

University of Twente
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Master thesis Business Administration

Topic : Implementation of an activity-based
costing method at MAIN B.V.

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Management summary

In order to get insights in their cost structure, MAIN B.V.¹, a subsidiary of Enviem, wanted to have an activity-based costing model implemented in their organisation. After researching what MAIN's activities are, to which cost pool these activities relate, which cost should be allocated to which type of activity, the output measures et cetera, it appeared that cost prices that are handled for the division Terminal were higher than the sales prices. This caused that MAIN is making losses. In order to improve the results, Enviem already made changes in MAIN's management team. A more experienced manager was hired as CEO, who is focussing on improving processes in the company. As a result of hiring this new CEO, there are already some changes visible. New IT-systems were set up. Also a new financial program, which is already used by the holding, is being integrated within MAIN. Hereby, the holding can better monitor how MAIN is performing. Also, there has become more focus on personal development of employees and managers. Also processes are analysed in order to reduce abundant costs. The developed activity-based costing tool helps MAIN to monitor their costs closely. The tool will be used to compare cost prices over time, so MAIN could react when major changes in cost prices appear.

As already stated, the outcomes of this research showed that the activity costs of the division Terminal were higher than the sales prices. A plausible explanation for this could be the decreasing price of oil worldwide and MAIN's inability to react towards it.

Another outcome of this research is that, due to the nature of products and services MAIN offers, a simplified activity-based costing model is developed. The theory of activity-based costing does not consider the diversity that could occur while executing a particular task. Therefore, a proportional-by-volume method was used in order to allocate overhead costs.

Furthermore, MAIN should closely monitor their direct costs, especially when demand for MAIN services/products remains on the same level. This research shows that increases in direct costs have major influences of MAIN's cost prices when the demand for MAIN's products/services stay more or less constant.

¹ From now on MAIN B.V. is called MAIN.

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Figure 1. MAIN's primary divisions (Nieuwenhuizen van, 2015).



Figure 2. Divisional structure MAIN (Nieuwenhuizen van, 2015).

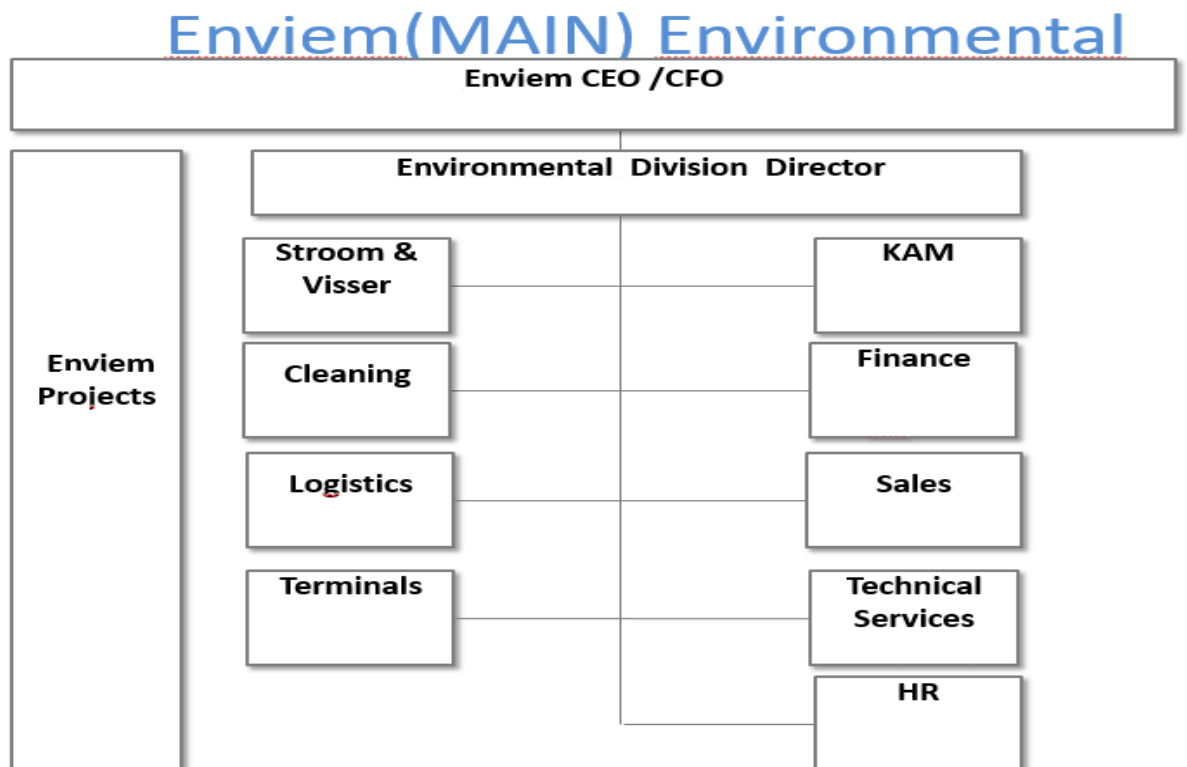


Figure 3. The way cleaning activities are executed (Nieuwenhuizen van, 2015).

