Master thesis J.W. Bierman

Changing the focus from corrective maintenance to preventive maintenance of the technical workforce to achieve an improvement of the performance of total maintenance activities of Brasco in Pointe-Noire

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BRASCO
BRASSERIES DU CONGO

Preface

During my master study Industrial Engineering & Management, with specialisation in production and logistics management, I became interested in logistical problems within a manufacturing environment. Besides, I participated in international research projects in South-America and Mauritius before. These foreign experiences stimulated me to arrange a third research project in a foreign country again as a graduate internship for my master. The main goal of this internship is to perform a project individually on an academic level.

In June 2012, I came in contact with Onno Snip en Dennis van der Plas, both working at the Africa and Middle East department of Heineken. They offered me an internship concerning the reorganisation of the technical department of a Congolese brewery called Brasco in Pointe-Noire, Republic of Congo. I am highly interested in Heineken as well as the African culture and decided to take this opportunity. I am very thankful that Heineken offered me this opportunity. It was a great learning experience.

During the execution of my project, I closely cooperated with Bertin Tabangoli, technical manager of Brasco. Furthermore, I reported to Jan Paul Boon, who was the supply chain director until December 2012, and Michel Maas, who replaced him until March 2013. We had interesting discussions and I learned a lot from their feedback and our discussions. Besides, I thank all Congolese employees who participated in the project and supported me in learning the French language. Merci beaucoup!

Furthermore, I thank Peter Schuur and Christiaan Katsma for being my supervisor from the University of Twente. It was a very pleasant way of cooperation and our discussions by phone and physically in Enschede inspired me in writing this thesis. Finally, I appreciate the support of my parents and girlfriend who had useful comments to my report concerning structure, grammatical language, and consistency.

Since September 2012, I learned a lot about the Congolese culture, doing academic research, and logistical problems in a third world country. I hope the results of this research will be of great value for Brasco as well as Heineken.

Jan Willem Bierman, May 2013

Summary

The research project that we describe in this report is executed at Brasseries du Congo (Brasco); a brewery that is partly owned by Heineken and annually produces 2.7 million hectolitres of beer for the Congolese market in their two plants in Pointe-Noire and Brazzaville. Similar to other African breweries, there is no standardised organisation and working routines as well as procedures are developed by local Congolese employees. Heineken has adopted a project for African breweries with the main goal to standardise these procedures and organisation within all technical departments.

Under the name of SAHARA project, Heineken developed many standardised tools, routines, and procedures. These tools are mainly based on best practices of other Heineken breweries. The main concern of African breweries is the lack of structure and that maintenance of their production equipment is not performed according to Heineken standards. This results in underperformance and bad results on the key performance indicators. The main goal of our project is to implement standardised tools and procedures and improve the way of working of the Congolese employees. As Heineken has no further information about the specific situation in Pointe-Noire, these goals are not further defined in more detail. To achieve this goal, we received a lot of documentation and best practices from Heineken.

First, we analysed the specific situation of Brasco. We discovered that almost all maintenance activities are based on corrective maintenance and technicians were mainly focussing on repairing failed equipment. However, the Heineken philosophy focusses mainly on preventive maintenance to prevent equipment from breaking down at unplanned moments in time. We discovered that the current maturity of preventive maintenance in Pointe-Noire was underdeveloped and the main focus was to improve the current status and update these to meet the Heineken standards. Therefore, we defined the research goal as: *"Realise a change in focus from corrective maintenance to preventive maintenance of the technical workforce to achieve an improvement of the performance of total maintenance activities of Brasco in Pointe-Noire.*"

To gain better insights in the concepts of maintenance, we defined preventive, corrective, and semi-corrective maintenance in more detail, followed by the maintenance philosophy that is adopted by Heineken. This enabled us to define a clear scope in which Brasco should operate. Secondly, we analysed the factors that influence the level of maturity of preventive maintenance. We analysed historical, economic, political, and cultural aspects and gained interesting insights that were useful for the final approach. Thirdly, we discussed all available tools and procedures that were provided by Heineken and combined these approaches with several interesting approaches on change management and change leadership from academic literature.

Based on these previous insights, we have developed an effective framework for Brasco that provides guidelines and a structure for successful change management with the goal to change the employees' focus from corrective to preventive maintenance. This framework is based on an eight-step change management approach, combined with several leadership styles. Furthermore, we included a model that describes how to increase the level of ambition and motivation of employees.

The overall framework consists of four main pillars that supplement each other:

- Sequence of activities
- Powerful change management approach
- Style of leadership that fits with the change management approach
- Additional requirements from practice

The sequence of activities that we propose ensures that the supporting basis is implemented first and is followed by the other steps. This prevents chaotic situations in which the employees get confused. The sequence is as follows:

1. Kick-off
2. Implementation of a new CMMS
3. Spare part management
4. Workshops
5. Management of (re)orders
6. Procedures, routines & planning

Every activity has to walk through all steps of the change management approach to ensure it will succeed. This approach provides the Congolese employees much structure in their work and in the implementation process:

1. Create a sense of urgency
2. Create a change team
3. Develop vision & strategy
4. Communicate
5. Empower others to act
6. Produce quick wins
7. Don't let up
8. Create a new culture

Each step is supported by a specific leadership style that fits best to the situation of Brasco. We propose to make use of a directive and transactional style of leadership in which the process is designed by top-management in the first phases and can be more developed by the employees in the final phases.

We performed a participative observation study in Congo, which gave us new interesting insights that enabled us to further improve our framework. We compared this framework with the findings we discovered during our implementation in Pointe-Noire and we supplemented the framework with several additions. Effective additions are:

- Using the expression 'Heineken standard' to indicate the importance of tools
- Using the spare part management as a pilot to motivate people
- Implementing a modern computerised maintenance management system (Maximo 7.5)
- Indicating that the brewery can be an example for other African breweries

This framework is very effective in the execution of the rest of the project and can be adopted by Heineken for the implementation at other African breweries as well. It is able to improve the maturity of preventive maintenance and change the way of working of Congolese employees. Furthermore, possibilities for a reward system and extensive training of employees should be further investigated. This framework is very powerful and effective and supports Brasco to achieve its main goals: to adopt a proper focus to preventive maintenance.

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1. Introduction

This research is based on a six-month internship that is performed at a brewery of Brasseries du Congo (Brasco). In this chapter, we give insights in the company and a short introduction in the project that has been started.

1.1. Brasseries du Congo

Brasco is an enterprise that owns two breweries in the Republic of Congo and produces beer and soft drinks for the Congolese market. The first brewery, based in Brazzaville, was founded in 1952 by an unknown Congolese company. In 1962, a second brewery in Pointe-Noire was opened by Kronenburg. These breweries merged in 1994 and are currently owned for 50% by Heineken and 50% by Compagnie Française de l'Afrique Occidentale (CFAO). Since 1994, the breweries operate under the name 'Brasseries du Congo' as an operating company of Heineken.

Brasco distributes 7 brands of beer (Primus, Ngok', Mützig, Turbo King, Guinness, Desperados & Heineken) and 6 brands of soft drinks (Coca-Cola, Fanta, Sprite, Schweppes, Pulp & Royal Club). Except for Heineken and Desperados, all products are being produced locally. Both breweries used to have 3 packaging lines for glass bottles. Currently, a 4th packaging line for plastic bottles is being installed at both sites. All lines operate 24/7. Brasco has a monopolistic position, as it is the only brewery in the country, except for some imported brands. The total production of Brasco in 2012 was 2.7 million hectolitres, exclusively for the Congolese market. Turnover has been growing at an annual rate of 7-15% in the last five years.

Within Brasco, CFAO is responsible for the human resources and financial department and Heineken is in charge of the marketing and production. As Heineken has a lot of experience and knowledge, due to its operations in 172 countries, many standard working procedures are implemented in breweries all over the world. As Brasco is struggling with the proper execution of its operations, Heineken decided to start a new project to implement Heineken standard procedures.

1.2. SAHARA project

During this internship, we implemented an important part of the standard working procedures of Heineken that are combined within the SAHARA project in Pointe-Noire, Republic of Congo. The SAHARA project stands for *'Spare part management, Asset management, Heineken Africa Restoration Actions'*. It is a Heineken initiative that started in 2011 and focusses on African breweries with the goal to build or restore basic maintenance principles.

It consists of four goals:

1. General African maintenance policy development
2. Spare part management improvement
3. Organization set up of maintenance
4. (Re)implementation of basic maintenance routines.

As many African breweries cope with similar operational problems, this project is broadly applicable and is being executed at the most important breweries in Africa. The project is already successfully executed in Algeria, Tunisia, Nigeria, Democratic Republic of Congo, Ethiopia, Sierra Leone, Burundi, and in the brewery in Brazzaville. As the results at these sites look very promising, the project has been launched in Pointe-Noire as well.

There are many problems concerning spare part management, maintenance routines, and organizational structures. These problems are similar at all African breweries, but are not identical and approaches can therefore not be completely standardized. Every brewery has to cope with its own specific problems. The SAHARA project offers a broad package of guidelines for successful approaches to these problems. These guidelines can be transformed into customized solutions for each brewery. We briefly discuss the guidelines in three categories. Combined, the approaches will result in the achievement of the four project goals.

1. *Organizational change*

The breweries' technical departmental organization does not always apply to Heineken standards and will be transformed into a standardized structure. This includes a new organogram, standardized responsibilities, creation of job profiles, well-balanced pay grades, hiring and training new staff, and the implementation of standardized KPIs and reports. The main goal is to get well-trained employees at the right positions with clear responsibilities within a standardized structure.

2. *Spare part management*

The management of spare parts must be analysed and improved. First of all, the data in the computerized maintenance management system (CMMS) has to be updated and the physical structure of the warehouse will be analysed and improved. As soon as this is properly arranged, all procedures within the warehouse have to be analysed and transformed into standard Heineken procedures. Secondly, the personnel should be trained to be able to apply these procedures. The main goal is to be able to get the right spare parts and quantities on stock and to reduce losses in the warehouse.

3. *Maintenance routines*

As soon as the organization and warehouse are well-arranged, maintenance routines can be standardized. This includes routines for cleaning, inspections, preventive and corrective maintenance, maintenance planning, breakdown analysis and safety. The main goal is to save money, reduce downtimes, and prolong the lifecycle of the packaging lines and supporting machines on the long-term.

Depending on the specific situation of each brewery, the full execution of the SAHARA project can take up to two and a half years per brewery. The kick-off of SAHARA in Pointe-Noire was in October 2012 and is estimated to be finished in August 2014.

We will discuss the specific problems at the brewery in Pointe-Noire in more detail in Chapter 2. Furthermore, we discuss the research questions and structure.

2. Problem identification

In this chapter, we discuss the main problems of the SAHARA project and the problems of the technical department of Brasco in more detail in Section 2.1. We start with the clarification of the current situation within the technical department, to identify the core problem of Brasco. Afterwards, we discuss the main problems that exist within the current situation and have to be solved to go to the desired situation. Continuing in Section 2.2, we focus on a specific problem and we discuss the research questions to be able to come up with an approach to this problem in Section 2.3. We end this chapter with an overview of the structure of this research in Section 2.4.

2.1. Main problems of Brasco

In order to be able to identify the core problem of Brasco, we start with the clarification of the current situation within the technical department. Afterwards, we discuss the main problems that exist within the current situation and that have to be solved to go to the desired situation. We conclude with the goals of this research.

2.1.1. Current situation

The technical department is responsible for all operations between the reception of ingredients to the delivery of full crates of beverages to the customer. As the project does not focus on the inbound and outbound logistics, we focus on the process of transforming ingredients into full bottles of beer and soft drinks. A simplified model of the process and its supporting activities is displayed in Figure 2.1.

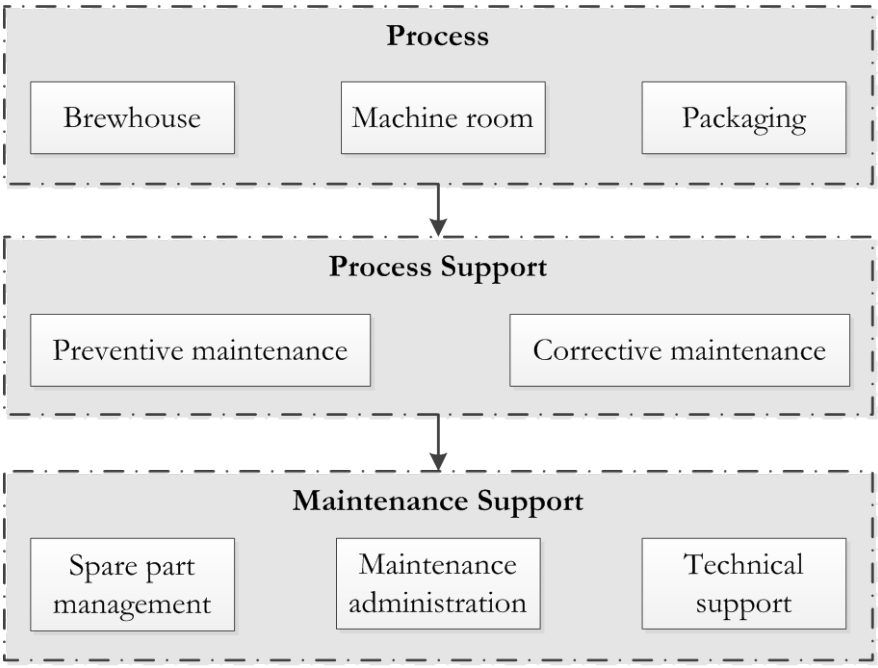


Figure 2.1: Overview of the brewery

The main process consists of three major parts: brewhouse, the packaging lines, and the machine room. Within the brewhouse, ingredients are being processed and transformed to beer within 14 days. After this stage, the beer is transported to packaging lines. At the packaging lines, bottles are washed, filled, closed, labelled, and pasteurised. At the final stage, the bottles are being put in crates and transported to the warehouse for further distribution. Both the brewhouse and the packaging lines are supported by the machine room, which contains boilers, compressors, and tanks to produce and recycle CO_2, NH_3, H_2O, and air. As this machine room is an extremely

important and highly complicated part of the brewery, it is handled as being part of the core process.

To achieve the highest uptime as possible and to ensure that all machines are running properly, the core process is supported by preventive as well as corrective maintenance. Preventive maintenance plans and revisions are usually provided by the supplier of the specific machines and should be executed by the local technicians. All bottling lines are taken down for 1 dayshift per week to execute planned maintenance. The proposed goal of this time is to execute preventive maintenance, but is mainly used for (semi-)corrective maintenance. Corrective maintenance is caused by machine breakdowns and usually executed immediately to guarantee a maximised uptime of the machine. The most common used short-term solution is to temporarily repair the failure. In addition a long-term solution is realised during the weekly planned maintenance day. This is called semi-corrective maintenance.

The maintenance activities are supported by three parts of the technical department. First of all by the operators and technicians, who are responsible for the detection, solution, and analysis of technical problems. Secondly, the chief spare parts who is managing the availability of spare parts that are required to solve technical problems. Finally, the technical administration who is handling the planning of maintenance days, the creation and distribution of work orders for specific tasks, and reorders of required parts. Regular meetings with employees of all three parts are important, to ensure that information about technical problems and requirements is distributed throughout the whole department. However, these meetings are not well executed.

2.1.2. Desired situation

Idealistic, all maintenance should be executed during the weekly maintenance days and all maintenance activities should be based on preventive maintenance. However, Brasco discovers many breakdowns and a lot of corrective maintenance is executed. The management has the strong feeling that the proper execution of the SAHARA project results in a reduction of corrective maintenance and, on the long-term, in the increase of the uptime of the equipment.

Currently, the major part of the supportive activities is focussed on (semi-)corrective maintenance, which is caused by downtimes during the week. However, the focus should be on preventive maintenance to prevent downtimes and reduce the required level of corrective maintenance. Thus, the main goal is to reduce the level of corrective maintenance by focussing on preventive maintenance.

The management expects that there exist many problems at the maintenance support activities, as there is too much corrective maintenance and there is no strong focus on preventive maintenance. However, these problems are not yet specified and have to be analysed before these problems can be solved.

Summarized, it is assumed that an increase of the uptime of the machines can be achieved by focussing on preventive maintenance instead of corrective maintenance. The step to make this possible is to analyse the maintenance support activities and to solve identified problems. We verify the management statements during the problem analysis.

2.1.3. Research goals

During years of worldwide experience and analysis, Heineken has developed a very broad range of standard procedures and structures for well-known problems. One of these standards is the assumption and belief that a strong focus on preventive maintenance leads to the reduction of corrective maintenance, which leads to increased uptimes and prolonged lifetimes of machinery. Besides, it is already observed that there is too much corrective maintenance being executed at Brasco because preventive maintenance is insufficiently performed. Therefore, we agree to this assumption and the main research goal here is to change the focus from (semi-)corrective maintenance to preventive maintenance.

Furthermore, we already mentioned that the SAHARA project provides a broad package of guidelines that may be of help to specific problems. However, it is not a detailed action plan that leads to solutions of specific problems that are already known. Therefore, Heineken would like to improve this package in any possible way to make it easier to perform the same project in other countries. Thus, our second research goals is to improve the SAHARA documentation while investigation and solving specific problems for Brasco.

2.2. Problem analysis

As the statements of the management of Brasco are rather vague and not yet verified, we start with an analysis of the main problem using a detailed problem-cause-analysis to achieve our research goals. Following, we identify and explain the underlying core problem that has the biggest influence to the main problem.

2.2.1. Problem-cause analysis

By analysing the specific problems that exist at the brewery in Pointe-Noire, we are able to specify one core problem that has the biggest influence on the main research goal: changing the focus from corrective to preventive maintenance. We start our analysis with the fact that there is currently too much (semi-)corrective maintenance, which is caused by a lack of focus on preventive maintenance. There are four main causes of the main problem, which we discuss in this section.

First of all, there is a *lack of standardized working procedures* on the work floor that describe how preventive maintenance has to be executed. Technicians and operators have no strict guidelines of how to act to specific situations and they do not know what to do when things go wrong. There are several procedures available, but those procedures have never been properly implemented. The technicians do not follow these procedures in the same way, because there have been a lack of supervision and there are no good tools available to support the technicians. Besides, responsibilities of the employees are unclear. Nobody is able to describe the exact responsibilities of his job and this explains why people do not know how to follow procedures. Moreover, the technicians discover indistinctness concerning the meaning of the concept 'preventive maintenance' very well. They are unable to explain what it means according to Heineken standards.

Secondly, the *administration office is performing badly*, which leads to insufficient support of the maintenance activities. Firstly, orders and reorders are handled insufficiently. Many (re)orders are getting lost, are not being approved, or do not arrive on time. There is no tool available that manages the control of (re)orders. Secondly, preventive maintenance plans, which are advised by the suppliers of the machines, are not handled like it should be. The information on the work

orders is not complete, planning schedules are not properly made, and administrative personnel discover indistinctness concerning the meaning of 'preventive maintenance' very well and does therefore not know how to perform their jobs. Besides, as there is no supporting CMMS providing all relevant data on maintenance, many required activities are not registered or not described properly.

Thirdly, the *management of spare parts is executed insufficiently*. Many parts that are required on a frequent basis are not available in the warehouse and if these parts are available, the quantity is insufficient. Relevant data on spare parts is outdated and the personnel is therefore not able to good estimations of required parts. Besides, there is no modern CMMS available that supports the warehouse personnel by making decisions based on historical data. Furthermore, the warehouse personnel has problems with the distinctness of the concept of 'preventive maintenance' as well. As they do not exactly understand what it means, they have no idea which parts are important for the execution of preventive maintenance.

Finally, there is *a lack of communication between the different departments*. As the organogram is outdated and incorrect, there are no specified communication channels that bring the right people together. There are some meeting structures, but not all relevant people join these meetings. Furthermore, as no-one fully understands the meaning of the concept 'preventive maintenance', employees do not know what information is relevant for other parties. Irrelevant data is being interchanged and relevant data is not always completely distributed.

