this issue is not directly tangible and the benefits of such a change cannot be seen immediately. If STK acknowledges the need for change, and implements a restructure of the management another issue may arise. As the founder has been running the company as the CEO without any changes in management styles through the last 25 years, a sudden delegation of responsibilities will be hard to comprehend, as someone else will be doing the job that he has always done. Furthermore the skills needed to carry the full responsibility of a CEO has not yet been obtained by the founder, which can assumable have three outcomes: (1) the management restructure collapses and the old patterns will be repeated, leading to the same issues and preventing growth, (2) the CEO adjusts to the new situation by obtaining the required skills, and the company continues the growth into stage 4 with the original manager at the wheel or (3) the CEO acknowledge that the restructure was necessary in order for the company to enter a new growth stage, but chooses to hire a more experienced CEO to take over the position. The last option will be the most unlikely as the CEO is showing no interest in passing on the leadership of STK. As problematic as it may be to make STKs top management acknowledge the need for a structural change in the management, as oppositely unproblematic it is assumed to be to convince them about the benefits of restructuring the warehouse. Changing the warehouse layout is a very tangible solution with some concretely presented economic benefits, which the top management of STK can relate to. The restructuring of the warehouse, depending on the chosen solution, will only cost STK the man-hours it takes to empty the warehouse and refill it. If STK choose the solution of exchanging the Reacher truck with the smaller forklift, it is necessary to retrain the employees to operate the new machine correctly.

It can be argued that the benefit of changing the warehouse layout is a quick but limited growth injection, which offers a permanent, but one time increase of the annual profit, without the ability to provide continued growth. Increasing the storage capacity will enable a further intake of customers, which allow STK to grow, but the warehouse solution is only postponing the inevitable as the same issues will reoccur at another time if the growth is

continued. When this happens, it is time for STK to consider the possibility of expanding their facilities to cope with further customer increase.

Throughout the writing of this project, a few limitations were encountered which have had an influence on the results presented within this paper. The primary limitation is the secrecy of the STK management. The company refuse to hand out key figures such as accounts, employee salaries, customer groups, etc. The result of this is that the numbers and calculations within this paper are based on conversations with employees outside the top management combined with research. This further leads to the possibility of undiscovered issues in the handling of customers or if any optimization would be possible/ necessary in the categorization of customers. The stuffiness of the management is not only a limitation for the writing of this project, but also a limitation for the company itself. If the management refuse to accept that a restructure of the management is necessary, it might have consequences for the competitiveness of STK.

Another limitation is the time available for this project, as the impact of the solutions cannot be presented in this paper. Without these limitations, the full effect of the changes suggested would be visible and the impact of a change in the management structure could further be measured on the customers.

## 9. Conclusion

STK is facing an increase in customer inquiries, but bottlenecks within the organization keeps the company from taking full advantage of the situation. This paper has investigated the possible reasons to the obstructing bottlenecks and presented STK with a few concrete solutions to overcome the issues discovered and the benefits of these solutions. While working on this paper it was uncovered that the main bottlenecks of STK were in the company warehouse and within the very heart of STK, the management. Observations within the warehouse clarified that, even though the management disagreed in this fact, the storage limit of STK was reached and that another increase in customers would make the system collapse. The warehouse was missing a manager with the authority to make actions and implement solutions on a daily basis, which had resulted in an unstructured warehouse where goods were placed on the floor between racks, the transit was full of goods not belonging in this area, none of the employees knew where any of the goods were located



and there was no system in where to place the goods. The data collection performed during this project showed that the bottlenecks within the warehouse originated from a missing management structure in the STK management, as the delegation of responsibilities was close to none existent and unclear. The warehouse tried to communicate the issues to the management but was rejected continuously. This paper therefore presented suggestions to get the warehouse back on track by implementing a location system for the stored goods together with a total restructure of the warehouse to cope with the customer increase. Beside the warehouse solution, this paper also provided a possible solution to the root causes of the warehouse issues, a restructuring of the STK management. This restructure would either result in the current CEO accepting a list of new responsibilities and obtaining new skills within management, or the hiring of a new CEO. Furthermore, the restructuring would clarify the working area of all employees and delegate responsibilities to lower level managers, as these has a better understanding of the processes of their unit than the top management.

The conduction of a cost-benefit analysis finally showed that the company stood to gain an annual profit between approximately 500.000Dkr. – 1.000.000Dkr. if implementing the presented warehouse solutions depending on the solution chosen. These calculations show that it would be economically feasible for STK to implement the presented solutions, as the investment is low and the profit high.

## Further Research

A proposal for further research includes observing the warehouse after implementing the suggested solution and note how well/ bad it performs. If the outcome of the observations prove that the changes are successfully leading to an increase in revenue, the solution can be applied to any future warehouse that STK engages in and secure a profitable layout and structure from the start.

A further research which could prove helpful on the restructuring of the management, would be a more thorough registration of the management patterns, working tasks and the decisions made by the individual managers. This research demands the management to accept a higher-level of information sharing and a cooperation on a more intimate plan, as the observer would be recommended to follow the manager for several days, watching all

acts performed. The outcome is expected to be a concrete mapping of all tasks performed by the managers and could make the redelegation of tasks and responsibilities easier as all aspects of the work performed would be known.

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