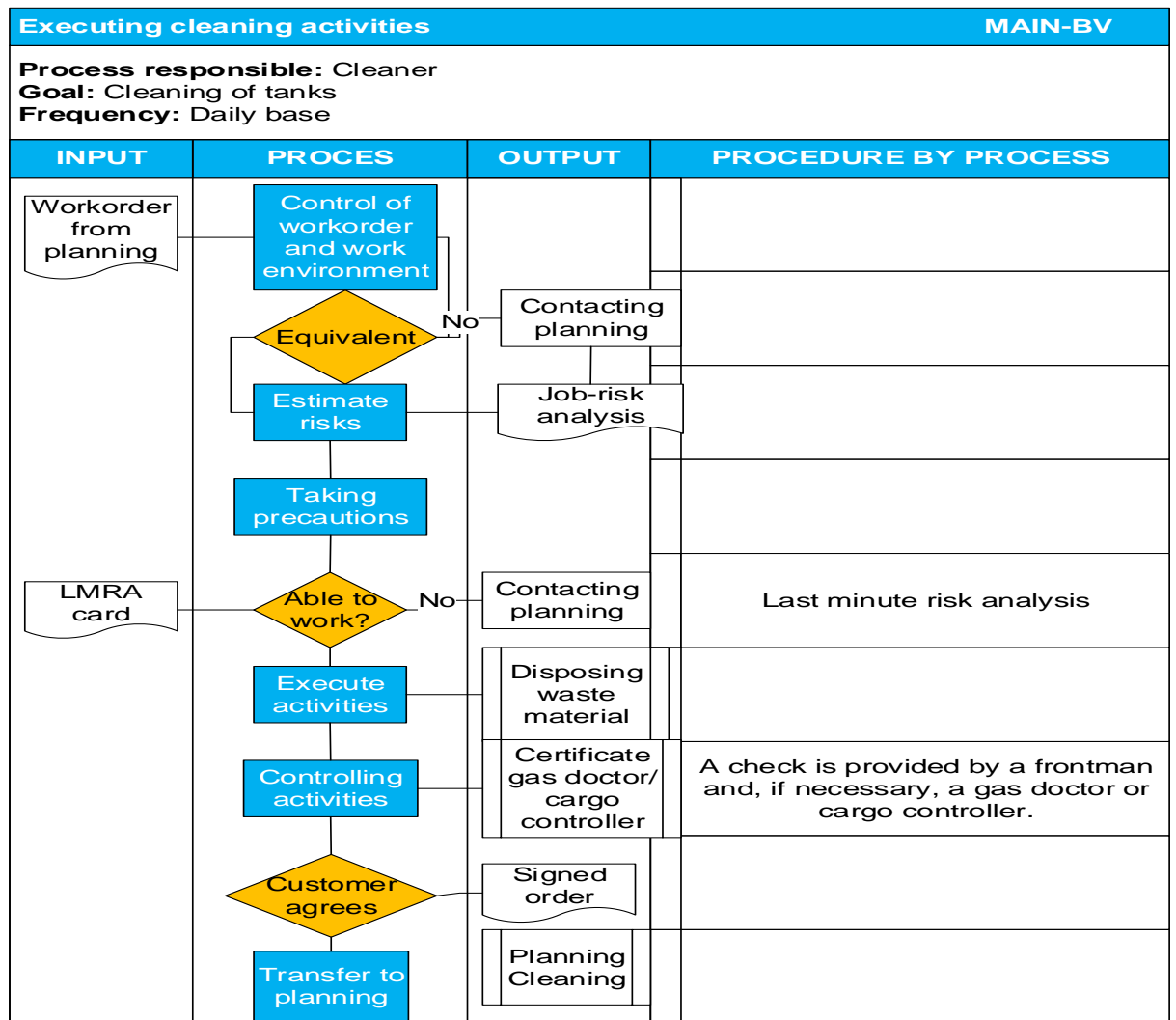


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