Our analysis of the problems and the underlying causes are visualized in Figure 2.2. The green blocks on top of the chart are the relationships that follow from the Heineken standard philosophy about preventive maintenance. The orange and blue blocks at the bottom of the chart represent the main causes that in the end lead to our main problem: a lock of focus on preventive maintenance.

2.2.2. Identification of the core problem

The problem-cause analysis helps us understand which causes result in the main problem at the brewery in Pointe-Noire. In total, we have identified seven main causes that result in the lack of focus on preventive maintenance. We discuss these causes in this section.

Responsibilities are insufficiently specified: People are not able to name their responsibilities and do not know which tasks they have to perform. This has to be specified to clarify all roles on the work floor. This is part of the SAHARA project, which contains a standardized responsibility matrix.

Lack of tools to support employees: Procedures are unclear and employees have no clear vision of how to perform their tasks. There are no proper tools to support them doing their job. The implementation of supportive tools is part of the SAHARA project. There are many guidelines and tools to help employees understand and perform their jobs properly.

Lack of supervision: Besides the lack of tools, employees at the work floor do currently not have the right supervision. They are not supported properly by their supervisor. The SAHARA project provides training material for these supervisors. This is supervised by an intern from Heineken Nederland.

No advanced CMMS available: Brasco makes use of DEFI; an information system that is developed in 1984 and is very outdated. Besides, the administration office makes use of Maximo 4 to handle

part of the relevant data. However, this is not well implemented and Brasco does not fully benefit from this system. There are no possibilities to print relevant reports concerning technical activities.

Relevant data is outdated: Data about spare parts is not complete and accurate. Many physical parts cannot be found in the information system, stock levels are not correct, and many movements are not registered. This database has to be updated, which is a standard activity in the scope of the SAHARA project.

No proper organogram: The organization of the technical department does not apply to Heineken standards. This results in unclear structures and responsibilities. The organogram has to be restructured. This reorganisation has already started and is handled by the top management of Brasco.

Indistinctness exists concerning the general concept of 'preventive maintenance': The Congolese employees are not fully aware of the concept and benefits of preventive maintenance. This results in many problems at all parts of the technical department.

The first six problems that we just have explained are all part of the SAHARA project. These problems are foreseen by Heineken and there exist guidelines, activities, and tools to support Brasco in solving these problems. However, the last problem does not show up in the SAHARA documentation. The indistinctness of such an important concept within the technical department is not handled within the SAHARA project and should be solved separately. As this cause influences all stated problems, we decide to narrow down our scope to this specific core problem. Besides, by researching this cause, we are able to improve the SAHARA documentation which is one of the research goals. We discuss the core problem in more detail in the next section.

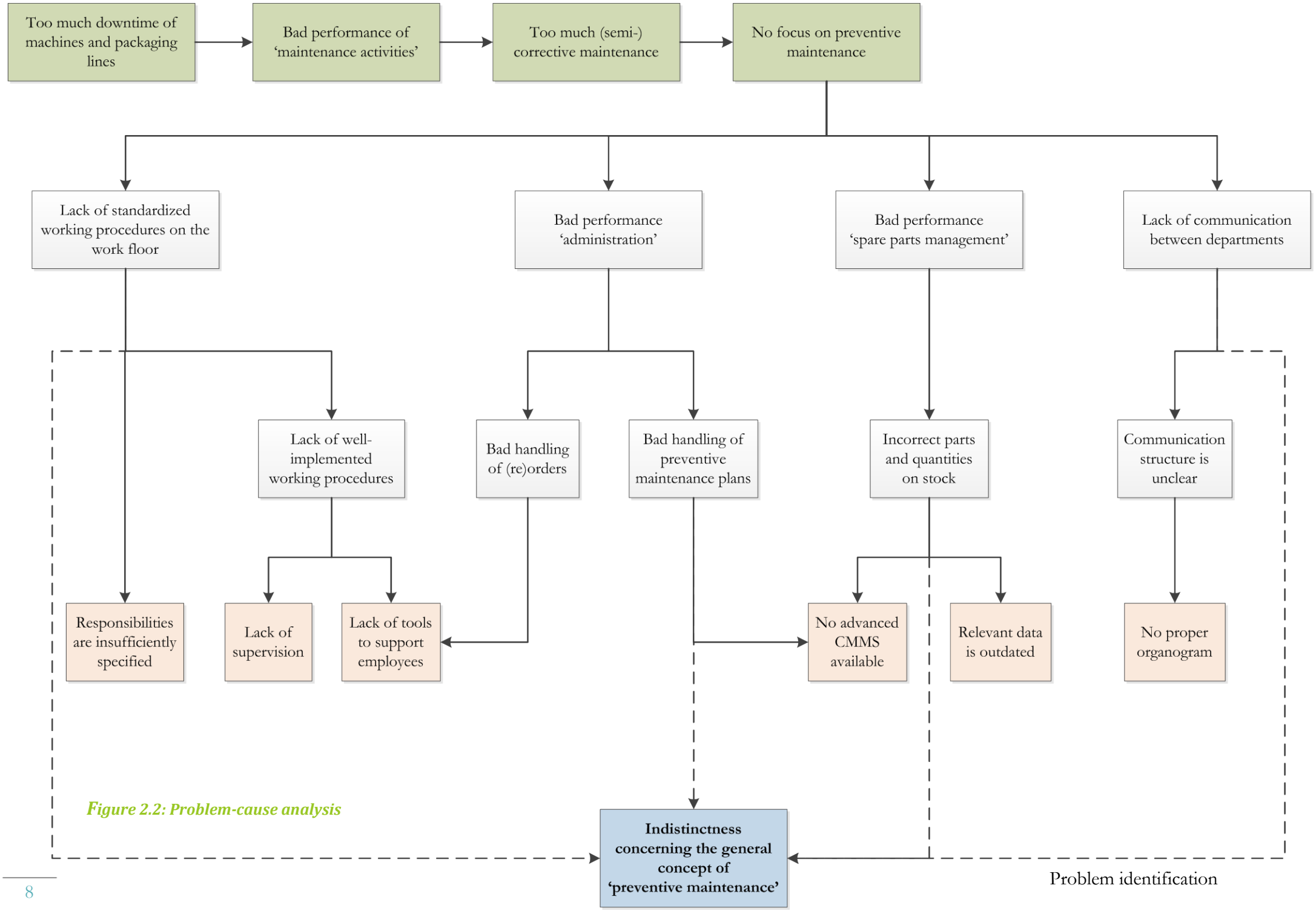


Figure 2.2: Problem-cause analysis

2.2.3. Description of the core problem

We identified our core problem as '*indistinctness exists concerning the general concept of 'preventive maintenance'*. This problem highly influences the main problem, namely the lack of focus on preventive maintenance. We discovered that all employees at the technical department are struggling with this issue and nobody is able to explain what preventive maintenance exactly is. We explain the importance of understanding the concept by discussing Heinekens maintenance philosophy and by discussing several examples.

2.2.3.1. Maintenance philosophy

Within Heineken, the Total Productive Maintenance (TPM) philosophy is adopted and distributed throughout its breweries all over the world. TPM is developed in Japan in the 1970s and focusses on the participation of the technical workforce combined with preventive maintenance techniques. In this philosophy, each operator and technician is responsible for his machine or zone and he will be held responsible for the maintenance and machine performance (Turbide, 1995). This philosophy is being adopted within Brasco as well, but is not yet fully implemented. As TPM is a way of thinking, it does not contain a specified action list for every possible situation. Employees have to understand this way of thinking and translate this to actions at the work floor that are in line with the TPM philosophy. Procedures and tools should be build based on the TPM way of thinking.

The TPM way of thinking is not yet sufficiently adopted within the technical department of Brasco. Personnel at all parts of this department use specific procedures and tools that help them doing their job properly. However, as long as the employees do not understand the importance and meaning of these tools, they are not able to use them according to the TPM philosophy. Currently, they are able to follow the standard procedures, but as soon as something happens that is not within these standards, employees do not understand how they are being expected to act. We discuss several examples in the next paragraph, to highlight the importance of this problem and to explain which employees are involved.

2.2.3.2. Examples of indistinctness

We discovered indistinctness at all parts of the technical department: at the work floor, within the spare part warehouse, at the administration office, and within the communication between these parts. We discuss four examples to explain the importance of the distinctness of the concept of 'preventive maintenance'.

Technicians at the work floor

Moving machine parts are likely to lose their quality and performance as these parts are being used for a long time. These wear parts have a life cycle in which they operate properly and they should be replaced afterwards. An example is the handling of the conveyor belts, which have to be replaced frequently during a maintenance day to prevent a machine breakdown. The quality of these belts is being inspected by the technicians. As soon as the belt reaches a certain low quality level, the belt has to be replaced at the next maintenance day. However, the technicians do not understand the meaning of these quality levels. They detect the low quality, but think: "The machine is still working, why replace this conveyor belt?". The belt is not being replaced and within weeks, an unplanned breakdown occurs due to a failed conveyor belt.

Administrative employees

The guidelines of the supplier of a certain machine advise to replace the oil every month. However, according to the administration, this machine is always running properly and never had problems due to oil consumption. The administrative employee decides to change this frequency to once every two months, because this will save oil and money on the short term. The machine still runs properly and after a few iterations, the oil is only replaced twice a year. There are no problems at the short term, but the life cycle of the machines decreases from 15 to 10 years. The administrative employee does not understand that this is partly influenced by the oil replacement policy.

Spare part management
As there is no clear history of part usage, the employees in the warehouse do not know exactly how many parts are being consumed. However, their experience helps them to understand how much should be on stock and which quantities should be reordered. They know that a certain part is on average being consumed once a year, so they decide to keep one part on stock. They do not verify the exact usage or the work order the part is used on. This work order would have explained that this part is used during a 2-year preventive revision of a machine and that every time, two parts are required. The revision starts and technicians discover that there is only one part on stock. The revision fails due to the unavailability of spare parts.

Communication
There are daily meetings with technicians, administrative, and warehouse personnel. The goal of these meetings is to discuss problems at the work floor, upcoming semi-corrective maintenance, and required preventive maintenance. The administration writes all required activities down and creates work orders to fulfil these activities. However, the technicians had not discussed the required spare parts and these spare parts do not show up on the work order. The warehouse personnel verifies the work order, thinks that no spare parts are required and approve the work order to be executed. During the maintenance day, the required spare parts are not yet available at the work floor and have to be gathered from the warehouse. This takes a lot of time and there is no sufficient time left to perform all planned activities. A lot of maintenance has not been executed.

These examples show the consequences of the indistinctness of 'preventive maintenance'. It is clear that employees do now know how to perform their tasks exactly. For successful implementation of the SAHARA project, we need to find a solution for this underlying problem.

2.3. Problem statement & Research questions

In this section, we define the problem statement, which is based on the identification of the core problem. We continue with defining the research questions that will help to solve the main problem of this research.

2.3.1. Problem statement

Brasco requires a proper implementation of the SAHARA project that ensures the change of focus from corrective maintenance to preventive maintenance. This change in focus can partly be achieved by the implementing several SAHARA guidelines, supplemented by the clarification of the general concept of 'preventive maintenance'. In addition, Heineken would like to improve the quality of its SAHARA documentation.

To be able to achieve these goals, we define the following problem statement:

"Realise a change in focus from corrective maintenance to preventive maintenance of the technical workforce to achieve an improvement of the performance of total maintenance activities of Brasco in Pointe-Noire."

To be able to analyse all factors of the problem, we have to split up this problem statement in several research questions. As stated earlier in this chapter, we focus on the underlying core problem to be able to solve the main problem. We assume that the existing guidelines of the SAHARA project are correct and do not analyse everything again. As the package of guidelines is not sufficiently large to solve the main problem, we focus on extending the guidelines and thereby solve its shortcomings.

2.3.2. Research questions

The management of Brasco makes a strong distinction between corrective and preventive maintenance, but these concepts are vague as they have not yet been specified exactly. In order to change the focus from corrective to preventive maintenance, we need to define these concepts first and understand how this fits in the Heineken way of working.

The second concern is why the concept of 'preventive maintenance' is indistinctness. We need to understand the underlying causes to be able to come up with an approach that helps clarify the concept.

Our final concern is which approach we should use to achieve our research goals: to change the focus from corrective to preventive maintenance. We define the following research questions for these three concerns:

<u>Definition and adoption of concepts:</u>

1. *"How are the concepts of preventive, corrective and semi-corrective maintenance defined within an operating company of Heineken?"*

2. *"How does the adopted maintenance philosophy of Heineken support the main operation goals of Brasco?"*

We answer these questions by the results of interviews and conversations with relevant employees of Brasco and based on Heineken standard documents. These research questions will be answered in Chapter 3.

<u>Underlying causes:</u>

3. *"What is the current maturity concerning 'preventive maintenance' of Congolese employees of Brasco and which factors influence this maturity?"*

We answer this question partly by findings we achieved while working in Pointe-Noire, supported by academic writings. We discuss this research question in Chapter 4.

<u>Approaches:</u>

4. *"What approaches are provided by Heineken to manage the change in focus of the employees' from corrective to preventive maintenance?"*

5. *"What approaches are described in literature that are effective in the management of changing the employees focus from corrective to preventive maintenance?"*

We discuss these two research questions in Chapter 5 to give an overview of all available approaches. With these approaches, we develop a framework that is effective for Brasco to achieve the main research goal.

We reflect on this framework and further improve it by answering the final two research questions in Chapter 7. We compare our framework with our practical experiences during the executing of the project.

6. *"What approaches have been used in practice to manage the change in focus of the employees from corrective to preventive maintenance?"*

7. *"What approaches for successful implementation of the SAHARA project have been used in other African countries?"*

After answering all research questions, we have combined approaches from practice and literature that will be effective and useful for Brasco as well as for Heineken to achieve the overall goals and solve the main problem. This will be based on literature as well as our practical findings, supplemented by existing guidelines of Heineken. The main result of this research is a framework that fits to the situation of Brasco in Pointe-Noire and is able to achieve the main research goal.

2.4. Structure of the research

In this chapter, we analysed the situation of Brasco in Pointe-Noire and described the problems the management is coping with. Furthermore, we identified the core problem as 'the indistinctness concerning the concept of preventive maintenance of Congolese employees'. The main goal of the research is to change the focus of the employees from corrective maintenance to preventive maintenance, by letting them understand the preventive maintenance philosophy properly.

We solve the main problem by defining all relevant concepts according to the Heineken standard way of working. This will be followed by the analysis of why these concepts or not clear and how we can change these people to let them understand the proper meaning. Based on these results, we conclude with a framework that can be helpful for Brasco as well as Heineken in improving the maintenance performance.

Chapter 3 contains the definitions of the concepts preventive, semi-corrective, and corrective maintenance and the way how the maintenance philosophy is adopted within breweries. This is followed by the discussion of the influencing factors of indistinctness in Chapter 4 and an overview of relevant approaches used in practice and literature to solve this problem in Chapter 5. We combine these approaches to develop a framework that is useful for Brasco in Chapter 6. Finally, we analyse the effectiveness of this framework and propose several additions based on practical findings in Chapter 7.

3. Definition and adoption of maintenance

In this chapter, we discuss the first two research questions concerning the definition and adoption of the relevant concepts:

> *"How are the concepts of preventive, corrective and semi-corrective maintenance defined within an operating company of Heineken?"*
>
> *"How does the adopted maintenance philosophy of Heineken support the main operation goals of Brasco?"*

We start with the exact definitions as how they are interpreted by Heineken in Section 3.1, followed by the way the Heineken maintenance philosophy is adopted in Section 3.2. We conclude with a comparison of theory and practice in Section 3.3.

3.1. Definitions

We make a clear distinction between preventive maintenance and corrective maintenance. Semi-corrective maintenance falls in between these concepts and overlap exists. We need to specify these concepts in more detail, before we can continue with the rest of our research. Therefore, we explain the term preventive maintenance in Section 3.1.1, followed by corrective maintenance in Section 3.1.2. Semi-corrective maintenance is discussed in Section 3.1.3.

All definitions are based on Heinekens interpretation of maintenance, which is internally referred to as:

"All activities that are required to ensure that physical assets continue to fulfil their intended functions throughout the lifetime of the assets." (Bello, Van Deursen, & Denis, 2001)

This is in line with the definition used by Gits (1992):

"Maintenance is the total of activities required to retain the systems in, or restore them to the state of necessary fulfilment of the production function."

3.1.1. Preventive maintenance

Within Heineken, preventive maintenance is seen as the most important part of maintenance and has therefore the highest priority. It is internally defined as:

"The execution of inspections and periodic replacements" (Bello, Van Deursen, & Denis, 2001)

This corresponds to 'retaining in' in the definition of maintenance according to Gits (1992).

Preventive maintenance is executed on a frequent basis and applies to all equipment that is used by the brewery. Preventive maintenance plans are usually provided by the supplier of the equipment in order to extend the lifetime of machinery. These plans can contain one or more different activities:

- Physical inspections: making a visual inspection tour of general nature of a great number of inspection points, only in cases where defects are observed actions will be initiated. Physical inspections can lead to corrective maintenance.

- Condition based inspection: maintenance operations under a predetermined agenda that are subject to control measures (auto diagnostics, sensor data, usage indicator, etc.).
- Periodic maintenance: Systematic preventive replacement activities carried out in accordance with a time schedule, depending on the period or number of units used.

Another important part of preventive maintenance is the breakdown analysis. After a breakdown, corrective maintenance is executed. To prevent the same problem to happen again in the future, the underlying causes must be analysed and actions must be executed to solve the cause(s).

Preventive maintenance is always executed during planned time windows and can never cause unplanned downtimes. The main goals of the preventive routines are to reduce the amount of required corrective maintenance and to prolong the lifetime of machinery.

3.1.2. Corrective maintenance

In an ideal situation, corrective maintenance should not exist at all: it is the result of badly executed preventive maintenance. Heineken defines corrective maintenance internally as:

"The reporting and remedy of defects" (Bello, Van Deursen, & Denis, 2001)

This corresponds to 'restoring' in the definition of maintenance according to Gits (1992).

Corrective maintenance is caused by unplanned activities or breakdowns and can be executed on both, planned and unplanned moments in time.

Unplanned corrective maintenance is caused by failures that result in an immediate machine breakdown or safety/environmental danger. These failures are reported directly to the supervisor and the equipment is stopped until the problem has been solved. In case the required spare parts or specific technicians are not available, a temporary solution has to be found and the permanent solution will be implemented during a planned maintenance day.

Planned repairs do not directly hold up the production or cause a direct danger and can be executed during specific maintenance days. The detection of these problems can be the result of preventive physical inspections or by machines that perform not according to normal standards.

3.1.3. Semi-corrective maintenance

Semi-corrective maintenance is not an official concept that is used neither by Heineken nor in literature, but it is used locally by Brasco. Therefore, there is no official definition available and we use our own definition:

"Maintenance that is not completely executed according Heineken standards and results in short-term solutions"

Semi-corrective maintenance has overlap with preventive as well as with corrective maintenance and is mainly focussed on short-term solutions. This includes temporary corrective maintenance caused by the unavailability of required resources (e.g. spare parts or technical expertise), and partly executed preventive maintenance.

Unavailability of resources is caused by bad spare part management or bad technical planning. The direct result is that problems have to be solved by unqualified employees or that critical

machine parts are being temporary repaired instead of being replaced. In practice, many of these solutions are not verified afterwards and often result in another breakdown on the short-term.

Preventive maintenance is often partly executed, due to the unavailability of spare parts or by misunderstanding the specific work order. During inspections and periodic replacements, often only parts that failed are being replaced instead of all parts that are advised by the supplier. These partly executed work orders often result in early failures or shortened life times of equipment.

3.2. Adoption of the maintenance philosophy

Heineken has adopted the Total Productive Maintenance (TPM) philosophy in order to cope with technical issues on the work floor. As TPM influences a broad range of employees within the technical department, we discuss the adoption of this philosophy at Heineken to indicate the importance of proper implementation of standards. We briefly start with an introduction to manufacturing control systems in Section 3.2.1, followed by the discussion of TPM in Section 3.2.2. Furthermore, we discuss how TPM is adopted by Brasco in Section 3.2.3. We conclude with the discussion of the importance of proper understanding of TPM in Section 3.2.4.