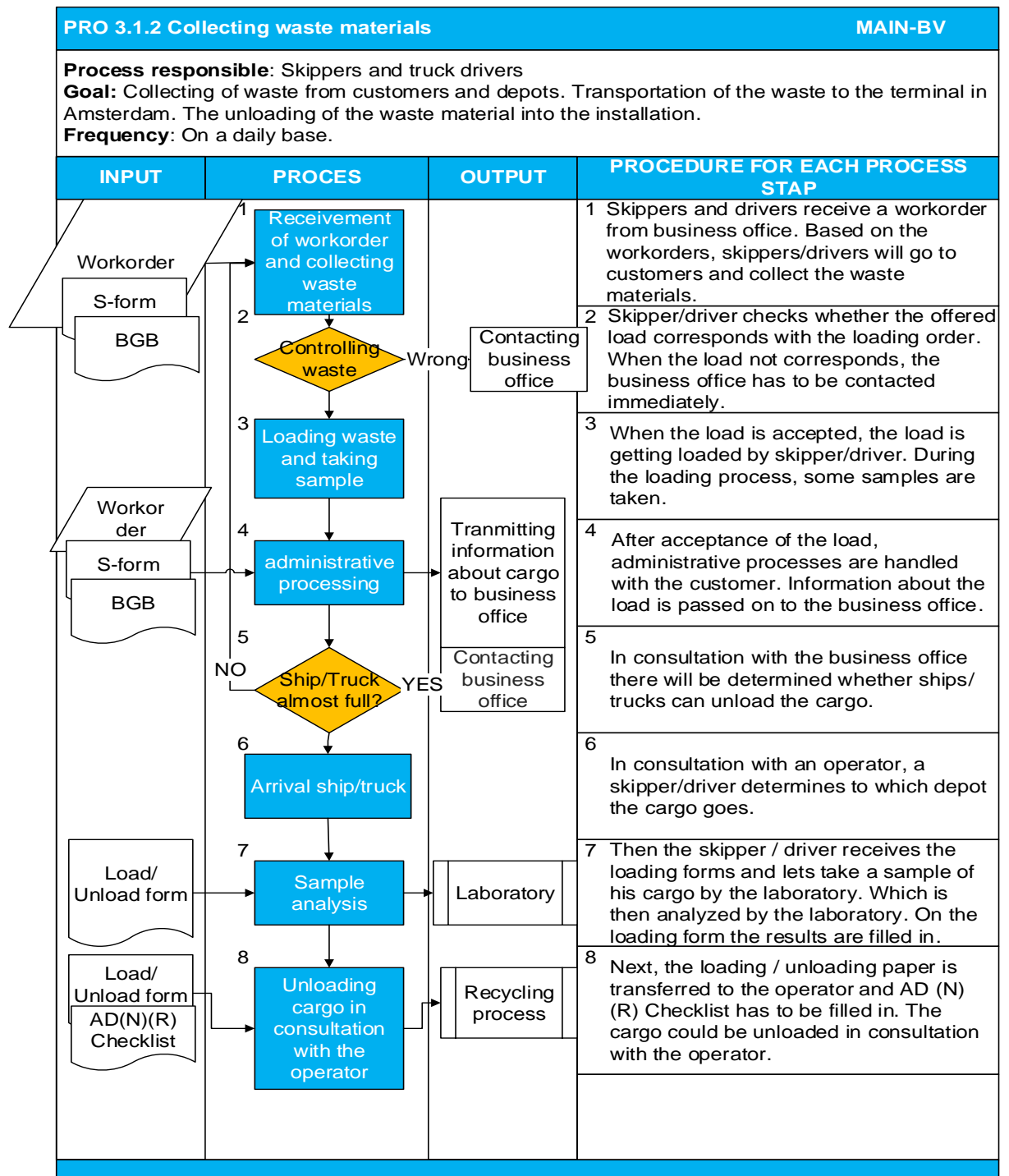


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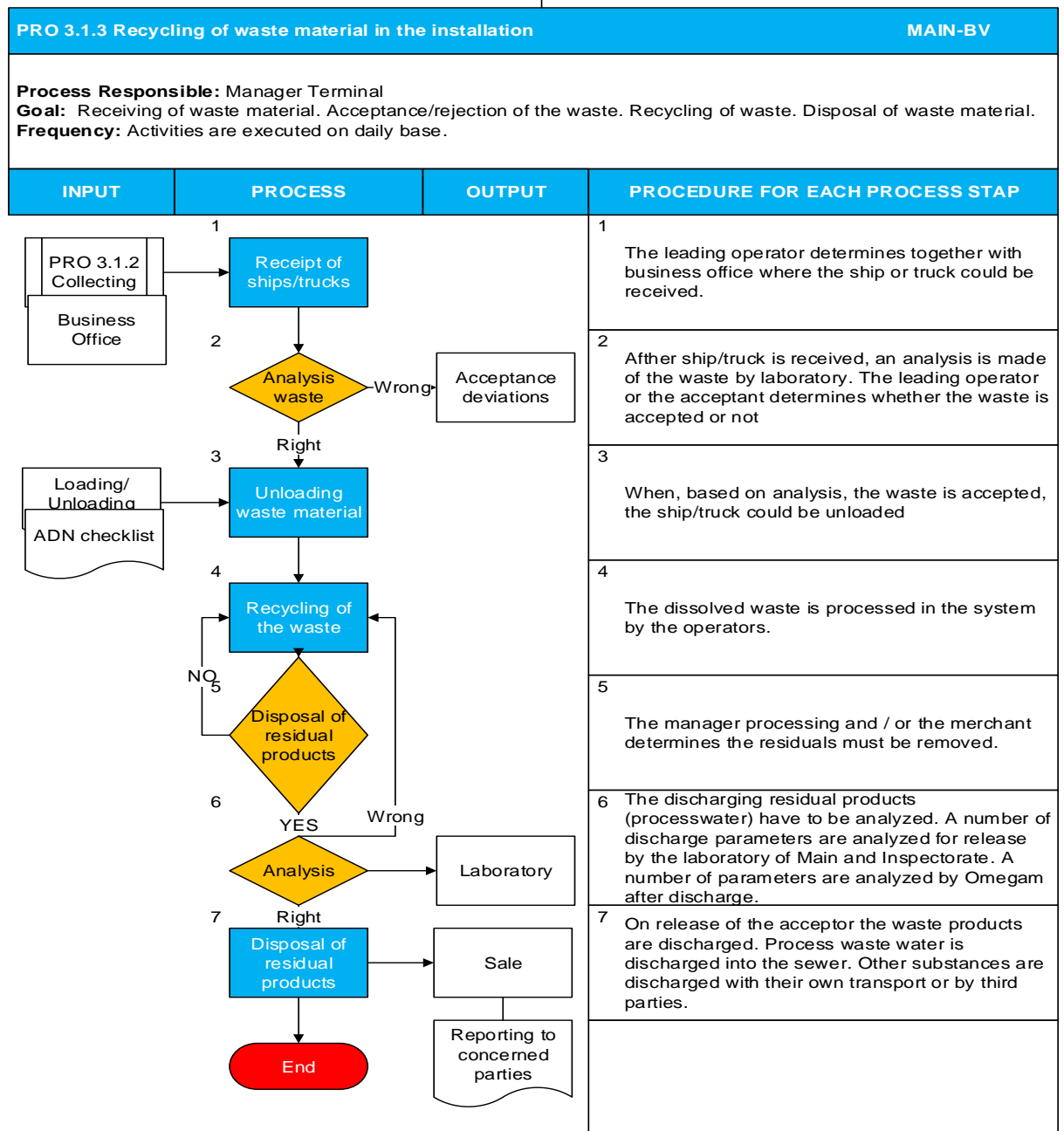


Figure 6. MAIN's place in the Enviem Holding (Enviem, 2015)



Figure 7. Academic problem solving (Visscher de, 2015).

Academic problem solving (design research)

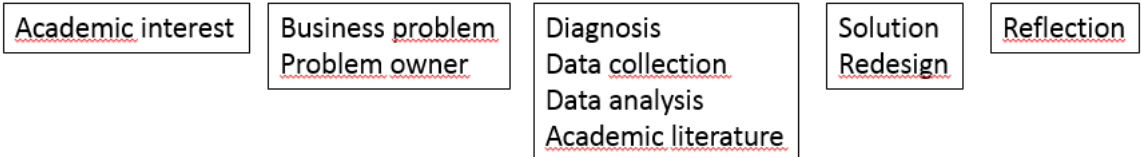


Figure 8. Output from accounting programmes used by MAIN.