3.2.1. Introduction to manufacturing control systems

Manufacturing companies cope with competitive environments in which they have to be efficient and effective to gain annual profit. Therefore, these companies need to structure their activities and to organise the whole company to achieve their main goals in the most efficient and effective way. Since the 1980s, many manufacturing control systems have been developed and are widely adopted by manufacturing companies all over the world. We briefly discuss several widely adopted systems.

Total Quality Management (TQM) is a philosophy that states that every stakeholder within the supply chain should be involved in order to manufacture products with a quality that meets or exceeds customer expectations. These stakeholders include customers, personnel at the work floor, suppliers, and the management. The main focus is on the continuous improvement of the quality of the product as well as the process. This can be achieved by adopting supplier quality management, customer involvement, feedback structures, cross-functional product design, and training (Powell, 1995) (Samson, 1999).

Just-in-time management (JIT) focusses on the reduction and elimination of all kinds of waste during the production. Two main forms of waste are unnecessary delays and breakdowns and work-in-process (WIP). These types of waste can be reduced by the use of a pull-driven production system, JIT delivery schedules by suppliers, cross-functional training, and extensive employee involvement. The main focus is to eliminate unnecessary use of space, time, equipment, workforce, and ingredients (Brown, 1991).

Total Productive Maintenance (TPM) requires the involvement of the complete workforce of a company to maximize equipment effectiveness, with the goal to gain a high production rate at minimum costs. TPM includes focusses on autonomous and planned maintenance, lifetimes of equipment, cross-functional training systems, and employee involvement (McKone K. S., 2001).

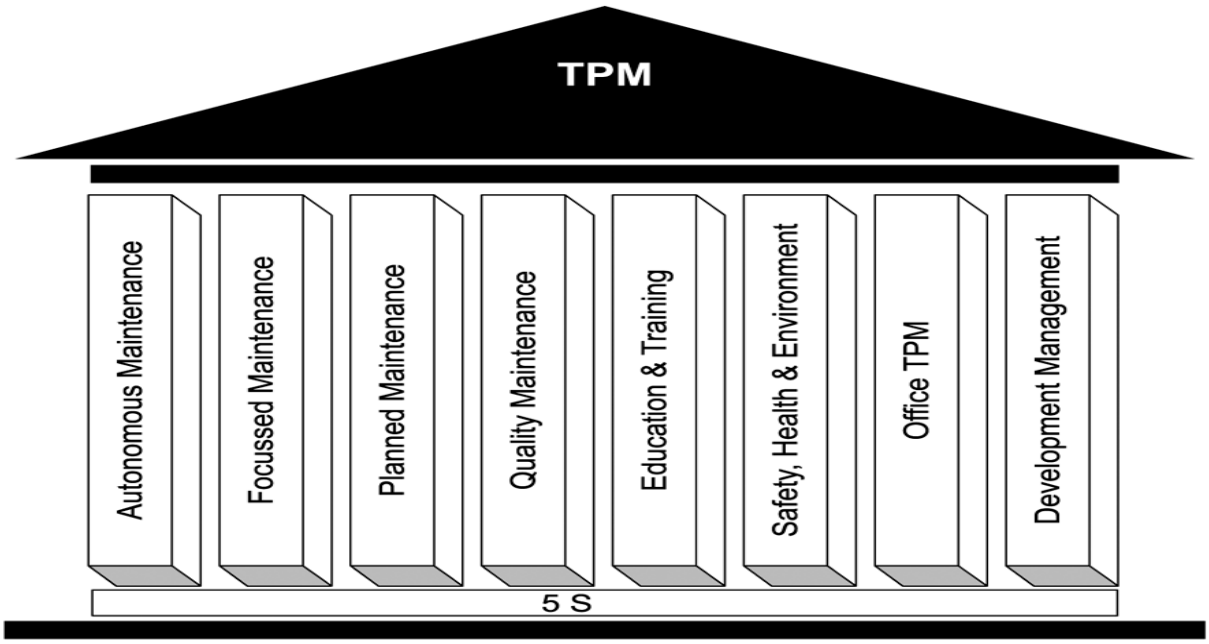
These concepts are all means to support manufacturing companies to achieve their goals in the best way possible. As Heineken has adopted TPM for all its operating breweries, we focus on this philosophy and discuss this in more detail in the next section.

3.2.2. Total Productive Maintenance

Total Productive Maintenance (TPM) is a broadly adopted maintenance philosophy with the goal to maximize equipment effectiveness to gain a high production rate at minimum costs. It is a Japanese philosophy, developed in the 1970s, which has been broadly accepted ever since. To maximize equipment effectiveness, TPM strives to achieve zero defects, zero breakdowns, and zero losses and thereby gain 100% operational uptime of equipment (Ben-Daya, Duffuaa, Raouf, Knezevic, & Ait-Kadi, 2009).

For proper implementation of TPM, the philosophy has been categorized in eight focus points that are referred to as pillars. These eight pillars require all employees within the technical department, including administration and planning, to invest time, adopts new procedures, and to cooperate to achieve the higher goals (Ben-Daya, Duffuaa, Raouf, Knezevic, & Ait-Kadi, 2009).

A visualized overview of these TPM pillars is shown in Figure 3.1 as it is suggested by the Japan Institute of Plant Maintenance. We continue with a brief description of these pillars, including 5S.



Note: Approach suggested by the Japan Institute of Plant Maintenance

Figure 3.1: Overview of TPM

Autonomous maintenance

The main goal of autonomous maintenance is to maximize the skills and responsibilities of operators. They should be able to maintain the equipment they are responsible for. First, equipment conditions are stabilized by teams with production and maintenance personnel. Operators get specific responsibilities and daily tasks to maintain these conditions. This includes cleaning, lubrication control, other checks, and small maintenance tasks. Furthermore, operators are being trained to developed skills and knowledge concerning his specific machine(s) (McKone, Schroeder, & Cua, 1999).

Focussed maintenance

This pillar focusses on the elimination of losses to directly maximize overall effectiveness of equipment and processes. These losses can be categorized into major equipment losses (breakdowns, setup, idle time, and reduced speed), manpower losses (waiting times for instruction / material, downtime / performance loss, measurement loss, and line organisation loss), material loss, and energy loss. The goal is to eliminate or reduce these losses and to achieve efficient utilization of equipment, material, energy, and workforce. This can be achieved by making all relevant personnel responsible for improvements (Krishna, 2001).

Planned maintenance
Planned maintenance is usually performed by the well-trained technicians. As more and more simple tasks are performed by the operators, these technicians have more time to perform the more complex maintenance activities, such as repairs, replacements, or executing counter measures to prevent known problems. The technicians are responsible for the execution of all planned maintenance tasks within given time windows. The main goal is to reduce unplanned breakdowns and focus on planned maintenance, resulting in an increase in equipment availability (McKone, Schroeder, & Cua, 1999).

Quality maintenance
Quality maintenance strives to control the machine conditions such that breakdowns and unnecessary maintenance can be prevented. Within this system, high quality products can be manufactured and delivered without discovering any failures during the process. Standardized condition settings and measurements are used to ensure the quality of the equipment and to detect upcoming problems in an early stage as well as to prevent breakdowns or quality losses. (Attri, 2012).

Education & Training
As discussed before, operators and technicians have to be trained to develop their knowledge and skills to perform autonomous and planned maintenance. However, employees must be trained to detect and reduce losses as well. This is a crucial factor to the success of TPM. Therefore, the main goal of this pillar is to improve the level of technical and management skills of both maintenance employees and operators. (Rodrigues, 2006).

Safety, Health & Environment
Within a manufacturing environment with advanced equipment, dangerous situations may occur. Accidents can happen, as well as environmental pollution, or unhealthy situations for the workforce. Every company should keep targets for zero accidents, zero health damage, and zero pollution, to keep the workplace a healthy and safe environment. This TPM pillar focusses on the compliance of safe working procedures, the prevention of gas and fluid leakages, and hazardous conditions (Ali, 2010).

Office TPM
The main purpose of the TPM office is to provide support to all employees and teams that are involved with TPM. This can be the distribution of guidelines, tools, training, coordination, administration, or planning. Their goal is to manage the TPM implementation and ensure the implementation will succeed. (Aspinwall & Elgharib, 2013).

Development Management
Development management facilitates options to create a system in which people learn from previous failures and gain from experience with existing machines while using new machines.

This part is responsible for gathering and storing information about passed failures, breakdowns, installations, and revisions in order to benefit from this experience in the future. By learning from existing equipment, procedures, and failures, the company can benefit in the future by preventing inefficiencies or unnecessary activities (Ben-Daya, Duffuaa, Raouf, Knezevic, & Ait-Kadi, 2009).

5S

All pillars are supported by the Kaizen 5S framework to ensure procedures and routines are standardized and improved continuously. This support focusses on the elimination of waste in the process or on the work floor, standards for good housekeeping, and standardization. Good housekeeping is referred to as 5S, which includes tidiness, orderliness, cleanliness, standardized clean-up, and discipline. The fundamentals of Kaizen are merged with the TPM philosophy and highly influence all pillars in a supportive way (Yokozawa, 2012).

Heineken has fully adopted the TPM philosophy and has implemented all discussed pillars in a company-wide perspective. In the next section, we focus on the relevant pillars that are within the scope of this research. We discuss the exact adoption of these pillars and name several examples of how this is implemented in practice.

3.2.3. Adoption of TPM at Brasco

As TPM is a maintenance philosophy that only describes the general meaning and goals, implementation issues are not described with much detail. Therefore, Heineken has developed its own standards for adopting TPM at its operating companies. These standards are all in line with the literature discussed in the previous section. At Brasco, TPM has not been completely implemented yet and is still in an early stage. However, the complete TPM philosophy as how it is adopted by Heineken will be implemented on the short term. In this section, we only focus on the pillars that are relevant in the scope of this research and concerns preventive maintenance.

The goal of Brasco is to standardize and continuously improve as much as procedures as possible and TPM is a means to support this goal. Figure 3.2 shows the circulation of the implementation process within Heineken; it is an on-going activity for the whole department. Heineken mainly focusses on the first 6 pillars of TPM and considers Office TPM and Development Management as supporting agencies.

First of all, steering committees have been created to manage every specific pillar and they have set targets and analysed losses. Furthermore, every job position within the technical department has been analysed and tasks and responsibilities have been categorized within the six pillars. Every employee has now a specific role within the adoption of TPM. Currently, employees are being informed about TPM and are trained to use the standard procedures and supporting tools of Heineken at the work floor. Many of the responsibilities, procedures, and supporting tools require employees to cooperate and communicate with others.

Figure 3.2: TPM implementation process within Heineken

The SAHARA project provides many procedures and tools that are based on TPM and will be implemented at the technical department of Brasco. These guidelines mainly focus on the pillars autonomous maintenance, planned maintenance, and quality maintenance. We briefly discuss how these pillars are adopted by Brasco, as these are the most important for this research.

Autonomous maintenance

This pillar focusses on the machine operators on the work floor. The goals of this pillar are to restore deterioration of the equipment, maintain optimal conditions, and autonomous improvement of performance. Operators should be able to maintain their own machines and keep them in optimal conditions.

Standards of Heineken include:

- A system in which operators are able to detect and report failures
- Daily cleaning, inspection, and lubrication standards (CILT)
- Basic maintenance tasks as responsibility of the operator
- Quality points and checks (KPIs) as part of operations
- 5S on the workplace

Combined, these standards increase the responsibilities of the operator and ensure that preventive tasks are executed daily and failures are reported quickly.

Planned maintenance

As discussed before, the goal is to reduce the amount of unplanned breakdowns and be able to perform all maintenance within the planned maintenance time windows. Therefore, the main goals of this pillar are increase plant performance and reduction of maintenance costs. Maintenance as well as production employees are responsible for achieving these goals.

Standards of Heineken include:
- Breakdown reduction
- Minor stops reduction
- Creation of preventive and predictive maintenance plans
- Systematic breakdown analysis, including a 5-why system
- Structured spare parts management
- Communication structure between work floor, administration, and warehouse

This pillar requires cooperation and communication between personnel on the work floor, in the administration office, and in the spare part warehouse to analyse all breakdowns, to plan inspections and repairs for all reported failures, and to ensure the required spare parts are available during planned maintenance.

Quality maintenance
Besides execution of autonomous and planned maintenance, quality standards have to be improved as well. The main goals of this pillar are to eliminate defects, reduce waste, and change from product control to process control. Employees have to focus on the process to achieve these goals.

Standards of Heineken include:
- Failure Mode Effect Analysis (FMEA) to learn from previous failures
- Daily control systems
- Quality checks (KPIs) on the process instead of the products
- Communication structure between chefs and administration

These methods ensure that all breakdowns are analysed and communicated to prevent the same failures at similar machines. Many KPIs indicate the quality of the process and have to reach a certain level. Moreover, frequent communication between all the chefs and the administration office ensures that problems and solutions are discussed and are able to prevent new failures.

The overall goal of autonomous, planned, and quality maintenance is to prevent failures and improve the process. All standards are focussed on prevent corrective maintenance, to better maintain the machinery and to further improve the process.

We do not discuss the adoption of the other pillars of TPM within Brasco, as those are not relevant in the scope of this research.

3.3. Comparison of theory and practice

Meanwhile it is clear how the different types of maintenance are defined, what the purposes of TPM are, and how this is adopted at Brasco. In this research however, we deal with the indistinctness of the concept of 'preventive maintenance'. Therefore, we discuss the importance of the distinctness of TPM within Brasco and how this relates to preventive maintenance.

TPM is not a clearly defined list of actions, but a company-wide philosophy that has to be adopted by all technical employees. Heineken has provided Brasco with many tools that help employees understand how standard procedures should be executed. However, they should be able to react according to the TPM way of thinking on nonstandard events as well.

Autonomous maintenance is one example in which many nonstandard events happen. In fact, every breakdown is a nonstandard event and the operator should be able to make the right decisions. Whether he should repair the failure or report it to his supervisor for further analysis. Subsequently, the supervisor and the administration office should analyse whether the failure could have been prevented by executing the correct preventive maintenance.

Every action on the work floor influences other employees as well. Everyone is connected and employees have to understand the whole system in order to understand what influences their actions have on other employees. As there are many communication structures to discuss technical problems and solutions, employees have to understand which information on a specific problem is relevant to others.

Brasco is not operated by a group of individuals, but by a technical team that should closely cooperate to reach their goals. TPM focusses on improving the system *together*. Therefore, it is very important that everyone within this team understands what his own responsibilities and tasks are, as well as the responsibility and tasks of his colleagues. Besides, everyone should understand how he can help to improve the whole system. We state that the distinction of the concept 'preventive maintenance' is a key success factor of TPM.

3.4. Summary

In this chapter, we answered the first two research questions. We started with the question *"How are the concepts of preventive, corrective and semi-corrective maintenance defined within an operating company of Heineken?"*. We defined the concepts of maintenance, preventive maintenance, corrective maintenance and semi-corrective maintenance. With these definitions in mind, we discussed several manufacturing control methods and, specifically, the TPM philosophy and the way Brasco has practically adopted this philosophy within its production process. This answered the second research question: *"How does the adopted maintenance philosophy of Heineken support the main operation goals of Brasco?"*

It has become clear that preventive maintenance is a very important part of TPM and is able to reduce the amount of corrective maintenance. We finished this chapter with discussing the importance of the distinctness of the philosophy. TPM is a company-wide philosophy in which everyone is related and all actions influence other employees on the work floor. Together, the employees can improve the system and they have to understand the whole concept to make this happen.

In Chapter 4, we will discuss the influencing factors of the current maturity of the concept of 'preventive maintenance'. After this, we are able to look forward to an approach to solve the main problem of Brasco.

4. Influencing factors of current maturity

Currently, there is insufficient focus on preventive maintenance within the technical department and the current maturity of this concept by the local employees is underdeveloped. Therefore, the annual goals of Brasco are not achieved and the maturity of preventive maintenance has to be improved. There are many factors that influence this current level of maturity and that cause the low level. In this chapter, we answer the research question concerning the underlying causes of the current low level of maturity:

> *"What is the current maturity concerning 'preventive maintenance' of Congolese employees of Brasco and which factors influence this maturity?"*

We answer part of this research question by doing a PEST-analysis, in which political, economic, social, and technological factors are reviewed (Peng & Nunes, 2007). As the economic and technical factors do not influence Brasco concerning the current maturity of preventive maintenance, we only discuss the political and social aspects. This is supplemented by educational factors, as the low level of education in Congo is a big problem since many years (Cornu, 1995). Moreover, we discovered historical aspects of Brasco that are relevant.

We discuss the historical differences between the breweries in Pointe-Noire and Brazzaville in Section 4.1, followed by the educational level in Section 4.2. We continue with political aspects in Section 4.3 and social and cultural aspects in Section 4.4. We conclude with the factors that we are able to influence in Section 4.5. These discussions are based on our practical experience in Pointe-Noire, supported by academic writings and demographic values.

4.1. Differences between the breweries

As stated in Chapter 1, Brasco contains of two breweries: Pointe-Noire and Brazzaville. The organisation of these breweries is similar, as well as the size and turnover. Both breweries are managed by the same managers (expatriates from The Netherlands and France) and are based in the same country. Besides, both plants operate with similar equipment of the same suppliers of more or less the same age. However, the results are different. The brewery in Brazzaville has achieved better results during the past few years. In this brewery, the SAHARA project has already been fully executed (started in 2011) and fewer difficulties were discovered during the process. Based on our experiences during the project and on interviews with several top-level managers, we state that preventive maintenance in Brazzaville is far more developed in comparison to the brewery in Pointe-Noire. This directly influences the annual results of the brewery as a whole.

We have discussed the topic of the maturity of preventive maintenance with the installation manager of Pointe-Noire, who has worked for years in the 1990s in Brazzaville. He works with many Congolese employees within the technical department and he discovers big differences between the employees in Pointe-Noire and the employees in Brazzaville. In Brazzaville, the main concern is the maturity of preventive maintenance is much further developed. Therefore, preventive maintenance has better results in Brazzaville, while there has been the same level of training and supervision.

The main cause of this difference can be explained by the history of the both breweries. Heineken has been operating in the brewery in Brazzaville since 1968 and has always been

managed by European employees from Heineken ever since. Heineken was an early adopter of the preventive maintenance concept and this has always been one of the main focus points within its operating breweries. Therefore, there has been a strong focus on preventive maintenance within the brewery in Brazzaville since 1968.

On the contrary, the brewery in Pointe-Noire was owned by Kronenbourg since 1962 and managed by European employees from Kronenbourg as well. However, the main focus of Kronenbourg has always been on a high production level and they have never had such a strong focus on preventive maintenance as Heineken had. Back then, the organisation and operation of the breweries were totally different as well as the results. Both breweries achieved good results, but on their own way of working.

Since 1994, both breweries are owned by Brasco, which is 50% Heineken and 50% CFAO. Heineken is fully responsible for the technical department and the results of its operations. Therefore, Heineken has transformed the way of working in Pointe-Noire into Heineken standards and has changed the main focus to preventive maintenance. Summarized, we can state that the focus on preventive maintenance in Brazzaville has been developed since 1968 and the focus in Pointe-Noire since 1994.

However, this transformation has been realised almost twenty years ago and has still large influences in the way of working. We consider this as the only explanation of the differences between Brazzaville and Pointe-Noire. Currently, most employees of Brasco are already working for the company since the 1970s or 1980s and they are still used to the working procedures of the old Kronenbourg environment. Furthermore, many parents of the current employees have worked for Brasco as well and are also used to the old way of working. This explains why the old Kronenbourg procedures and focus points are still influencing the current way of working within the brewery in Pointe-Noire.