Kosten	Kostenplaatsnaam	Pa	Paragraafnaam	Groc	Grootboeknaam	Bedra	Bedi	Bedi	Be
1001	LINDE - heftruck linde	440	KOSTEN VERVOERMID	44000	Onderhoud en Reparatie	3.139	7.490		
1001	LINDE - heftruck linde				Resultaat boekjaar 2015			3.139	7.490
1002	K16GKL4 - Citroen 16-GH	440	KOSTEN VERVOERMID	44000	Onderhoud en Reparatie	0	6		
1002	K16GKL4 - Citroen 16-GH	440	KOSTEN VERVOERMID	44050	Gas, water en elektra (V)	0	1.127		
1002	K16GKL4 - Citroen 16-GH	440	KOSTEN VERVOERMID	44800	Parkeer-, tol- en veergeld	0	72		
1002	K16GKL4 - Citroen 16-GH				Resultaat boekjaar 2015	0	-1.204		

Figure 9. Output combined into generalizable ledger numbers.

Paragraaf	Paragraafnaam	Grootboek	Grootboeknaam	Bedrag Debet Cur	Divisie	Subdivisie
400	PERSONEELSKOSTEN	40.030	Pensioenpr./ verz.kst. directie	7.457	HOLDING OVERHEAD	Indirecte kosten
400	PERSONEELSKOSTEN	40.091	Inhuur personeel	434.069	HOLDING	Kosten direct toe te wijze
400	PERSONEELSKOSTEN	40.100	Arbodienst	6.419	HOLDING OVERHEAD	Indirecte kosten
400	PERSONEELSKOSTEN	40.115	Werkkleding	24.316	HOLDING OVERHEAD	Indirecte kosten
400	PERSONEELSKOSTEN	40.116	Stomenrijkosten	12.758	HOLDING OVERHEAD	Indirecte kosten
400	PERSONEELSKOSTEN	40.120	Studiekosten	18.804	HOLDING OVERHEAD	Indirecte kosten
400	PERSONEELSKOSTEN	40.125	Kantinekosten	25.125	HOLDING OVERHEAD	Indirecte kosten

1. Situation description & research outline

In this chapter, the goal of this research, the research question and relevance of this research, academic as well as practical, will be discussed.

1.1 Situation

In the current situation, MAIN handles a traditional cost system. A traditional cost system allocates indirect costs of departments to products or services (Rchid, Bouksour, & Beidouri, 2013). These indirect costs or overhead costs are allocated using a single allocation driver, which is based on a predetermined allocation rate (Özkan & Karaibrahimoğlu, 2013). According to Kujacic et al., shortcomings of this cost system would be overcome by the activity-based costing method (Kujacic, Blagojevic, Sarac, & Vesovic, 2015). Activity-based costing analysis assigns resources to activities, using a different cost driver for each activity (Özkan & Karaibrahimoğlu, 2013). ABC-analysis also contributes to reducing arbitrariness into the division of indirect costs (Stefano, Werustky, Selig, & Filho, 2013). So in order to calculate a more accurate cost price, more allocation drivers should be taken into consideration. In order to get a more accurate overview of their costs per activity, MAIN wants to implement an activity-based costing analysis (ABC-analysis). With a more accurate cost price per activity, MAIN will be able to respond better to the markets they are involved in. Also, MAIN will be able to compare their costs more accurately with competitors and react to it. Furthermore, there will be looked how a change in direct cost structure affects the costs per activity. In that way, MAIN will know what their costs per activity approximately will be when there is an in- or decrease in direct costs of a division, due to an in- or decrease in service demand.

1.2 Goal of this research

The goals of this research are:

- To implement an activity-based costing analysis (ABC-analysis) at MAIN.
- Analyse what happens with the cost per activity when the direct cost structure changes.
- To research whether activity-based costing method is still an applicable method these days.

1.3 Research question

MAIN already determined that an ABC-analysis had to be implemented in order to create a more accurate cost price per activity. However, it is not clear how this ABC-analysis has to

be implemented. Therefore, in order to execute this research, the following research question was raised:

How should MAIN allocate their costs to their activities?

In order to answer this question, several sub-questions were deposited (based on Kaličanin and Knežević activity-based costing implementing scheme):

1. What are MAIN's activities ?
2. What are MAIN's cost objects?
3. Which activities are required for each cost object to occur?
4. Which cost drivers will be used for allocating indirect costs?
5. How should the output be measured?
6. What are the costs per activity?
7. What happens to the cost price per activity when overhead cost structure change?

1.4 Theory & Relevance

In this case, the solely theory that is used is the theory of the ABC-analysis. Substitutable theories are explained. Because MAIN wants to have an ABC-analysis executed and implemented for future use. Hereby, MAIN generates a more accurate cost overview per activity, which it can use in order to respond to market changes, customer desires, holding desires et cetera. Also, this information could be used to create a benchmark, which is not available for the current market. Number of researchers argued that ABC could lead to more accurate costing information (Elhamma & Fei, 2013). This research could strengthen or weaken this argumentation, by showing that the analysis leads (not) to more accurate costing information. Also it could provide evidence in order to test whether the theory is still applicable. According to Kaplan and Anderson, many companies faced difficulties or could not implement activity-based costing at all (Kaplan & Anderson, 2004). For this reasons, the research is also academically relevant.

1.5 Research Outline

In this research, an ABC-analysis will be implemented at MAIN. In order to successfully implement this analysis, first the activities that are executed by MAIN and MAIN's position in the holding are accurately mapped in chapter two. Chapter three explains what an ABC-analysis is, what its advantages and disadvantages are and how it should be implemented. In chapter four, the methodology used in this paper will be explained. Chapter five contains the analysis of the results and thereby the creation of an activity-based costing

tool, which can be used in the future. Chapter 5.2 gives an overview of what happens when the overhead cost structure changes. Chapter six will give the conclusion and the remaining parts will elaborate on discussion, limitations and appendices.

2. MAIN: the company

In this chapter there will be elaborated on activities performed by MAIN. Also MAIN's structure will be explained, even as and its place in the holding. This elaboration creates a good understanding of what kind of company MAIN actually is.

2.1 Structure of the company

In this chapter there will be elaborated on how MAIN has been built up.

2.1.1 MAIN's divisions

When taking the products and services MAIN offers into consideration, it appears that MAIN divides their products and services into three divisions, as shown in figure 1: Cleaning, Logistics and Terminals.

In 2013, MAIN bought and integrated a competitor into the company; Stroom & Visser, a company that mainly focused on cleaning of tanks and collecting maritime waste. While Stroom & Visser's cleaning activities were allocated into MAIN's cleaning division, the collecting of maritime waste was allocated to MAIN's logistic department. So, Stroom & Visser was fully integrated into MAIN.

The cleaning department mainly focuses on the cleaning of tanks of ships and trucks, while logistics takes care of collecting, saving and transporting waste from ships, trucks and gas stations like used oil, bilge water, sanitary waste water, engine room sludge and small dangerous waste like coolant, oil filters, polishing cloth, fats, paint waste, batteries et cetera from different platforms. There are two ways of collecting: by ship or by truck. There are also two ways of transporting: by ship or by truck. Some of the ships MAIN possesses serve as a storage facility; some of the ships MAIN possesses are used as a way of transporting the waste to MAIN's terminal, where the recycling process takes place. The terminal is responsible for the analysing and recycling of the collected waste. All of the divisions are supported by secondary divisions, who's role will be further elaborated on in the next paragraph.

2.1.2 Supportive divisions

MAIN's head activities are supported by a lot of secondary activities in order to keep the company going. These secondary activities are placed into divisions, which are shown in

figure 2. The divisions that produce and delivers MAIN's products and services are placed on the left side of figure 2. The supporting divisions that are needed to keep the company going are placed on the right side of figure 2. The environmental division director has to make sure that all of these divisions function well and that MAIN creates value for the Enviem group. The environmental division director reports to and is accountable to the CEO and CFO of Enviem. The secondary divisions are specifically bounded to one of the primary divisions. All of the secondary divisions support and contribute to the three primary divisions. The Enviem projects department supports MAIN by implementing improvement programs.

The KAM division is responsible for quality and regulation management. It is KAM division's responsibility that all of the processes meet regulations and internal standards. The finance division is responsible for all of the financial processes within MAIN, such as drafting and paying of invoices, bookkeeping et cetera. The sales division is responsible for the sales made, attracting new customers and satisfying current customers. The technical services division takes care of all the maintenance that has to be executed. The HR division takes care of personnel issues, like recruiting new personnel, administration of pay roles, managing employees performance et cetera.

2.2 MAIN's activities

In order to create a good understanding of the company, first there will be looked at the prime activities MAIN execute. MAIN categorize their activities into three divisions : Cleaning, Logistics and Terminal. The divisions consist of prime activities, which, on their turn, consist of secondary activities, where has been elaborated on in previous paragraph.