4.2. Educational level

The educational level of the Congolese people is very low compared to western European standards. First of all, the education level of sub-Saharan countries is very low compared to European or Asian countries. Moreover, the average educational level of Congo is below average within this sub-Saharan region (Maslak & Anisimova, 2006). Worldwide, Congo is ranked based on educational quality at place 142 and classified in the lowest region (United Nations, 2013). There is only one university located in Brazzaville and many people are not able to go to the university, because of financial or geographical reasons. Furthermore, the civil war during the 1990s has influenced the quality of education negatively (Unesco). Some Congolese people with enough financial resources decide to study abroad in Ghana or South-Africa. The quality of education is much higher in these countries, but there are not many Congolese people that have the financial resources. On average, Congolese people follow 10 years of education from primary to tertiary education (CIA, 2012).

As the unemployment rate in Congo is over 50% (CIA, 2012), it is relatively easy for Brasco to hire employees who went to the university in Brazzaville or a university abroad. Only Congolese people who have been studying abroad are eligible for a management function in practice. Compared to the same functions in western breweries, the required level of these management functions is much higher. Because of the scarcity of well-educated people, under-educated Congolese people have to fulfil these management functions. To indicate the low level of education of people who studied in Brazzaville, the graduates from this university can get a job as

operator of one or more machines. Before they can start, they have to participate in a three-month training program to gain the required level of knowledge. In a Heineken brewery in Europe, those functions are fulfilled by employees without or with a low-level education.

We can state that it is a very complicated task to fulfil job positions without Brasco with people that meet the educational requirement of that position. This results in positions with employees who are relatively well-educated, but who do not have the required educational certificates. As this is a problem at almost all positions within the brewery, almost all positions are filled with under-educated employees compared to the requirements. As the main focus of the brewery in Pointe-Noire has changed to preventive maintenance since 1994, people need to change as well. We discover that, partly because of educational issues, the Congolese workforce was not able to manage and implement these changes in a proper way and have not yet succeeded.

4.3. Political aspects

Brasco has to cope with two important political aspects that influence their way of operating: labour unions and human resource management. Both aspects are problematic by getting the right people at the right position within the company. We start with the discussion of the issues with and consequences of the labour unions in Congo in Section 4.3.1. This is followed by the political influences concerning human resources within the company in Section 4.3.2.

4.3.1. Labour unions

The Republic of Congo was a former French colony and still has many French influences. One of these influences is the power of labour unions, which have a very strong bargaining power (Comité national, 2011). The main part of the labour union system in Congo is copied from France, which has led to a very strong position for employees. We discuss the most extensive influences for Brasco.

As soon as employees receive a permanent contract, the unions require Brasco to meet standards concerning safety, salary, health, and training that are in line with the market standards. Brasco does not have any issues with meeting these standards. However, the position of the unions is so strong, that it is practically impossible to terminate or change a permanent contract of an employee. Even underperformance, absence, sleeping at work, or stealing cannot be a reason to terminate a contract or to replace the employee to a lower position. As soon as Brasco has offered the employee a permanent contract, the unions require Brasco to cope with these problems and find a solution. Even in cases that an employee has followed several trainings and is still underperforming, he cannot be replaced. The same holds for stealing or sleeping at the work place.

As we already discussed in the previous section, the low level of education may result in employees that fulfil a position and do not meet the educational requirements. It often happens that these employees cannot be further trained and have to be replaced to a lower position. The unions do not allow these movements if the specific employee does not agree with this repositioning. The process of convincing the labour unions that specific employees have to be fired or replaced takes a long time and is very difficult to almost impossible.

For example, we can look at the technicians in the machine room. Until 2010, these technicians have always been working with old equipment and performed a lot of manual labour. In 2010, this machine room has been replaced by more advanced machines. Afterwards, the technicians have been trained, but most of them are not able to adapt to these advanced machines. Brasco

has already found other technicians that meet the requirements and would like to move the current technicians to another department. However, when those technicians do not agree, Brasco is not allowed to move them. This results in very problematic situations with the new machinery. Therefore, this new and expensive machinery is currently operated by under-educated employees and there is a highly increased risk for breakdowns and failures.

The large number of temporary workers within the brewery is a secondary effect of the strong bargaining power of the labour unions. As it is practically impossible to move or fire employees, Brasco decided to hire many temporary workers. Currently, around 40% of the workforce is temporary. These employees are low educated and do not have much knowledge of their work field. Therefore, many positions within the technical department are fulfilled with temporary workers who are under-educated, which leads in the end to underperformance of the whole technical department.

4.3.2. Human resource management

The department of human resource management (HRM) copes with many complexities concerning educational issues. Their biggest issue is that it is not possible to offer a contract to everyone who is capable to perform the job. Companies in Congo have to cope with a high level of corruption, which increases the complexity of doing business (Standing, 2007). Currently, Congo is ranked at place 144 out of 176 in the corruptions perceptions index (Transparancy International, 2012).

As soon as Brasco has an open position for a job, the HRM department has to contact the municipality of Pointe-Noire. This municipality develops a list with people who are allowed to apply for the specific job and Brasco has to invite them for the job application. Usually, out of this list someone has to be chosen. It may happen that the HRM manager decides that no one on the list is capable of performing the job and only then he is allowed to invite other people for the job interview. However, even then the mayor of Pointe-Noire can influence the final decision. In practice, it often happens that family members or close friends of powerful people (e.g. the mayor or the HRM manager) are contracted instead of the applicant with the best score or best résumé.

We state that it is very difficult to contract the best people for a specific job and that it frequently results in the contracting of under-educated people because of political influences.

4.4. Social and cultural aspects

During our research, we discovered several interesting aspects that influence the level of ambition and motivation of Congolese employees. Before we discuss these aspects, we need to discuss the differences between the Dutch and Congolese culture in more detail first to get better insights in Congolese reasoning.

4.4.1. Cultural dimensions

In this section, we perform a comparison between the dimensions of the Congolese and Dutch culture, in order to get better insights in de differences between Congo and The Netherlands. We use the five main dimensions that are described in the model of Geert Hofstede (2006). This is a powerful tool to compare cultural differences between countries.

Hofstede (2006) defines these cultural dimensions as follows:

- *Power distance*
  - *The degree to which the less powerful members of a society accept and expect that power is distributed unequally*
- *Individualism vs. collectivism*
  - *The degree of interdependence a society maintains among its members*
- *Masculinity / Femininity*
  - *The extent to which society is driven by competition, achievement and success (high score, masculinity), or by caring for others and quality of life (low score, femininity)*
- *Uncertainty avoidance*
  - *The extent to which the members of a culture feel threatened by ambiguous or unknown situations and have created beliefs and institutions that try to avoid these*
- *Long term orientation*
  - *The extent to which a society shows a pragmatic future-oriented perspective rather than a conventional historical short-term point of view*

Hofstede analysed these dimensions of the region West Africa, which is based on Nigeria, Ghana, and Sierra Leone. Unfortunately, there is no specific data about Congo available. However, this West-African region can be used as a reliable indicator of Congolese values. We discuss all dimensions based on the scores of Hofstede that are displayed in Figure 4.1 (Hofstede, West Africa, 2012). Scores can vary between 0 and 120.

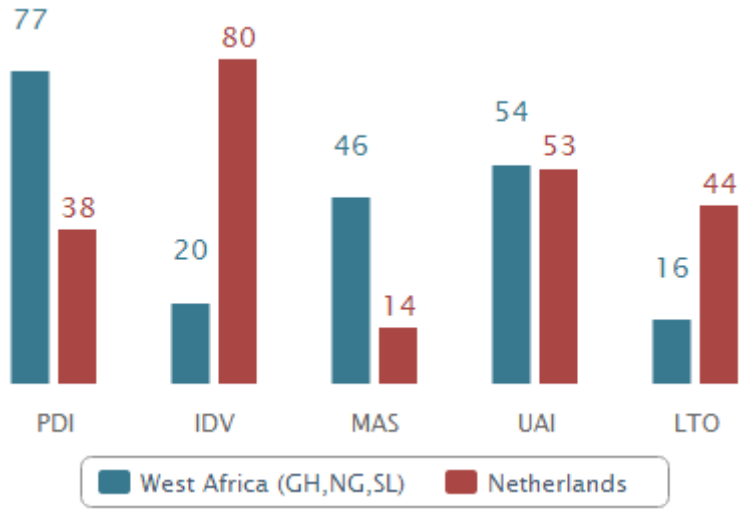


Figure 4.1: Hofstede comparison of West Africa and the Netherlands

Power distance (PDI)

A high score indicates that less powerful people expect that power is distributed unequally. In societies with a low score, people strive to equalise the distribution of power. With a score of 77, West-African people accept a hierarchal organisational structure that reflects inequalities in which everybody has its own role without further justification. Power is centralized, which results in Congolese employees that are used to being told what to do by an autocrat manager.

At the other hand, Dutch people use hierarchy for convenience only and are independent, have equal rights, superiors are accessible. Power is decentralized and managers are being seen as consultants and considered as equals. Organisational relationships are informal and on a first name basis.

Individualism (IDV)
A high score indicates that people are very individualistic and have a loosely-knit social network. Collectivistic societies with high scores represent tightly-knit relationships in which families and groups are very important. The low score of 20 indicates a collectivistic society with close groups that have very strong commitment to its group members. There are strong relationships in which loyalty and taking responsibility for fellow group members is very important. Decisions are made based on the influences on the whole group instead of a specific person. Offence leads to shame or loss of face,

The Netherlands has a very individualistic society in which individuals take care of themselves and immediate family members only. Offence leads to less of self-esteem and guilt.

Masculinity / Femininity (MAS)
The high score (masculinity) represents a preference for achievement, assertiveness, and material reward for success. A feminine society prefers cooperation, caring for the weak, and quality of life. With a score of 46, West-Africa is considered a relatively feminine society in which the focus is on 'working in order to live'. Status is not important and people focus on well-being, having free time, and flexibility.

The Netherlands has a very feminine society in which people focus on a well-balanced life/work ratio. Managers are supportive and employees are involved in decision making. The Dutch are known for their long debates until consensus has been achieved.

Uncertainty avoidance (UAI)
This is the degree in which people feel uncomfortable with uncertainty and ambiguity. West-Africa and The Netherlands have both a high preference of uncertainty avoidance. These cultures know a strong need for rules, people work hard, and innovation may be resisted. Security is a very important factor concerning individual motivation.

Long term orientation (LTO)
Short-term societies with a low score want to establish have great respect for traditions, focus on quick results, and do not focus on the future. Long-term societies adapt traditions to changed conditions and save money and resources for the future. With a score of 16, West-African people are very short-term oriented concerning careers, relationships, and savings. The Netherlands are, with a score of 44, also short-term oriented and have a strong impatience for achieving quick results and a strong concern with establishing the truth.

Summarised, we can state that there are many differences between West-Africa and The Netherlands concern the Hofstede dimensions. The only correspondence is the level of uncertainty avoidance. All other dimensions show big differences. West-African employees accept a strong hierarchal structure in which they are being told what to do and inequalities are common, while Dutch employees are used to a more informal and cooperative structure in which everyone has equal rights. Furthermore, West-African people have strongly related groups and take responsibility for the group as a whole. Dutch people are very individualistic and take care of themselves. Besides, Dutch people have a long-term orientation while Congolese are very short-term oriented.

4.4.2. Level of ambition and motivation

During our research in Congo, we discovered a strong lack of motivation and ambition of the Congolese employees. They did not seem to be motivated to perform their jobs at the highest level as possible, were sleeping very often during business hours, and there was no ambition to achieve a high self-esteem or to create possibilities to get a better position within the company. Furthermore, they are not open for changes in their working procedures or culture. We consider this as an enormous barrier in achieving the main goal: changing the focus to preventive maintenance and ensure that everyone adopts this changed mind-set properly.

We discuss the causes of the lack of ambition and motivation based on the cultural dimensions of Hofstede followed by the influences of labour unions. Finally, we discuss several organisational aspects that influence the level of motivation.

4.4.2.1. Cultural dimensions

We can relate many causes of the lack of motivation and ambition to the cultural dimensions we discussed in the previous section. Congolese employees are not highly motivated to desire a better function within the organisation. Therefore, they are not highly motivated to perform their jobs very well. For them, it is sufficient to do the basic tasks and nothing else extra.

This is partly related to the high preference of avoidance of uncertainty. They accept their current position and are not willing to take the risk to get promoted to a position they may not be capable of. Besides, due to the femininity, Congolese employees do not consider status or a high self-esteem. They would like to have as much as free time and flexibility as possible and if they get promoted, they often have to work harder. Moreover, the collectivistic society expects people to take responsibility for their families. As soon as an employee has a sufficient salary to support the whole family, there is no motivation to gain a higher salary.

The very hierarchical organisation and the enormous inequalities between managers results in a dutiful way of working. Employees are used to execute exactly what the manager commands them to do and they are not used to extent their responsibilities and to start acting on their own. Their supervisor should do this for them. This highly influences the guidelines of TPM, which requires operators and technicians to extent their responsibilities and tasks.

Finally, Hofstede states that Congolese people are very short-term oriented and focus for quick wins. Therefore, they decide to do nothing else extra besides their daily tasks and do not think on a long-term basis about their future.

4.4.2.2. Labour unions

The labour unions are a very important aspect in the level of motivation. We have already discussed that Congolese unions have a very strong bargaining power and that companies are not able to fire or replace employees that are underperforming. Underperformance, sleeping during business hours, or even stealing cannot be used as a reason to fire or replace employees. This results in employees that are not motivated to perform their jobs very well. As soon as they received a permanent contract, they know for sure that they can stay with the company until their retirement. There is not much ambition to get promoted to a higher position within the company, employees earn sufficient money to support their families, and the labour unions ensure them that they cannot be fired. Therefore, they are not motivated to perform their jobs at

a high level. There is no reason to work harder or to compete with colleagues, because there is no willingness to get promoted.

We can state that the combination of cultural aspects and the position of labour unions results in a low level of motivation and ambition of Congolese employees. This is considered as a barrier to achieve the main goals: changing the focus to preventive maintenance.

4.4.2.3. Organisational aspects

Within the organisation of Brasco, there are several factors that influence the level of motivation and ambition of the employees. First of all, there is not much potential for growth. Even if employees want to grow within the organisation, the options are very limited. Most employees fulfil their positions for decades and are not willing to move to another position or to move to Brazzaville. Therefore, the number of vacancies is very limited.

Secondly, there is no bonus and punishment system within the technical department. Employees cannot earn a bonus if they exceed expectations or perform above average. In practice, employees who perform their jobs very well will get even more tasks and have to work more hours per week. Besides, employees cannot be punished if they are underperforming or lacking to do all their tasks.

Thirdly, managers are not used to verify the tasks performed by their workforce. If an employee promises his manager to perform his tasks, the manager assumes that this will be done properly. There are no frequent controls and this results in many employees who do not fulfil all their tasks.

4.4.3. Working structure

The final cultural difference between Congolese and Dutch employees is the way how people structure their work. Dutch people are used to work with tight planning schedules, have a lot of structure in their working procedures, have many communication structures, and are very strict in dealing with time. If a meeting starts at 08h00, everyone is expected to be present at 07h59. Moreover, as Dutch people have a strong focus on causes and effects, they have a strong focus take action before something breaks down or happens. They act pro-active (preventive) instead of reactive.

Congolese employees perform their jobs with much less structure and standard procedures. They are not used to tight schedules or many meetings. They are goal-oriented, but do usually not consider time as a restriction. Therefore, deadlines are considered as soft restrictions and it is no problem that deadlines are not met. Moreover, they respond in a reactive way and there is no focus to prevent events from happing. Their mind-set is mainly: “if it aint broke, don’t fix it”.

These differences in working structure highly influence the introduction of European tools and philosophies in an African business environment. These tools and philosophies are being accepted by European people, but are interpreted in a total different way by Congolese employees.

4.5. Analysis of aspects

We discussed the main aspects that cause the current low level of maturity. We present an overview of the underlying aspects that cause the current level of maturity of preventive maintenance in Figure 4.2. We consider four categories of factors that influence the maturity of preventive maintenance. First of all, the education that has a low quality and results in many people that not meet the requirements. Secondly, there have been historical differences between the two sites that influence the mind-set of the workers. Thirdly, politics are involved concerning the human resource management and labour unions. And finally, there are social factors that influence the working structure of the Congolese people as well as their level of ambition and motivation. This low level is the result of the influences of labour unions, cultural differences as described by Hofstede, and organisational shortcomings.

All these aspects can be split into two categories: aspects that we, realistically speaking, can influence and aspects that we cannot influence. We consider the historical differences between the breweries and the political aspects as factors we are not able to influence. Furthermore, we neither can influence the quality level of Congolese educations. However, we are able to train employees to improve their level and to prepare them for their jobs. Moreover, we are able to influence the social and cultural aspects as these aspects are mainly influenced by internal factors.

Therefore, we will focus on the following aspects:

- Educational level
  - People do not meet educational requirements
- Social & cultural aspects
  - Level of ambition and motivation
  - Organisational shortcomings
  - Working structure

4.6. Summary

In this chapter, we identified the underlying causes of the current maturity concerning 'preventive maintenance' by answering the research question *"What is the current maturity concerning 'preventive maintenance' of Congolese employees of Brasco and which factors influence this maturity?"*

We discussed the historical differences between the brewery in Pointe-Noire and the brewery in Brazzaville, followed by the educational problems in Congo. Furthermore, we discussed the position of the labour unions and the corruption concerning political aspects. We finished with the discussion of social and cultural aspects, which influence the motivation and ambition levels of the Congolese employees. We made a link with the cultural dimensions of Hofstede, the labour unions, organisational issues, and the working structure of Congolese people. We conclude with the factors of which we are able to influence.