2.2.1. Cleaning

As already suggested by its name, the cleaning division takes care of cleaning; the cleaning of ships and tanks. This is the cleaning's division main activity. The cleaning division takes care of the cleaning of all of the tanks that are available on a ship, such as bilge tanks, sewage tanks, heavy fuel oil (HFO) tanks, diesel tanks, marine diesel oil (MDO) tanks, settling tanks, void space and bunker tanks. Also on shore tanks and engine rooms could be cleaned by MAIN. In order to start the cleaning activities, the customer first has to contact MAIN. Hereafter, an employee of MAIN controls the work order and working place. When the work order fits the working place, a risk analysis has to be made by the employee. After the analysis, the employee has to take precautions concerning the situation. If the employee believes the working place is safe enough, the cleaning activities

could start. However, when the working place is not safe enough the employee should contact planning personnel. When the cleaning activities are fulfilled, the cleaned area should be checked by the employee and sometimes also by a gas specialist. After the check, the customer should sign the work order, which is eventually processed by planning personnel. This is graphically shown in figure 3.

2.2.2. Logistics

Logistics takes care of collecting and transporting of used oil, bilge water, sanitary waste water, engine room sludge, and small dangerous waste, like coolant, oil filters, polishing cloth, fats, paint waste, batteries et cetera from different platforms. The collected material is collected in two ways: by ship or by truck. Waste material from ships could be pumped into ships of MAIN, who are in the same harbour. Hereafter, a ship could go to the terminal in Amsterdam and deliver the waste materials. It is also a possibility that a MAIN ship only collect the waste of third parties in order to secure a high service level. In that case, a MAIN ship could collect waste of multiple other ships, pump it into another MAIN ship, which transports the waste material to the terminal in Amsterdam. So there are two ways ship waste is collected by ships of MAIN. The trucks also collect in two ways: trucks could collect ship waste and used oil from a customer and transport it to the terminal. It is also possible that trucks pump collected waste material into ships of MAIN, which will transport it eventually to the terminal in Amsterdam. Furthermore, the ships and trucks could be subdivided regarding to flash point. Some of the ships and trucks are available to collect maritime waste with a high flash point, such as sludge, bilge, diesels and sewage; other ships and trucks are available to collect maritime waste with a low flash point, such as benzenes, naphtha's and wash water. This is graphical shown in figure 4. The main activity of logistics department is transporting, by ship or by truck.

2.2.3. Terminal

The terminal (recycling) division takes care of the recycling of used oil, oil-water mixtures and bilge and sludge, which are the MAIN activities of the terminal division. All of the remaining waste material that is collected is stored at the terminal or depots. MAIN however does not recycle it. The remaining waste is transported to companies who are able to recycle the waste materials. In order to recycle the oil, first a sample of the oil has to be analysed at the laboratory. After this analysis the recycling process could start. When the sample is approved, the unloading of the ship or truck could begin. The waste material is

pumped into the installation. After a high technological process, the output of the installation are the products MAIN wants to sell; used oil, oil-water mixtures and fuel remnants as bilge and sludge. The recycling manager determines whether the products have to follow the technological process again or if these could be analysed. The products have to follow the technological process until they are able to be analysed. When it appears that the analysed products do not meet the required standards, they also have to follow the process again. This circle repeats until the products meet the required standards. When the required standards are met, the products could be drained and sold. This is graphically viewed in figure five.

2.3 Company's place in the holding

When taking the holding into consideration, it appears that the holding handles four divisions: Enviem Environmental Services Holding B.V., Enviem Wholesale Holding B.V., Enviem Retail Holding and Enviem lubricants. MAIN belongs to the Enviem Environmental Services Holding B.V., see figure 6. These divisions are all together responsible for a net turnover of € 1.700,41 million per 31-12-2014 whereby Enviem Environmental Services Holding B.V. contributes to this number with € 18,7 million. The holding had a short term debt of € 40,34 million, a long term debt of € 47,38 million and had to pay € 1,57 million on interest. The environmental division was responsible for 92 out of 697 jobs in 2014 of the Enviem group (holding, 2015).

3. Methodology: Direct costs, indirect costs and the ABC-analysis

In this chapter, the differences between direct and indirect costs will be discussed. Also, the ABC-analysis, its advantages and disadvantages and its implementation process will be elaborated on.

3.1 Direct costs

Costs could be divided into two broad categories: direct and indirect costs (Drury, 2012).

Direct costs are costs that could directly be assigned to a product or service, like raw materials that are used for fabricating a product. Direct costs also could be divided into two categories: direct labour costs and direct material costs. Direct labour costs are labour costs that could directly be assigned to a product or service. For example, the costs of a truck driver who is collecting oil. Direct material costs are the material costs that could directly be linked to a product or service. For example, a truck that is needed for collecting oil.