We have defined and discussed all relevant concepts and implementations in Chapter 3 and we have discussed the influencing factors of the current maturity of preventive maintenance. In Chapter 5, we discuss the standard tools of SAHARA and perform a literature search in order to find approaches that are effective in the management of changing the employees focus from corrective to preventive maintenance

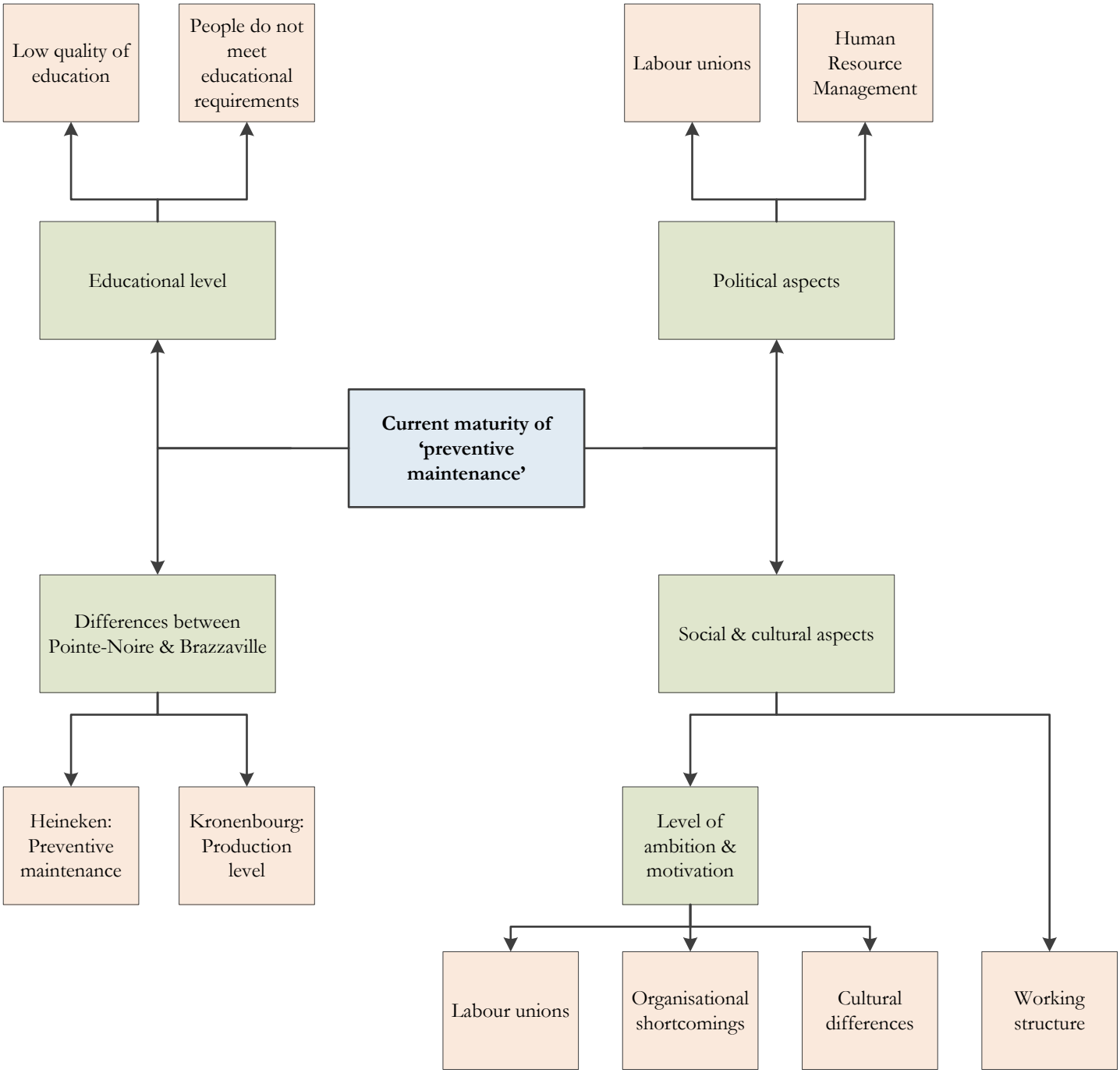


Figure 4.2: Overview of underlying causes current maturity 'preventive maintenance'

5. Analysis of possible change approaches for Brasco

In this chapter, we focus on relevant approaches that may be effective for the change in focus in Pointe-Noire. Therefore, we discuss relevant approaches that are provided by Heineken, supplemented by academic approaches to change management, leadership styles, and we discuss how the underlying causes discussed in Chapter 4 can be influenced according to literature. We start with the first research question, concerning available approaches:

> *"What approaches are provided by Heineken to manage the change in focus of the employees from corrective to preventive maintenance?"*

We discuss multiple methods that are able to cope with the low educational requirements, the working structure of Congolese employees, and the organisational shortcomings. We continue with the second research question, concerning academic approaches:

> *"What approaches are described in literature that are effective in the management of changing the employees focus from corrective to preventive maintenance?"*

We discuss approaches that help us to cope with social and cultural aspects. The goal is to find approaches that aim to increase the level of motivation and ambition of the Congolese employees, improve the working structure, and cope with the low level of education.

Combined with the practical barriers, we discuss and develop an improved approach for Heineken in Chapter 6. We start with the practical tools that are provided by Heineken to support the SAHARA project in Section 5.1. We continue with a literature review starting with the definition of change and change management in Section 5.2, followed by the clarification of the change process in Section 5.3. In Section 5.4, we discuss multiple change management frameworks, followed by different styles of leadership in Section 5.5. We finish with discussing specific approaches to cope with the underlying causes of the maturity in Section 5.6.

5.1. Standard tools SAHARA

In this section, we discuss the tools that are provided by the SAHARA project. These tools are used by all African breweries and are more or less customized locally. However, the overall goals are the same: make use of these tools to support local employees in structural execution of their jobs and gain a strong focus on preventive maintenance.

Cleaning the database of the current CMMS

Every brewery should make use of an advanced computerized maintenance management system (CMMS). This information system contains relevant data concerning spare parts, (re)orders, equipment of the brewery, preventive maintenance plans, revisions, work orders, suppliers, historical usage of spare parts and execution of maintenance, etc. A common problem within African breweries is that the data in this CMMS is otherwise outdated, incomplete, or both. The cleaning of the database is one of the first goals of the SAHARA project, as this is the basis for all further implementations. Proper use of the CMMS provides the employees with more structure in their work.

Order tracking tool

All (re)orders of parts within African breweries are handled by Ibecor, which is a business unit of Heineken that manages all contacts with suppliers of foreign breweries. The brewery has to provide Ibecor with relevant demand data and detailed descriptions of parts. However, all orders

have to be approved multiple times by a manager and supply chain director and this may be problematic due to unavailability. Moreover, due to the lack of internal communication structures, many problems exist within this ordering process. This may lead to excessive lead times between demand and delivery, which may take up to one year. To eliminate these internal problems and improve the contact with Ibecor, an order tracking tool is developed in which the administration office can track down all open orders with the main goal to reduce lead times. As soon as a specific stage in the process takes too many days, a message pops up and action can be taken. This tool improves the working structure.

Weekly planning schedules

Many African employees are not used to make use of tight schedules and standardized planning schedules. Besides, frequent meetings do not exist or not all relevant people participate in these meetings. Moreover, even weekly maintenance days are not planned on specific days and are randomly executed. The SAHARA documentation provides standardized weekly planning schedules for everyone within the technical department, including meeting structures with all relevant people, planned maintenance days, daily maintenance activities, etc. Even the agendas of the frequent meetings are standardized, including points of discussion, KPIs, and goals. These guidelines support local employees in a structured execution of their jobs. The implementations of these schedules is able to solve the organisational shortcomings and increases working structure.

Planning tool for planned maintenance

As weekly planning schedules have never been used before, the preparation and execution of planned maintenance is problematic as well. Therefore, a planning tool has been developed to support the planning department with the development of daily planning schedules. This planning tool supports the planner to organise all relevant maintenance activities and make a planning schedule for two weeks in advance. With this tool, he can estimate how much time is required to execute all maintenance tasks and prioritise activities to ensure that the most important tasks are executed first. As the planner can make use of a structured approach and he is able to develop planning schedules in advance, the maintenance activities can be prepared before the start of a maintenance day as well. This tool increases the structure of the maintenance days.

Work preparation area

To benefit from the planned activities for the maintenance days, a work preparation area must be created. This area provides the possibilities to prepare all work orders that have to be executed during the upcoming planned maintenance days. Many work orders require specific utilities, spare parts, permits, or experienced staff before they can be executed. In practice, these requirements are collected during the maintenance day instead of being prepared, which takes a lot of valuable time. The main goal of this area is to centralise all work orders, which can be verified by the warehouse personnel who can collect all required parts and tools. As soon as these parts and tools are collected in the preparation area, the work order can be 'activated' and technicians can collect them to execute the maintenance tasks.

Maintenance routines & procedures

As soon as the supporting tool has been implemented, the complete technical workforce can be trained to start using standardised working procedures and routines, mainly based on maintenance activities. At every brewery, all procedures and routines of all personnel within the technical department are analysed and transformed into standardised procedures. This includes

the handling of spare parts, (re)orders, maintenance planning, revisions, frequent activities at the work floor, daily cleaning, health & safety standards, etc. As we have not yet implemented many of these procedures during our stay in Pointe-Noire, we will not discuss these standards with much detail. The routines and procedures increase the working structure of the employees and is able to cope with the educational level as well. Due to the standardised methods, employees are no longer required to fully act based on their knowledge and experience.

Combined, these tools provide much support for the technical work force of African breweries in structuring their working procedures and achieving their goals. The SAHARA package is very effective in supporting employees and to cope with the low level of education, improvement of working structures, and organisational shortcomings. However, the way these tools are implemented and how employees focus can be changed into preventive maintenance has not yet been discussed. We discuss this aspect in the next section.

5.2. Definition of change

The main goal of our research question is to find effective approaches to change Congolese employees and to manage this process. To clarify the meaning of change and change management, we use two definitions for both concepts that supplement each other.

Change is defined as:
"an act or process through which something becomes different" (Oxford Dictioniaries)
"an ever-present feature of organisational life, both at an operational and strategic level" (Burnes, 2004)

Change management is defined as:
"the management of change and development within a business or similar organization" (Oxford Dictioniaries)
"the process of continually renewing an organisation's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers" (Moran & Brightman, 2001)

Applied to the situation of Brasco, we combine these definitions as follows:

- *"Change is an organisational process through which things become different, both at an operational and strategic level"*
- *"Change management is the management of the process of continually renewing an organisation's direction, structure, and capabilities"*

With these definitions in mind, we focus on academic approaches to realise the required changes by proper and effective change management.

5.3. The change process

Around 70% of all change processes within organisations tend to fail. Many of these change processes fail due to internal or external resistance of change (Del Val, 2003). The resistance to change is widely recognised and many frameworks are developed to reduce this resistance. We start with clarifying how stakeholders experience several phases of the change process. In Section 5.3.2, we briefly discuss an effective method to consider the existing resistance to change and the risk of a failed project.

5.3.1. Four phases of change

Many change projects fail due to resistance from the stakeholders. To be able to cope with these stakeholders, they have to be informed and supported in a structured way. The transformation of people during a change process can be categorised in four phases:

1. Denial: people ignore changes or deny that changes influence them
2. Resistance: people admit that changes influence them, but they do not want to change. They feel lost or hurt and they resist against any form of change.
3. Exploration: people start to discover the specific influences and start looking for possibilities and exploring new alternatives.
4. Commitment: people are committed to the changes and focus on the future with a new vision, cooperation, and goals.

This model is visualised in Figure 5.1. These phases are important in every change process and are helpful to understand how people think and act. The change manager should use a very careful approach to remove resistance against change and to motivate stakeholders to explore and get committed. As soon as everyone is committed to the changes, the process can be considered successful (Mowat, 2002).

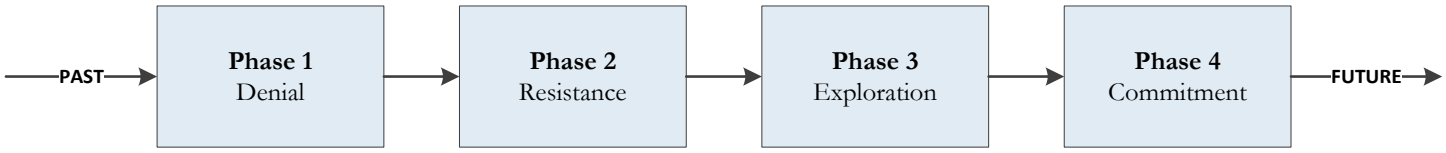


Figure 5.1: Four phases of change

5.3.2. Change equations

Backhard & Harris (1987) developed an equation that states that the combination of dissatisfaction, vision, and the quality of the first steps should be greater than the total resistance to change. Based on this theory, the Bosting Consulting Group (BCG) developed the more advanced DICE framework (Ziólkowski, 2006). This framework exists of an equation that scores a change process and categorised this process into three zones to estimate its possibilities to succeed: the win zone, worry zone, and the woe (risky) zone. This equation is based on duration of the process (D), integrity that indicated the team's ability to succeed (I), commitment of top management (C1) and of effected employees (C2), and the effort that indicates the improved workload of the employees to change (E).

$$DICE\ Score = D + (2 * I) + (2 * C1) + C2 + E$$

This score indicates the risk that is involved for the project to succeed and an efficient approach for the specific change process can be picked. Both equations are based on the stakeholder's resistance to change. The higher the resistance, the more risk is involved and the harder it will be to succeed. We continue with discussing several frameworks and approaches that can be used.

5.4. Change management frameworks

During the years, many frameworks have been developed by a broad number of authors. In this section, we discuss several different frameworks that are widely adopted within organisations and have proven to be successful. All frameworks provide in a structured approach to implement the SAHARA project properly and focus on the level of motivation and ambition as well.

Furthermore, it copes with the low level of education by providing a structured approach that does rely less on the employees.

5.4.1. Eight steps to change

Kotter & Cohen (2002) state that change is not a single event, but should be handled like a complex process in which results have to be gained. They developed an eight-step framework to organise the change process and to reduce the resistance. This framework is further improved by Kotter (2007) who states that people are willing to change if there is a sense of urgency to change, a vision, and a powerful guiding team that motivates others to change. Furthermore, this team empowers others to act on the vision and gain short-term successes to confirm the urgency to change. All improvements have to be consolidated before new approaches can be institutionalised. This improved process is shown in Figure 5.2.

Figure 5.2: Framework of Kotter (2007)

Kotter developed this framework based on the successes and errors he discovered during his research at over 100 companies that tried to change successfully. His approach have been successfully adopted by many companies ever since.

5.4.2. Theory E vs. Theory O

Another approach is the combination and balance of two basic theories of change, namely Theory E and Theory O (Beer & Nohria, 2000). Theory E focusses only on economic value in terms of shareholder returns. Theory O on the other hand, focusses on the 'softer' aspects, such as corporate culture, human capability, trust, and commitment. These theories should be kept in mind and have to be combined to successfully execute the change process. This is based on five important dimensions of change (HBR, 2011):

1. Goals: embrace paradox between economic value and organisational capability
2. Leadership: set direction from top and engage people from below
3. Focus: focus on both hard and soft sides of the organisation
4. Process: Plan for spontaneity
5. Reward system: Use incentives to reinforce rather than drive change

These theories should be carefully and simultaneously balanced to achieve the set goals and to successfully change the organisation. The style of change leadership is very important in this approach, which makes the distinction between designing and developing the change process. We discuss this in the next section.

5.4.3. Seven-step framework

Luecke (2003) developed a seven-step framework to manage the change process. He argues that people require routines to be effective and to be able to improve performance. One of these routines can be defined as continuous change, which has the goal to achieve many small changes on a routine basis.

The framework consists of the following steps:

1. Mobilise energy and commitment through joint identification of business problems and their solutions
2. Develop a shared vision of how to organise and manage for competitiveness
3. Identify the leadership
4. Focus on results, not on activities
5. Start change at the periphery, then let it spread to other units without pushing it from the top
6. Institutionalise success through formal policies, systems, and structures
7. Monitor and adjust strategies in response to problems in the change process

Figure 5.3 shows an overview of this framework. Compared to other frameworks, Luecke starts with gaining commitment in the first stage and develops the process further based on that perspective.

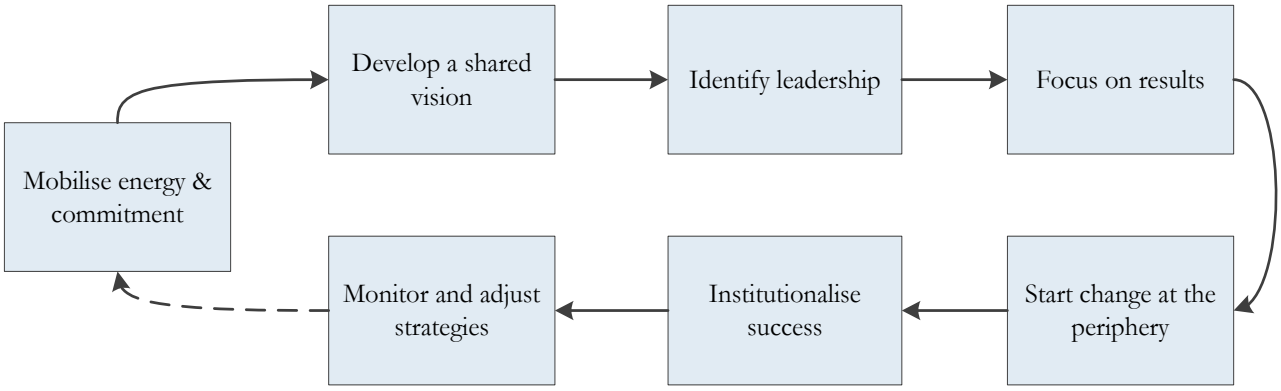


Figure 5.3: Framework of Luecke (2003)

5.4.4. Persuasion framework

Garvin & Roberto (2005) argue that acceptance of the workforce have to be created first. As soon as this is achieved, the changes can be presented and implemented, while continuously motivating people and prevent them for fall-backs. With these steps, managers are able to persuade their workforce to embrace change. These steps are defined as follows:

1. Set the stage for acceptance: develop a bold message that provides compelling reasons to do things differently
2. Frame the turnaround plan: present the turnaround plan in a way that helps people interpret your ideas
3. Manage the mood: strike the right notes of optimism and realism to make employees feel cared for while also keeping them focussed on your plan's execution
4. Prevent backsliding: provide opportunities for employees to practice desired behaviours repeatedly.

This framework does not make use of guidance teams or continuous improvement of the commitment of people. As soon as the right level of acceptance has been achieved, the changes can be carried out.

5.4.5. Pass four hurdles to change

Kim & Mauborgne (2003) state that the process of change exists of several hurdles that have to be coped with. As you are able to cope with these hurdles successfully, you are able to execute the required change.

Treat these hurdles as follows:

1. Break through the cognitive hurdle: Make key stakeholders experience your organisational problems, instead of telling them.
2. Sidestep the resource hurdle: Do not fight for more resources, focus on the current resources instead and position them at the areas that need to change the most.
3. Jump the motivational hurdle: Motivate key influencers who have many connections with other stakeholders.
4. Knock over the political hurdle: Put a respected senior employee on your top team to cope with naysayers.

This is a continuous process, which is displayed in Figure 5.4.

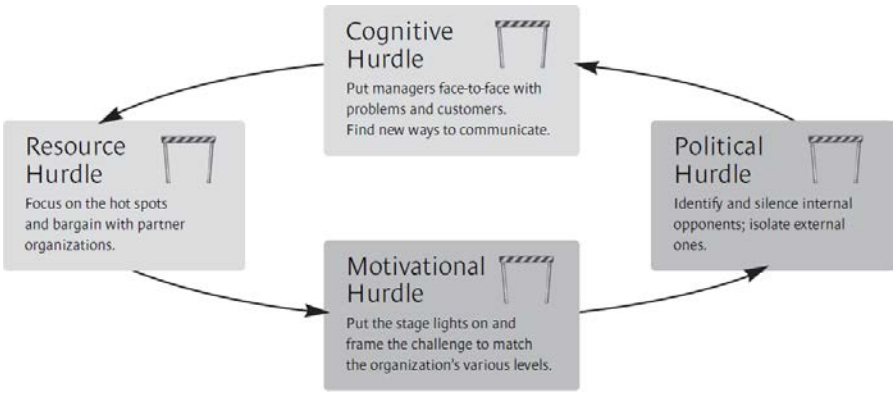


Figure 5.4: Framework of Kim & Mauborgne (2003)

5.4.6. Breaking employees immunity

Kegan & Lahey (2001) developed an approach that is similar to the framework of Garvin & Roberto (2005). Similarly, they argue that the people involved have to be convinced of the change and that the process will succeed as soon as this is fulfilled. They argue that a manager has to break through the employees' immunity to change in three steps:

1. Diagnose the competing commitment by discussing the disadvantages and shortcomings in their work
2. Identify the big assumptions that have been developed by the employees and examine these.
3. Test – and consider replacing – the big assumption by changing behaviour, procedures, or routines and verify the results.

This approach assumes that employees experience negative aspects during their work, which they would like to eliminate or improve. By showing them how they can change, they experiment with new ways of working and adopt new behaviour or procedures.

5.5. Styles of change leadership

The concepts change management and change leadership are, although they are totally different, often interchanged and differences are undermined. Change management is the set of tools, processes, and mechanisms that activates change and keeps it under control. Change leadership is fundamentally different. It is the philosophy, the engine of change management. It concerns the driving forces and visions of change instead of a prescribed set of tools. Successful change management requires proper change leadership (Kotter J. , 2011). Therefore, we consider and discuss several styles of leadership in this section.

The style of leadership is very important for the overall result of the project. As the Congolese employees have a low level of education, extensive supervision and management is required. The methods we discuss in this section enable us to cope with these educational problems.

5.5.1. Directive vs. Nondirective support

An important role of the change leader is to support people who are involved in the change process. Resistance has to be taken away in order to convince people of the benefits of the changes and to motivate them. Bacon (2003) distinguishes two approaches: directive support and nondirective support.

Directive support is seen as an easy and intuitive way of leadership. In the directive approach, employees are being told what to do, receive immediate feedback on their acting, or are being advised what the best way of acting is. They are not considered as part of the change process and cannot influence the results. Directive support is a top-down approach.

Nondirective support on the other hand, enables the employees to influence the process and the results. This bottom-up approach requires employees to come up with solutions and alternatives for specific problems. Within this approach, employees are informed about the problems and have to accept and understand these problems to come up with solutions. They are more involved and they will understand the importance of change, which results in less resistance to change.

5.5.2. Transactional vs. transformational leadership

Changes can be achieved in two different ways: continuous change in which small incremental steps are taken or discontinuous change in which bigger transformational changes are realised. Both approaches require a different style of leadership (Dixon S. E., 2010).

Incremental change is supported by transactional leadership. With this approach, leaders set goals, discuss expectations, and increase the robustness of the existing organization. Transformational leadership on the other hand, has the goal to change the existing organization by inspiring people and reframe the future.

Dixon et al. (2007) state that these styles can coexist during the change process. Initially, transformational leadership is appropriate to break with the current procedures and achieve first results using a top-down approach. As soon as people start to understand why change is required and which steps are necessary, a transactional approach is appropriate to achieve continuous successes and support incremental changes and improvements. This last stage accelerates the change process.

5.5.3. Design vs. Development

This leadership style is strongly related to the Theory E and Theory O discussed in the previous section. The change process can be approached in two different ways: a designed process or a developed process. The design approach considers a prescribed process with clear targets. The change process contains specific steps that are required to reach the prescribed targets. If these steps are properly executed, the targets will be automatically achieved. The change process itself will not be changed during its execution. It is therefore a functionalistic approach that requires a top-approach.

The development approach is considered to be an interpretive perspective on both the process and the outcomes. The main goal is to change, but the exact steps and outcomes are developed during the execution. The collective analysis of the current situation with its existing problems, combined with the collective ambitions and goals, will result in consensus and collective goals. These goals are met by executing steps that are developed collectively during the change process. To succeed, the participants need to understand the organisation very well to be able to develop a future vision that improves the organisation. The change leader has to enable people to change and to develop the change process, instead of designing the change process in much detail. It therefore requires a bottom-up approach.

These approaches can be combined to benefit from both, the designed structure as well as developed ideas. By designing specific steps to realise prescribed changes (Theory E) and by enabling people during the process to develop (Theory O) specific parts in order to increase competences and support social interactions (Katsma, 2008).

5.6. How to influence motivation and ambition

In Section 4.5, we stated that four underlying causes can be influenced from an organisational perspective. Educational requirements, organisational shortcomings, and existing working structure can easily be handled by training programs, implementing SAHARA procedures, and reorganisations. However, the level of ambition and motivation is less tangible and more complex to influence. Therefore, we discuss how the level of motivation and ambition can be influenced in this section.

A broadly adopted model that indicates factors that influence motivation as well as ambition is the Job Characteristics Model of Hackman & Oldham (1976). This model distinguishes three job characteristics that are important for employees, namely satisfaction, growth satisfaction, and motivation. These characteristics are the result of the combination of the experienced meaningfulness of the job, the experienced responsibility of the employee, and whether the employee has knowledge of the results of his job. This can be further decomposed in five factors:

1. Skill variety: the degree to which a job requires different skills and talents
2. Task significance: the extent to which specific tasks influence the overall results
3. Task identity: the degree to which the completion of a task has a visible outcome according to the whole
4. Autonomy: whether the employee is independent and has freedom how to carry out specific tasks
5. Feedback: whether the employee receives information from other people and the job itself, concerning the execution and outcomes

In order to influence the level of ambition and motivation of the employees, these five factors have to be coped with. The higher the levels of these aspects, the higher the level of satisfaction, motivation, and ambition. Figure 5.5 displays an overview of the Job Characteristics Model, including the relations between all aspects.

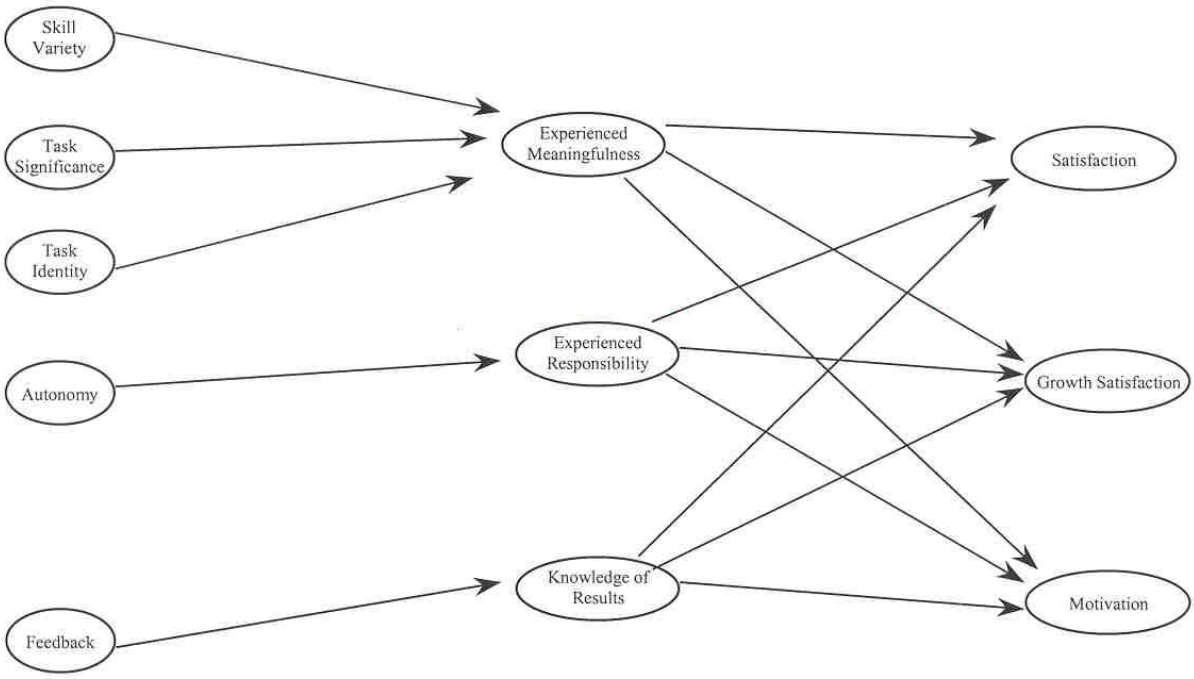


Figure 5.5: Job Characteristics Model of Hackman & Oldham (1976)

5.7. Summary

In this chapter, we answered two research questions concerning available approaches of change management that are effective in changing the employee's focus from corrective to preventive maintenance. We started with answering *"What approaches are provided by Heineken to manage the change in focus of the employees from corrective to preventive maintenance?"*. We discussed the standard tools that are provided by Heineken within the SAHARA project and how these tools are able to solve the problems identified in Chapter 4.

We continued with the second research question, concerning academic literature: *"What approaches are described in literature that are effective in the management of changing the employees focus from corrective to preventive maintenance?"* We defined the concepts of change and change management, followed by the discussion of the change process and existing resistance. Furthermore, we discussed multiple change management frameworks that provide structured approaches to realise change successfully. This is followed by several styles of leadership that can be applied to manage the change process. We finished this chapter with discussing the underlying aspects that influence employee's motivation and growth potential.

In Chapter 6, we combine the best parts of the theoretical approaches and the practical barriers we discussed in this report in order to develop guidelines that are effective for Brasco to achieve the defined research goal: successfully change the focus of the employees from corrective maintenance to preventive maintenance.

6. A situational change approach to increase maintenance maturity at Brasco

In this chapter, we combine the best approaches found in theory with the practical situation of Brasco in order to develop an effective and powerful approach that can be used in Pointe-Noire as well as other breweries in Africa. We discuss the results of our research questions in order to cope with the main research goal:

"Realise a change in focus from corrective maintenance to preventive maintenance of the technical workforce to achieve an improvement of the performance of total maintenance activities of Brasco in Pointe-Noire."

To consider all approaches that we need to draw a proposal for Brasco, we discuss the underlying causes of the current level of maturity of preventive maintenance in Section 6.1 and we continue with the results from literature in Section 6.2.

After considering all practical barriers and theoretical findings, we are able to develop a framework that will be effective for Brasco as well as for Heineken to achieve the overall goals and solve the main problem. This proposal will be based on our research results and consists of a combination of practical barriers and theoretical findings. We develop and discuss this framework in Section 6.3.

6.1. Practical barriers

In Chapter 2, we stated that the main cause of all existing problems was the 'indistinctness concerning the general concept of 'preventive maintenance'' and we proposed several research questions to gain insights in the causes for the current level of maturity of this concept and to come up with approaches to improve this maturity. In Chapter 4, we answered the following research question, concerning the maturity of preventive maintenance:

"What is the current maturity concerning 'preventive maintenance' of Congolese employees of Brasco and which factors influence this maturity?"

Realistically speaking, many of these influences cannot be changed by Brasco and have to be considered as a restriction we have to accept. We are only able to influence the aspects we discussed in Section 4.5:

- People do not meet educational requirements
- Organisational shortcomings
- Working structure
- Level of ambition and motivation

Furthermore, we discussed the need to change the overall focus of employees from corrective to preventive maintenance. This change process is less tangible and measurable. We discuss all barriers that we can influence in this chapter and we draw a proposal in which we describe approaches to cope with these barriers and to enable the organisation to change.

6.2. Theoretical approaches

In the previous chapter, we answered the research question concerning academic approaches available in literature: *"What approaches are described in literature that are effective in the management of*

changing the employees focus from corrective to preventive maintenance?". In this section, we discuss the results of this answer .

We consider the organisational shortcomings and the level of ambition and motivation as a problem that have to be coped with using a theoretical approach. Moreover, we discuss the academic approach for change management and change leadership.

Level of ambition and motivation
The job characteristics model of Hackman & Oldham (1976) helps us understand how motivation and ambition can be influenced. The characteristics skill variety, task significance, task identity, autonomy, and feedback have to be considered during the change process to increase the level of motivation and ambition of employees to change and to adopt their new designed jobs. The increase in the level of ambition and motivation are also described in the persuasion framework of Garvin & Roberto (2005) (Manage the mood) and the hurdles of Kim & Mauborgne (2003) (jump the motivational hurdle).

Moreover, the O-theory of Beer & Nohria (2000) states that a reward system should be used for the change process to succeed. In case the employees succeed to change, they will be rewarded to keep them motivated to improve even further. This is also one of the issues that exist in the organisational shortcomings: there is currently no rewarding or punishment system and this results in a low level of motivation of employees.

Change management
In total, we described six approaches to change management that can be effective for the situation of Brasco in Pointe-Noire. The main idea of these approaches is similar: to guide the employees and the organisations through the stages of denial, resistance, exploration, and commitment. We consider the approach of Kotter (2007) as the most extensive approach that describes eight clear steps to pass through these four stages in order to achieve successful changes. We use this method as a basis and supplement this with findings from other approaches.

The main idea behind Theory E and Theory O is already adopted by Kotter (2007): to consider the hard as well as the soft goals and issues. As discussed, the reward system may be very effective for Brasco. The seven-step framework of Luecke (2003) focusses on routines to be effective. This idea is already adopted during the development of the SAHARA project and is included in all standardised procedures and tools. The persuasion framework focusses on acceptance, which is a very important aspect. This is also adopted by Kotter (2007) in the first four steps of his approach. The four hurdles provide in interesting insights for the level of motivation and focus on achieving change using the current resources. This focus is an interesting addition to Kotter's method (2007) as well. The final method concerning employees' immunity can be adopted by the development of a guidance team in the second step of the method of Kotter (2007).

We use the method of Kotter (2007) as a basis and supplement this method by adding several factors of other change management approaches.

Change leadership
We distinguished three fields within change leadership approaches. We assume that Brasco can benefit from adopting and combining parts of all three fields to end with a strong style of leadership.

Directive vs. Nondirective
We discussed that directive leaders inform or advice people what to do and provide the employees with direct feedback concerning their acting. This top-down approach can be used within situations in which employees are not fully enabled to come up with their own ideas or approaches. Nondirective support enables people to influence the process. Therefore it is required that they have a proper understanding of the situation and the targets of the project. As the main concern of this research is the indistinctness of the concept preventive maintenance, we propose a directive approach to support employees in the process of change.

Transactional vs. transformational
We discussed these styles in combination with incremental and discontinuous change. We agree with Dixon et al. (2007) that both styles should be combined to gain quick first results followed by incremental changes afterwards. However, based on our practical findings we assume that transformational leadership will have a negative impact. As the relevant concepts are not yet clear and European tools and procedures have to be implemented in an African culture, we consider smaller incremental changes as more appropriate and effective. Therefore, we focus on transactional leadership in which the focus is on continuous incremental changes.

Design vs. Development
The same issue has an important role in this field as well: as the concepts are not clear for all Congolese employees, a focus on development requires much input from employees and results in increased risks that the change process will not succeed. On the other hand, the involvement of employees has a very motivational effect and stimulates the acceptance and adoptability of new procedures. Therefore, we propose a strictly designed process that is combined with development in a later stage. A designed process will be required to pass through the denial and resistance stage. As soon as employees start to the exploration, they can be more and more involved in the development of the process.

Summarised, we will consider the following parts:
- Level of ambition & motivation
    - Job characteristics of Hackman & Oldham
    - Reward system
- Change management
    - Eight-step framework of Kotter (2007) as a basis
    - Reward system
    - Routines to be effective (SAHARA tools)
    - Gain acceptance
    - Motivational hurdle
- Change leadership
    - Directive approach
    - Transactional leadership
    - Design during denial & resistance stage
    - More development during exploration & acceptance stage

6.3. Change management framework for Brasco
Our proposed framework for Brasco consists of three parts. First of all, we consider the current sequence of the implementation of the different SAHARA procedures and tools Section 6.3.1. We state that it is very important to start with the correct part and follow a strict sequence. Secondly, in Section 6.3.2 we describe the proposed change management approach that is in line

with this sequence. This approach includes the style of leadership that is required. Finally, we discuss several additional implementations that have to be adopted in order to succeed with the required changes in Section 6.3.3. Combined, this proposed approach is an effective method to cope with the existing problems at Brasco in Pointe-Noire described in Section 4.5 and provides guidelines to solve these problems and implement the SAHARA project successfully.

6.3.1. Sequence of SAHARA implementations

In Chapter 5, we answered the research question concerning methods and tools provided by Heineken: *"What approaches are provided by Heineken to manage the change in focus of the employees' from corrective to preventive maintenance?"*.

In practice, there is currently no very clear prescribed sequence of activities and implementations to execute the SAHARA project. However, a structured approach is very important to succeed and is prescribed by all theoretical methods. Therefore, we propose an effective sequence. First of all, the basis concerning the distribution of information should be right as this supports the rest of the project. People have to get involved by a department-broad kick-off workshop to communicate the meaning and targets of the SAHARA project. As the whole project is dependent of the supporting information system, the CMMS should be properly implemented and updated. This is the basis of the whole project. As a very modern CMMS will be implemented, this can be one of the factors in which Pointe-Noire can be an example for other breweries.

The spare part management is an important supportive function of the packaging lines and brewhouse. Therefore, the spare part management activities of the SAHARA project have to be executed before new routines and procedures can be implemented at the packaging lines. The spare part management is supported by the CMMS, which will be up-to-date in this stage of the project. As there is a totally new spare part warehouse, these activities can create an example position as well. Moreover, this part of the project can be used as a pilot to show others what the benefits of the SAHARA project are. Therefore, it should be very carefully executed.

As soon as the basis of the CMMS and spare part management is correctly implemented, the two workshops can be planned to get people involved and communicate the means and goals. As the next step will be the implementation of standard routines and procedures, this timing is much better then to plan these workshops in the beginning of the project.

Meanwhile the workshops are being held, the new management system for (re)orders can be implemented. This will support the spare part warehouse and sets the target to reduce the lead times of orders. After the workshops, the goals of the project are properly communicated and all procedures, routines, and planning schedules can be transformed and implemented. As these are all Heineken standards, employees can be motivated by using this term often to motivate them.

Summarised, the sequence of activities will be as displayed in Figure 6.1. These activities and the change process should be managed properly in order to ensure the project succeeds.

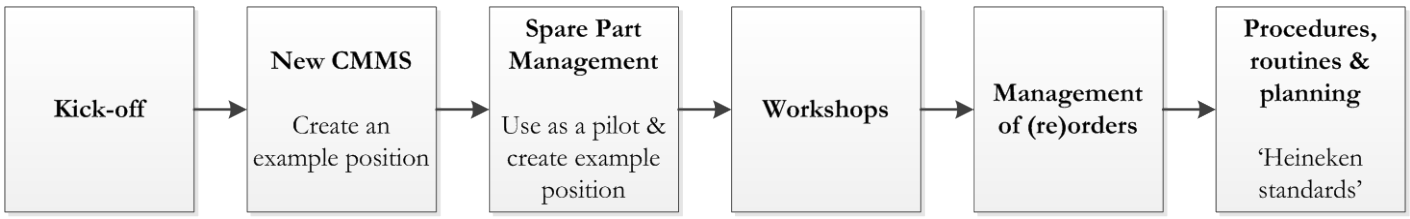


Figure 6.1: Sequence of activities

6.3.2. Change management approach

We already stated that the change management method is very important and influences the success of the project. We will execute the SAHARA project considering the change management approach of Kotter, supplemented by several leadership styles and minor additions based on our practical experiences. We use exact the same eight steps that are described by Kotter (2007). This method is visualised in Figure 6.2. For every step, we defined the correct leadership style and proposed several additions to the model in order to motivate employees to participate.

Figure 6.2: Approach of Kotter (2007)

The approach contains of four stages in which several steps have to be taken: plan, lead, act, and embed. During the planning stage, a sense of urgency is created, a leading change team is created, and the vision and strategy are developed. The leading stage enables the management to communicate the means and goals of the project and to empower all employees to act. Within the acting stage, the first benefits and wins are realised and the rest of the project should be promoted. The final stage ensures that the change is embedded in the organisation and that a new culture is created to realise the benefits of the project on the long-term.

We already argued that there should be a directive and transactional leadership style that is strictly designed in the first stages and can be more developed during the later stages. Moreover, we stated that employees have to be motivated to ensure the project succeeds. We present a complete overview of the change management approach and required actions in Table 6.1.

This change management approach has to be used for every step in the sequence described in the previous section. This is an effective approach to support Brasco in executing the project in a structured way. Furthermore, it is a guide to manage the project as a whole.

The combination of the sequence of activities and the eight steps of change management will be very effective in the proper implementation of the SAHARA project. Using this structured approach, employees will get motivated, the relevant concepts and ideas behind the standardised tools will be more clear, and employees are more willing to adopt a new way of working. With the right timing and management, the project will succeed. To further improve this approach, we discuss several additional implementations that should be considered.

6.3.3. Requirements from practice in Pointe-Noire

The change of sequence of the SAHARA project and the new approach to change management are not sufficient to implement the project in the best way possible. As we presented in Figure 4.2, employees should be more motivated and improve their ambition to fully cooperate. Besides, the educational level of many employees is insufficient and has to be improved. To overcome these shortcomings, we propose several additional implementations that should be considered by the management of Brasco whether it is possible and whether they are willing to implement these additions. These additions are based on specific requirements from practice, which became clear during our stay in Pointe-Noire. These practical requirements are presented in Table 6.1 as well.

Employees require more training. Training programs already exist within Brasco, but these programs should be more extensive to educate the employees to the required level and to give them proper understanding of their responsibilities. Furthermore, the job characteristics described in the model of Hackman and Oldham (1976) has to be considered and investigated. There is no clear understanding of what the Congolese employees want to improve in practice and which characteristics can be influenced by the management. This has to be investigated. Finally, we discussed the rewards system multiple times. As Congolese people cannot be fired or punished for bad behaviour, they are not very motivated to work very hard. A solution may be the introduction of a rewards system for good behaviour. The willingness and possibilities have to be investigated for this part as well.

Implementation stage	**Leadership Style**	**Requirements from practice**
Create sense of urgency - Convince managers that current situation is problematic - Explain a worst case scenario	Directive Transactional Design	Gain acceptance
Create a change team - Assemble a group with enough power to lead the change process - Encourage this team to work different compared to the current situation	Directive Transactional Design	Gain acceptance Training
Vision & Strategy - Create a vision of the future - Develop a strategy to realise this vision	Directive Transactional Design	Gain acceptance Training
Communicate - Use all channels to communicate the vision and strategy - Use the change team to promote the change	Directive Transactional Design	Gain acceptance Training Rewards
Empower others to act - Remove all barriers for the vision - Encourage employees of acting different	Directive Transactional Design & development	Training Rewards
Produce quick wins - Develop visible performance indicators - Reward people to improve	Directive Transactional Design & development	Rewards
Don't let up - Develop employees to realise the vision	Directive Transactional	Motivational hurdle

- Use benefits from early wins to promote the rest of the process	Design & development	
Create new culture - Link new behaviour to successes - Ensure that new goals are consistent with the new vision	Directive Transactional Development	Motivational hurdle

Table 6.1: Change management proposal for Brasco

6.4. Summary

In this chapter, we discussed the results that followed from our research questions. We started with the underlying causes of the current maturity that can be influenced by Brasco. These causes are considered during the discussion of the methods we found in literature and the analysis we executing in practice. With these results, we were able to draw a framework that is effective for managing the change process in Pointe-Noire, which we discussed in Section 6.3.

Our proposal consists of three parts: the sequence of SAHARA activities, a change management approach, and the style of leadership. This is supplemented by additional requirements from practice. We propose a clear and logical sequence of activities to ensure that the timing of the implementations is correct. Besides, we use the academic approach of Kotter for the change management part, and use a combination of directive and transactional leadership. The approach should be strictly designed in the first stages of the project and can be more developed in later stages. Combined, these three parts ensure that the SAHARA project can be implemented properly and reduce the barriers discussed earlier in this report.

In Chapter 7, we reflect on this framework by using practical examples that we have experienced during our stay in Congo.

7. Practical reflection on the framework

We discussed the importance of the proper implementation of the SAHARA project and the maturity of preventive maintenance. We have stated that the maturity of the concept has not yet reached a sufficient level and employees are still focussed on corrective maintenance. Furthermore, we have discussed the tools that are included in the SAHARA project supplemented by many approaches that are effective the change the focus from corrective to preventive maintenance. Based on this information, we developed a framework that is very effective for Brasco to reach its goals.

In this chapter, we perform an analysis of our proposed framework based on practical experiences during the implementation of the SAHARA project. During this implementation, we did not use the proposed approach and have performed many activities with a different structure. We discuss our practical findings in this chapter, reflect on our framework, and propose several additions to further improve the framework.

We discuss the approaches that have been used in practice in Pointe-Noire in Section 7.1 and at other African breweries in Section 7.2. The goal of these discussions is to gather several effective approaches that can be combined with the current framework and further improve this framework. We discuss this in Section 7.3.

7.1. Practical approaches used in Congo

In this section, we answer the research question concerning change management approaches by discussing the practical approaches we used in Pointe-Noire:

> *"What approaches have been used in practice to manage the change in focus of the employees from corrective to preventive maintenance?"*

We already discussed the standard tools that are provided by the SAHARA project and we supplement this with the discussion of practical approaches we used in Pointe-Noire to implement these tools properly.

Involvement of all employees

The SAHARA project influences the daily tasks and responsibilities of the whole technical work force on the long-term. In the first stage of the project however, mainly the middle-managers and line managers are involved by the new way of working. However, we have involved the whole department including technicians, warehouse personnel, and operators to inform them about the upcoming changes. We considered it as very important that every employee at the work floor was familiar with the SAHARA project and its main goals from day one.

Workshop 1, Kick-off: Responsibilities, meetings & agendas

We performed the kick-off workshop in October to explain the main targets and focus points of the SAHARA project to all technical personnel and to make the first steps. During this four-day workshop we prepared many presentations, discussions with the employees, work sessions and exercises. Based on our presentations, the employees had to execute several exercises together. During this week, we analysed and updated the responsibilities of all employees (based on TPM), created weekly planning schedules, created zones per packaging line for every technician, and we fixed the planned maintenance days per packaging line. These were the first steps to structure the way of working of the technical workforce in Pointe-Noire. Several weeks after this workshop,

several employees were using the planning schedule and around 75% of the meetings existed. However, the employees were still struggling with the specifications of their responsibilities.

Workshop 2: Maintenance planning & execution

During the second workshop in December, we focussed on the planning and execution of maintenance. Again, many employees were involved: technicians, warehouse personnel, administration personnel, and line managers. Our approach was different during this five-day workshop: we used a more directive approach and explained employees what we expected them to do. They were not involved with the end result, because these were already fully standardised by Heineken. We presented these standards to the Congolese employees and explained the specific implementation. Hereby, we introduced the maintenance planning tool, explained the targets of the work preparation area, and introduced a tool with which the warehouse personnel, technicians, and planners were able to manage the preparation, approval, and execution of work orders. Figure 7.1 displays an example of the work preparation of packaging line 1. The old system of managing planned maintenance has been removed and employees were forced to use the new system. The new planning and execution system has been used, but the employees have not yet used it properly. Work orders were centralised, but the preparation has never been executed. Moreover, the work orders were still not planned in advanced.

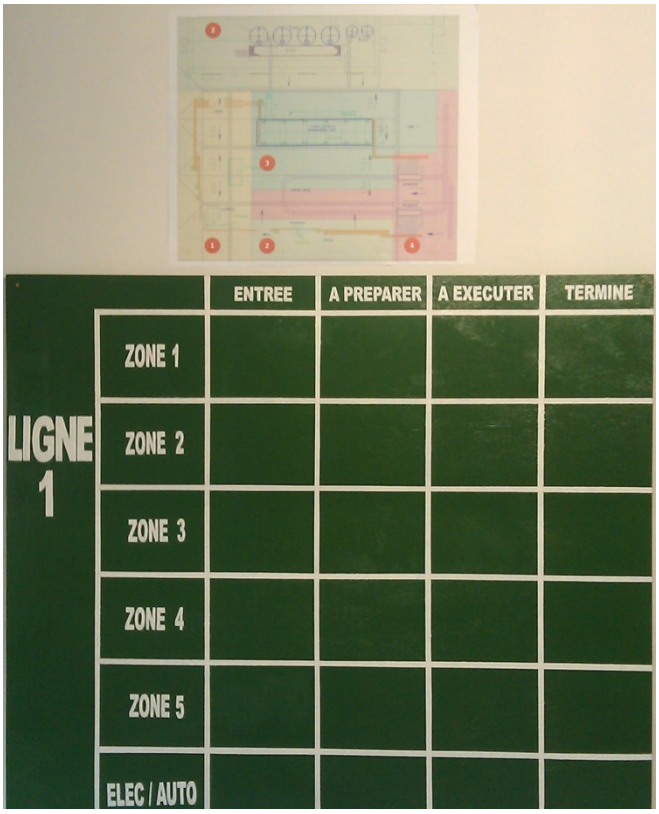


Figure 7.1: Work preparation zone

New CMMS: IBM Maximo v7.5

In Pointe-Noire, two different information systems are implemented. For the financial part and the management of spare parts, DEFI is used. This is an outdated CMMS developed in the 1980s. For the management of equipment and maintenance, Maximo 4.0 was implemented in 2004. During the data cleaning process, we discovered that Maximo 4.0 was never implemented properly and not functioning well. Moreover, it was not used for spare parts, there was no ICT knowledge to solve problems, and several modules were handled in the wrong way. After two months of problem solving, nobody was enthusiastic about this information system anymore and there were too many technical problems for a proper use. Therefore, we decided to implement the newest version of Maximo (7.5) and start all over again with this CMMS. As soon as this decision was made, employees were enthusiastic again and had many new ideas to improve their jobs using this new system. With this CMMS, they saw possibilities to solve many problems and to make use of new functions that are able to help them doing their job properly and more effective. Furthermore, we were able to connect all employees (technicians, warehouse, administration, and managers) using a single CMMS. The implementation has not yet been executed, but the preliminary results were very promising.

Visualisations

To make employees aware of changes and support them to get used to several implementations, we visualised several implementations. With the work preparation, the goal is to inform the employees about the distribution of the zones per packaging line and in which stage a specific work order currently is. Within the spare part warehouse, we marked all zones of machines with a different colour and indicated the borders of all racks on the ground to indicate that parts should be in the right zone and should not be stored on the ground. We implemented many of these small visualisations on the work floor, to indicate how work should be executed and what the results should look like. This supports employees in structuring their work. During the months, we discovered some improvements. However, many visualised restrictions were ignored and employees have to be informed to a further extent.

Two-week absence

One of the main goals of the SAHARA project is to train the Congolese employees in such a way that they are able to perform their jobs conform European standards on their own at the long-term, without any supervision. As an experiment to verify the current state of this ability, we developed a list with many activities for these employees and suspended our supervision for two weeks. Before this suspension, we arranged a meeting with the whole technical workforce to explain our absence and to clarify all planned activities. We created schedules and specific tasks for everyone and everything was clear. When we came back after two weeks, no single activity was executed properly and the Congolese employees were working conform their old working procedures again. This experiment made clear that the implementations and change of focus were not yet adopted properly. We needed a new approach.

The expression 'Heineken standard'

One example of a new approach was to motivate Congolese employees in another way. We discovered that Congolese people have much respect for the Dutch Heineken way of working. They consider the Europeans as superior who operate on a level that will never be possible in Congo. Therefore, we started to use the expression 'Heineken standard'. All tools and procedures we developed were developed by Heineken in The Netherlands and were standardised for African breweries. Therefore, we could explain people that all implementations were Heineken standards that were exactly the same in Europe. Although this is not completely true, the Congolese employees adopted this in a very positive way. They became much more enthusiastic and motivated to perform their jobs conform the Heineken standards and they adopted our implementations with more success. The use of this expression has a positive effect on the implementation of the SAHARA project.

Pointe-Noire as an example for Africa

Our second approach is to use Pointe-Noire as an example for other African breweries. As Pointe-Noire has built a new spare part warehouse in 2012 and starts using a highly sophisticated CMMS in 2013, it is the most modern implementation of the SAHARA project in Africa. Many breweries still use old equipment, buildings, or outdated information systems. Pointe-Noire can continue with very modern software that is implemented according to the SAHARA guidelines. Therefore, we promoted the implementation of the most tools and of Maximo 7.5 as a very modern approach, which can be an example for all Heineken breweries in Africa in case it succeeds. Together with the employees, we made many photographs of implementations that are used for the SAHARA documentations. Employees became very enthusiastic and proud and were willing to adopt these modern implementations as soon as possible. The results are very promising for the future of the project and may be very effective in supporting the implementations of the project properly.

Supervision: a directive approach

As the SAHARA implementations are totally different compared to old tools and procedures in Congo, the employees need relatively much supervision to be able to adopt the changes properly. All implementations were more or less standardised by Heineken and implemented in the same way as in other African breweries. Therefore, we used a very directive supervision approach by telling the people what to do instead of allow them to have many influences and come up with new ideas. We discovered that many concepts, such as preventive maintenance, were not very clear for everyone and we expected that a nondirective approach in which employees could come up with their own solutions would not result in a proper solution for existing problems in Pointe-Noire. As we already discussed with our two-week absence, this approach did not result in well-implemented tools that were understood by everyone. This may be the result of this supervision approach. We will discuss this in more detail during our literature review.

Summarised, we have involved the whole technical workforce from the beginning of the project, we performed two workshops to clarify several concepts and gain the first quick results, we introduced a new CMMS and many new ways of working, and we experimented with visualisations, absence, and the use of specific expressions to motivate people. We present a timeline of the most important milestones and activities in Figure 7.2. We discuss other ways of managing the SAHARA project in the next section.

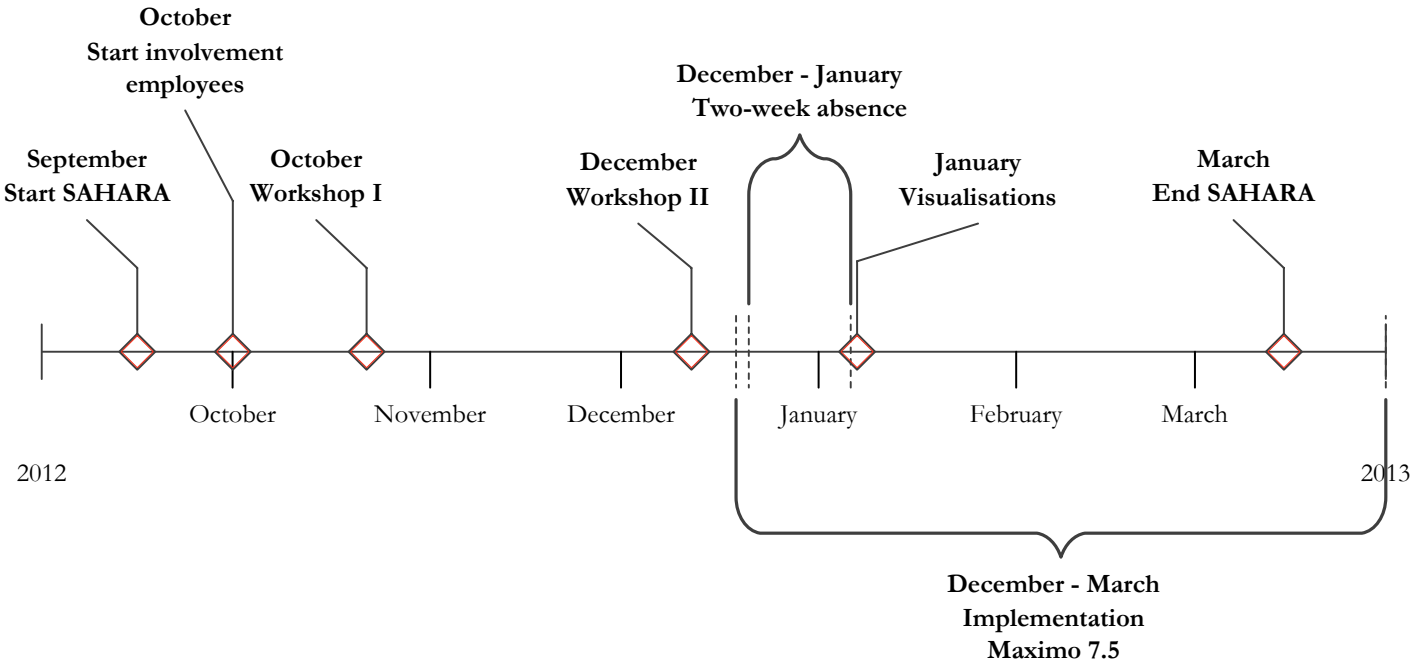


Figure 7.2: Timeline with activities and milestones

7.2. Implementations in other African countries

Besides our project in Pointe-Noire, the SAHARA project has been implemented in several other African countries as well. Most of these implementations are more or less executed in the same way we did. However, there have been two experiments that have adopted a different approach. By discussing these experiments, we are able to answer the final research question:

"What approaches for successful implementation of the SAHARA project have been used in other African countries?"

We start with discussing the implementation of Consolidated Breweries in Nigeria in Section 5.3.1, followed by the experiment at Sonobra in Tunisia in Section 5.3.2. Both experiments were executed to gain new insights in managing the change process.

7.2.1. Consolidated Breweries (Nigeria)

Consolidated Breweries (CB) was the first brewery that started with the adoption of the SAHARA project in Africa. By then, the SAHARA standards were already developed and were no subject to change anymore. However, the local implementation was not yet clear and CB was the first experiment. CB is one of the best African breweries for Heineken and achieves the best annual results. Therefore, the implementation of a new project was considered to be relatively easy.

The first step was to clarify the role for maintenance. The definitions of preventive maintenance, daily maintenance, and weekly maintenance days were explained and a very detailed explanation of responsibilities was developed. This was followed by the auditing of PM tasks, to gain insights in the quality. Thirdly, they focussed on zone specialist empowerment, which was gained by much training for the operators of specific zones and teaching them how to perform inspections by themselves and solve problems immediately.

Fourthly, all employees involved had to become enthusiastic and motivated to use the new procedures. Feeling for the PM system had to be developed. This is done by three keywords:

- See: Create new detailed PM plans and train staff on functions of machines. Thereby, you can show the engineers that there is the will to create an improved PM system.
- Feel: Through audits of inspection they made technicians feel that high quality inspections are priority,
- Change: By training technicians on detailed inspections and discuss relevant findings, technicians develop a mind-set to continuously improve the PM system.

The management focussed on root cause failure analysis (RCFA) to teach the employees to analyse all breakdowns and find possible causes. When they solved these causes, they learned that this is prevention for the breakdown to happen again in the future.

The final stage was to create a guiding team of experts that could influence others within the brewery. This was done in three stages:

- Select people with the right behaviour in problem solving and learning
- Empower them to have success by removing barriers
- With their success they inspire others

The change process is summarised in Figure 7.3.

Figure 7.3: Change process of Consolidated Breweries in Nigeria

The results in Nigeria were very promising, but Heineken was still wondering if this approach would work at other breweries as well. As CB is a thriving brewery, new routines are adopted relatively easily. Implementations in other countries using the same approach, did not achieve the same results. The project was still successful, but there were some downsides as well. Therefore, another experiment was executed in Tunisia.

7.2.2. Sonobra (Tunisia)

Several good practices from experiences in Nigeria and other countries were still used during the implementation in Tunisia. There was still a defined and structured implementation strategy, guiding teams were created, and the same training methods were used. However, there were some important differences.

First of all, the implementation in Tunisia was implemented on a lower scale. In Nigeria, the project was implemented in the whole brewery. In Tunisia, only one packaging line was used for the implementation and had the function of a pilot. The underlying goal was to achieve very promising results and roll out the project to other packaging lines afterwards.

A focus team was created with the best technical employees of the brewery. This 'Talent Factory' worked together at one packaging line and focussed on failure mode, effects, and criticality analysis (FMECA). This method is used to analyse the probability of specific failure modes and their consequences. The team should focus on the failure modes with high probability and big consequences, to prevent these failure modes from happening.

The rest of the approach was very similar to the approach used in Nigeria and these results were very promising as well. By using one packaging line with the best team as a pilot, they were able to successfully implement the SAHARA standards and inspire others. The downside of this approach is, however, the time window in which the project can be implemented. By starting with one packaging line and follow with the others, a proper implementation will take a lot of time. This approach is therefore not useful for breweries that require a quick implementation.

7.3. Analysis of the framework

Our framework consists of three important pillars: the sequence of the activities, the change management approach, and the leadership style. We perform an analysis of these pillars and compare this with our practical findings. Moreover, we propose several additions to the framework that have proven to be effective in practice.

Sequence of activities

In practice we have never developed a six-month project plan considering a structured change management approach with strict milestones. There are no guidelines provided by Heineken in which sequence the activities have to be executed and there is no information about effective approaches. We discovered that our approach was not the ideal sequence and this could have been executed better when using the proposed sequence. For example, the dates of our workshops were fixed by Heineken and were performed too early in the process. This was confusing for the employees and resulted in a chaotic sequence of activities. Besides, we focussed on the whole department and we did not focus on the basis (CMMS, spare part management) first. This sometimes resulted in a chaotic situation in which people did not exactly know what we expected from them.

Concluding, we have discovered that the absence of a clear sequence can be problematic and create chaotic situations. The proposed sequence of activities is very interesting and we expect this to be much more effective in the implementation of the SAHARA project. This should be adopted by Brasco and other African breweries as well.

Change management approach

We experimented with many approaches to change the Congolese workforce and several approaches gave us promising results. The involvement of all people made everyone aware of the existence of the project and the upcoming changes. The two workshops were interesting and useful, but were executed too early in the process. The implementation of a new CMMS gave many people much more structure and motivated them to improve. The use of the expression 'Heineken standard' and using Pointe-Noire as an example for Africa had very positive results. Employees became much more motivated and enthusiastic to adopt these standards and to be the best African brewery. Finally, our two-week absence gave us interesting insights. Not much work was executed, but it was a very useful approach to verify whether or not the employees understand what they are expected to do. However, we discovered a lack of overall structure of the change process. We performed several activities without a predetermined structure.

Although the results in Nigeria were very promising and a structured approach was used, we are not able to adopt this in Brasco. The Nigerian brewery is much more developed into a standardised Heineken environment and the Nigerian employees adopt new standards relatively easily. We expect Brasco to need a more advanced change management approach in which people receive more support, better training, and more motivational drive to change. The Tunisian approach however, was very interesting. Brasco is not able to adopt a pilot execution at one packaging line, as this takes too much time. However, the idea of a pilot is very interesting and can be executed for the spare part management, to show other employees what the influences of SAHARA can be. This can be implemented without delaying the complete project.

Concluding, we state that the change management approach of the framework would have been very useful, but should be further improved by our practical findings. This includes the factors we discussed:

- Involvement of all technical employees in an early stage
- Our two workshops
- Implementation of a new CMMS
- Expression 'Heineken standard'
- Pointe-Noire as an example for Africa
- Two-weeks absence to verify the process
- Spare part management as a pilot project

The proposed framework can be very effective and supports Brasco by managing the change process. It will be even more effective if it is combined with the additions we discussed. By involving all employees, implementing a modern information system, and using several methods to motivate the employees, the combination is a very effective approach to realise a change in focus concerning preventive maintenance. These additions have proven to be successful in practice and enable the framework to be more powerful.

Change leadership style

Our proposed leadership styles per stage within the change process will be very helpful to support the Congolese employees. We expect this method to be very effective in reaching the

overall goals and to motivate the employees during the process. However, we have an important footnote. We discovered that Congolese employees, due to multiple reasons, are struggling with the understanding of European standards. Therefore, these employees require relatively much supervision compared to Dutch employees. We state that our proposed method should be unchanged, with the footnote that extensive supervision is required.

Other additions
We described the many problems of the current working structure of Congolese employees. The whole SAHARA project focusses on improving and standardising these structures and already provides in a broad range of very effective and useful tool and procedures. We consider the standardised organisation, working procedures, and meeting schedules as a very strong supportive implementation that solves many structural problems.

The same holds for a part of the organisational shortcomings. We state that there is currently no verification whether activities are performed by technicians and operators. The SAHARA project provides in these verification methods, including control lists that have to be filled in on a daily basis, short-term, mid-term, and long-term goals, and several key performance indicators that allow managers to easily verify the state and quality of the activities.

Summarised, the proposed framework provides guidelines that are very useful and effective for Brasco in order to reach its goals. However, we discovered several factors in practice that are interesting and should be added to this framework. These effective practical additions to the framework are:

- SAHARA procedures and tools to improve working structures
- SAHARA KPIs and goals to improve organisational shortcomings
- Involvement of all personnel
- Our two workshops
- Implementation of a new CMMS
- Expression 'Heineken standard'
- Pointe-Noire as an example for African breweries
- A two-week absence
- Pilot project at spare part management

The combination of the proposed framework and the additional aspects we discussed in this section is very effective for Brasco and is able to realise a change in focus from corrective to preventive maintenance.

7.4. Summary

In this chapter, we reflected on the framework we proposed in Chapter 6. Furthermore, we answered the research questions by discussing the approach that we have used in practice for the implementation in Pointe-Noire:

"What approaches have been used in practice to manage the change in focus of the employees from corrective to preventive maintenance?"

We discussed the sequence of activities and which methods are effective in the change management approach. We have involved the whole technical workforce from the beginning of the project, we performed two workshops to clarify several concepts and gain the first quick results, we introduced a new CMMS and many new ways of working, and we experimented with

visualisations, absence, and the use of specific expressions to motivate people. Furthermore, we answered the second research question:

"What approaches for successful implementation of the SAHARA project have been used in other African countries?"

We answered this research question by discussing two experiments: the total implementation of Consolidated Breweries in Nigeria and the pilot implementation at one packaging line at Sonobra in Tunisia. The pilot implementation is interesting for our improved change management approach.

Furthermore, we analysed our framework. We compared the proposed steps and methods with the practical situation of Brasco and we state that the framework is very effective in changing the sequence of activities, the change management approach, and the style of leadership. However, we proposed several additional implementations as well that are very helpful in this specific situation. Combined, this framework is very powerful and is able to achieve the goals that are set by Brasco: change the focus from corrective to preventive maintenance.

We continue with our final chapter, in which we discuss our conclusions and recommendations.

8. Conclusions & Recommendations

During our research, we answered all research questions and combined the information to propose a framework for Brasco that is effective in the proper implementation of the SAHARA project. Moreover, we reflected on this framework from a practical perspective. In this final chapter, we discuss the most important conclusions of this research in Section 8.1 and outline recommendations for Brasco and potential further research in Section 8.2.

8.1. Conclusions

During our research project, we have analysed the main problems that Brasco is currently facing within the technical department and which factors mainly influence these problems. We discuss our conclusions in Section 7.1.1. We found interesting approaches from academic theory and practice that are effective to cope with these problems. We propose an effective framework that is able to manage the current problems in Section 7.1.2. We conclude with discussing the impact of this framework to the situation of Brasco in Pointe-Noire in Section 7.1.3.

8.1.1. The main problems of Brasco

We discovered in an early stage that the amount of downtime of equipment is caused by the lack of focus on preventive maintenance. This is caused by the lack of standardised working procedures, lack of communication, and bad performance of the administration and spare part management departments. There are many factors that influence these problems, but we conclude that the underlying problem is the indistinctness concerning the general concept of preventive maintenance. The concept of preventive maintenance is insufficiently adopted within the technical department and is resulting in in a lack of focus on preventive maintenance.

We adopt the following research goal: *"Realise a change in focus from corrective maintenance to preventive maintenance of the technical workforce to achieve an improvement of the performance of total maintenance activities of Brasco in Pointe-Noire."*

Based on our analysis of the underlying causes of the current low level of maturity of preventive maintenance, we conclude that there are four main factors influencing this level:

- The educational level of Congolese people
- Historical differences between Pointe-Noire and Brazzaville
- Political aspects
- Social & cultural aspects

We consider the historical differences and political aspects as unrealistic to solve within the scope of our research. However, we are able to cope with several social, cultural, and educational issues within our scope. We state that the following causes of the current level of maturity can be influenced by Brasco:

- Educational level
  - People do not meet educational requirements
- Social & Cultural aspects
  - Level of ambition and motivation
  - Organisational shortcomings
  - Working structure

We focus on these aspects that can be influenced while working towards our solution to solve the main problem: the lack of focus on preventive maintenance.

8.1.2. An effective framework to face the main problems

Brasco is able to cope with the current problems by using an effective and structured approach. We developed a framework based on academic literature combined with our practical findings in Pointe-Noire. It is clear that Brasco is facing a complex change process by changing the employee's focus. The standard tools that are provided by the SAHARA project are interesting and can be very effective, as long as the implementation of these tools is supported by a proper change management approach. Based on the theoretical and practical findings, we conclude that an effective approach requires four main factors to cope with the main problems of Brasco:

- A proper and logical sequence of activities
- A powerful change management approach
- A style of leadership that fits with the change management approach
- Additional requirements from practice

Currently, there is no clear sequence of implementation activities of the SAHARA project. We state that the distribution and availability of information is the basis that supports all other activities and should therefore be handled first, followed by other activities. By implementing modern standards, Pointe-Noire can be handled as an example for other African breweries. Combined with the use of a pilot to show the benefits and implementing many Heineken standards that are used worldwide, employees get motivated to complete the project. Concluding, we propose the following sequence of activities:

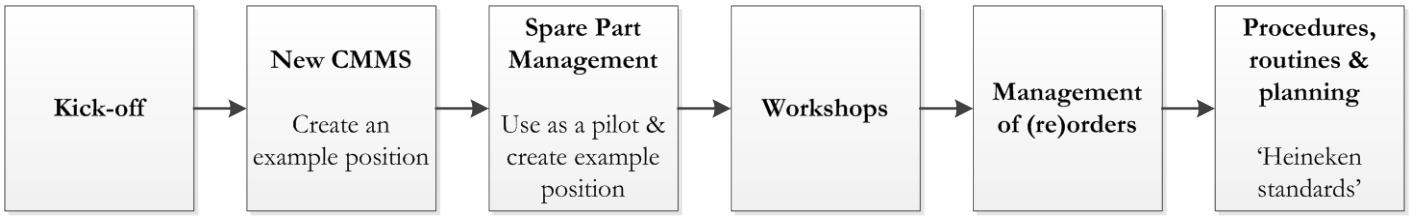


Figure 8.1: Sequence of activities

Every activity within this sequence should be supported by a powerful change management approach. Based on our theoretical research, we conclude that the eight-step approach of Kotter (2007) fits best to the situation of Brasco, which is displayed in Figure 8.2:

1. Create a sense of urgency
2. Create a change team
3. Develop vision & strategy
4. Communicate
5. Empower others to act
6. Produce quick wins
7. Don't let up
8. Create a new culture

Figure 8.2: Approach of Kotter (2007)

Each step should be supported by a proper leadership style to ensure the stage succeeds. Furthermore, we further improve the approach by supplement the eight-step method with several additions that are required by the employees based on other theoretical methods and experiences from practice. We state that the Congolese employees in Pointe-Noire require a relatively high level of supervision. As they are not yet very motivated and ambitious to execute all activities properly and they are relatively low educated, we propose a directive and transactional leadership style in which a top-down approach is adopted. The change process should be designed by the higher

management in the first phases and can be more developed by the lower employees in the later phases. This development of the process can start as soon as they get motivated and have sufficient understanding of the concepts, the mains, and the goals of the project. Moreover, we conclude that employees require more extensive training, can be more motivated by giving them rewards, and are more willing to participate if they accept the changes in an early stage of the project.

We present a complete overview of the change management framework including the eight steps, leadership styles, and additions from other methods in Table 8.1.

Implementation stage	**Leadership Style**	**Requirements from practice**
Create sense of urgency - Convince managers that current situation is problematic - Explain a worst case scenario	Directive Transactional Design	Gain acceptance
Create a change team - Assemble a group with enough power to lead the change process - Encourage this team to work different compared to the current situation	Directive Transactional Design	Gain acceptance Training
Vision & Strategy - Create a vision of the future - Develop a strategy to realise this vision	Directive Transactional Design	Gain acceptance Training
Communicate - Use all channels to communicate the vision and strategy - Use the change team to promote the change	Directive Transactional Design	Gain acceptance Training Rewards
Empower others to act - Remove all barriers for the vision - Encourage employees of acting different	Directive Transactional Design & development	Training Rewards
Produce quick wins - Develop visible performance indicators - Reward people to improve	Directive Transactional Design & development	Rewards
Don't let up - Develop employees to realise the vision - Use benefits from early wins to promote the rest of the process	Directive Transactional Design & development	Motivational hurdle
Create new culture - Link new behaviour to successes - Ensure that new goals are consistent with the new vision	Directive Transactional Development	Motivational hurdle

Table 8.1: Overview of the change management framework of Brasco

8.1.3. Impact of the framework

The framework we described is based on academic and practical findings, and we combined these findings to develop a customised framework for the specific situation of Brasco. We have focussed on the core problem and the underlying causes that can be influenced within the scope of our research. This combination of theory and practice resulted in a very powerful and effective approach that is very valuable for Brasco in Pointe-Noire.

We considered educational as well as social and cultural problems and barriers. The framework copes with the educational issues by extending the provided training of employees. By training sessions during stages 2-5 of the framework, the employees will gain a better understanding of the means and goals of the project as well as their role in the whole process.

The cultural and social issues are handled by the framework as well. The combination of a clear sequence, a structured change process, and a proper leadership style supports the employees to improve their working structure. This is further improved by additional training sessions. This improvement of structure and the proper implementation of SAHARA standards copes with the organisational misunderstandings. Communication structures and responsibilities are much better controlled if these standards are properly implemented. Finally, the eight-step approach aims to gain acceptance by the employees and further improve this by motivate them to succeed. A reward system, training sessions, the use of specific terms, and other motivational factors further stimulate the employees to get motivated and to improve their level of ambition.

Based on our practical reflection on the framework, we conclude that a structured approach with a proper sequence and leadership style is required. Without a clear sequence, chaotic situations will occur and employees will get confused. Moreover, the use of the expression 'Heineken standard' and the example position of Brasco for other breweries are very effective tools to motivate Congolese employees. The SAHARA tools have proven to be potentially very effective as soon as these tools are properly implemented.

We conclude that all underlying causes that can be influenced are considered within the framework. This framework provides Brasco with a structured approach to manage the change process and is able to cope with all practical barriers and requirements. This leads to an effective approach to solve the overall problem: a lack of focus on preventive maintenance.

Brasco should be aware that this approach has not yet been implemented. Besides, a reward system and training programs are not yet developed and it is unsure if this same approach is applicable to other African breweries. We discuss these factors in more detail in the next section.

We summarise the pros and cons of our framework in Table 8.2.

Pros	**Con's**
+ Effective and powerful approach + Solves the core problem + Provides much structure + Considers all underlying causes + Supports & motivates employees	- Not yet implemented - Extensive training is undefined - No reward system - Applicable to other African breweries?

Table 8.2: Pros & cons of the framework

8.2. Recommendations

The development of the framework is completed and can be fully implemented. This has not been fulfilled yet. We discuss this in Section 8.2.1, followed by required further research in Section 8.2.2 in which we consider the training programs, reward system, and the applicability of the framework in other African breweries.

8.2.1. Implementation

During our stay in Pointe-Noire at the brewery of Brasco, we gained interesting and useful information and were able to develop a framework that is effective in the implementation of the SAHARA project and realisation of the change in focus of the employees from corrective to preventive maintenance in a structured way. However, the framework has not yet been implemented and this is still a very important part.

The most important part is that the implementation is executed according to our framework and that the responsible manager fully understands the meaning and targets of this framework. As Congolese people are not used to make use of very structured and European methods, we recommend hiring someone from Heineken Nederland to manage the whole project. Currently, an intern is responsible for the SAHARA project and he is supported by Heineken. This approach should be extended until the end of the project.

Although our framework provides Brasco with a structured approach to implement the project and describes a proper sequence in which the activities should be executed, it does not contain a very detailed project plan. This project plan should be developed by the responsible project manager in Pointe-Noire according to our framework.

As soon as the framework is properly adopted by Brasco and the project manager fully understands the meaning and targets of the project, the implementation of the SAHARA project has a very big chance to succeed.

8.2.2. Further research

We discovered several options that are relevant for the implementation of the project that are not yet investigated. We discussed these additional implementations already in Sections 6.3 and 7.4. First of all, the training program should be extended. The human resource department should investigate what the exact levels of the employees are and how Brasco can improve these levels by proper training.

Secondly, they should investigate opportunities to improve the level of ambition and motivation. As we discussed in this report, this level influences most main problems and has to be improved. Therefore, Brasco should investigate the possibilities for a punishment or reward system. Besides, the human resource department has to investigate all jobs according to the job characteristics model and find ways to improve these characteristics.

Finally, Heineken has to analyse this framework and compare it with the situations at other African breweries. We expect that our proposed framework can be very effective at other breweries as well and this should be further investigated.

Summarised, further research subjects have to be the training programs of Brasco, the introduction of a punishment or rewards system, and whether this framework can be used at other African breweries.

Reflection

In this chapter, I look back at the past year in which I arranged and executed an internship for my graduation project. I discuss the main learning goals of this internship and my professional functioning during the execution of the project

As I am highly interested in doing business in an underdeveloped country, I was looking for a new opportunity to perform an internship in Asia. After contacting several companies, I came in contact with Heineken and they offered me a project in Africa. Although this is not the same as Asia, I took this opportunity as the project looked very interesting and the conditions were good. Heineken arranged all vaccinations and administrative requirements and I was able to take a plane on the 15th of September to Pointe-Noire, Republic of Congo, to perform a six-month project concerning the reorganisation of the technical department of Brasco.

To benefit as much as possible from this opportunity, I set several learning goals before I left The Netherlands:

- Having an experience within a different (business) culture
- Learn to set goals, manage the process, doing critical analysis, and gain the right information to successfully perform the project
- Performing an academic research individually
- Learn to convince my managers of new ideas that should be implemented or executed
- Learning the French language

Experience within a different culture

It was a great learning experience to live and work in an African culture. On my first day, it already became clear that this was totally different compared to Holland. There is very much manual labour, they use much older equipment, and their IT systems are outdated. However, these Congolese people are still able to operate on a large scale and achieve great annual results. I cooperated with almost all employees of the technical department, who were all Congolese. Although I was just an intern, they handled me like I was a consultant from Europe that had years of experience within a brewing environment. They treated me like their boss, which was very strange and uncomfortable in the beginning. I had very much responsibility and even my (Congolese) manager accepted everything I proposed. This was strange, because I had no experience within Heineken or another brewery. After a couple of weeks, I succeeded to decrease the enormous gap between me and my Congolese colleagues and it became very pleasant to cooperate together. Furthermore, I got approval to hire 10 Congolese interns who were working full time for my project. I had to manage this group of interns, which gave me a great leadership experience. It was very hard in the beginning, as there were many cultural differences and we did not understand each other properly. However, I learned to cope with these interns and to understand them. Overall, I have learned a lot from working within an African business culture and cooperating with Congolese employees.

Managing & executing the project

This project was the second project that I performed within a big (African) company concerning logistical complexities. However, this was the first time I cooperated with so many people and I had so many different activities and deadlines. As the Congolese employees were not used to work with strict goals, deadlines, and time schedules, it was sometimes very hard to manage the project and to achieve my goals on time. It was an enormous challenge to manage this process

and to ensure all goals were met at the end of my six-month internship. During many meetings, action plans, workshops, and training sessions, I managed to explain all activities and motivate the employees to execute them properly. Within my project, I had several different sub-projects that I wanted to execute during my internship. I gained many new insights of how to cope with several sub-projects and how to motivate people to execute work for me.

Individually performing an academic research

The project I performed in Congo was very interesting and useful, but was not very academic. The procedures and tools I implemented were developed by Heineken and mainly based on well-known logistical concepts that were developed decades ago. However, I still had to perform an academic research based on this internship. During discussions about this topic with Peter Schuur, I came to new insights that resulted in the subject of my research: change management within an African culture. This was very importing during the execution of my project and changing Congolese people was the hardest part of it. Within five weeks, I managed to write my thesis based on literature and my practical findings in Congo. I am very proud of the results and I am convinced the results are very interesting for Brasco as well as Heineken. I learned how to approach a non-academic project on an academic way.

Selling new ideas

One of the sub-projects was to start using the CMMS that was installed: Maximo 4. This was an outdated system that was never implemented properly and there was no more knowledge about this old version. However, my manager required me to start using this system. During many experiments and discussions with experts, I was convinced that it was much better to upgrade to the new version. With the right arguments and enthusiasm, I managed to convince the supply chain director to invest in the newest version and to approve the implementation of the newest version. This was not easy and I learned a lot from selling my ideas.

Learning the French language

After I received the phone call that confirmed me that I was able to go to Africa, I realised that Congo was a French speaking country and that literally nobody speaks English. Of course, I had French lessons during high school, but my level of French in September was insufficient to work in a French speaking environment. In the first month in Congo, I had two hours of French class every day and I improved very quickly. During my stay in Congo, I improved my French such that I feel comfortable of working in a French environment. Currently, I am able to participate in French conversations and discussions and I am no longer afraid to work for a French company.

Concluding, I can state that this internship was a great learning experience for me. The African culture, doing business for Heineken, and performing an academic research projects were very interesting and I gained many new insights. This experience will be very useful for the rest of my career.

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