3.2 Indirect costs

Indirect costs are the costs that could not be directly be assigned to a product or service.

These costs are often referred to as overhead costs. These overhead costs could be divided into three broad categories: indirect labour, indirect materials and indirect expenses (Drury, 2012). Indirect labour costs could not be directly assigned to a product or service. Examples of indirect labour costs are the labour costs of personnel working on financial, human resources and maintenance departments. Indirect material costs are for example the costs of material used for maintenance, materials used at offices et cetera. Indirect expenses include for example lighting and heating expenses as well property taxes (Drury, 2012). In MAIN's case, direct costs are 5,2 times as high as indirect costs.

3.3 Traditional costing method

The traditional costing method imputes costs that could not directly be linked to a specific product are equally divided between all fabricated products, the amount of production hours or the selling value of the produced goods. It is a relative easy and cheap way of calculating a cost price (Van der Velde, 2011). However, it is not an accurate method of calculating a cost price, because only one output measure and one cost driver are used. The following sub-chapters will discuss the ABC-analysis, another way of calculating the cost price of a product or service, what the advantages and disadvantages of this method are how it should be implemented.

3.4 What is an ABC-analysis?

An ABC-analysis provides information on the cost of processes, products, activities and other costs. Its goal is to create a framework for overcoming the trouble encountered in traditional cost accounting (Rchid, Bouksour, & Beidouri, 2013).

According to Berry and Jarvis, “*activity-based costing recognizes the complexity of business activities, the nature of the overheads and what drives or causes them* (Berry & Jarvis, 2011).” The most important assumptions that underpin activity-based costing are:

- Costs are caused by activities, activities like ordering of raw materials, processing of materials, use of machines and assembly; also overhead costs like a finance or human resource department are caused by activities.
- Making products stimulates the demand for activities.
- Costs are allocated to products based on products consumption of the activities (Berry & Jarvis, 2011).

This analysis tool could create value by giving a clearer insight into a company’s cost structure. According to Kaličanin & Knežević, “*ABC-analysis creates better understanding of all of the processes of doing business and provides relevant information on:*

- *Costs of object in order to set selling prices, assortment choice, marketing channels, etc.*
- *Duration and costs of particular activities in the value chain, to manage activities with the intention of reducing or eliminating costs of particular activities, reducing or eliminating non-value added activities, and increasing the efficiency of value-added activities to the customer”* (Kaličanin & Knežević, 2013).

So, this better understanding of all processes allows management to adjust current activities and to benchmark it with other companies. Therefore, the ABC-analysis is a useful tool for better insights of costs per activity, benchmarking and adjusting or changing the strategy of a company (Kaličanin & Knežević, 2013). While the ABC-analysis mainly focuses on the costs of each activity, it is also a tool that could be used for managing a company. The main principles of the ABC-analysis, according to Kaličanin & Knežević, are the following:

- Calculating a more accurate cost price of activities than traditional costing method, because indirect costs are allocated better.
- Creating a better understanding of the business processes.
- It becomes easier to monitor the processes because of the better understanding of processes.
- Focus lays on process and activity output, so it provides management with relevant information.
- An ABC-analysis provides data on efficiency and effectiveness of business processes, which could result in eliminating non-value-added processes.
- Because of the better understanding of the cost structure, a better prediction of future costs could be made (Kaličanin & Knežević, 2013).

The ABC-analysis is a tool which provides information to multiple levels of the company. This tool provides management with data of the cost of different activities. So it provides data on operational level. The tool provides information for management whether management should strive for a low-cost competitive advantage. So the tool also provides information for the strategic level of a company. All this together makes the ABC-analysis a powerful tool that could improve a company's competitive advantages.

3.5 Advantages and disadvantages of an ABC-analysis

When a company introduces any kind of new method, analysis, system or tool, there should be some kind of benefit in it for the company; why would a company change something when they are not benefitting from it? Besides the previous mentioned advantages, there are also some disadvantages towards the implementation of an ABC-analysis. In table one, there is given an overview of the most important advantages and disadvantages of this method (Onat, Anitsal, & Anitsal, 2014; Kaličanin & Knežević, 2013; Özkan & Karaibrahimoğlu, 2013).

Table 1. Advantages and disadvantages of ABC-analysis

Advantages ABC-analysis	Disadvantages ABC-analysis
It creates more accurate information of costs	It might be difficult to implement
Costs could be reduced	Resistance from management and personnel towards change
Waste could be detected and eliminated	It requires technical skills and equipment
It provides information for management's decision making process	Activities could be too difficult to distinguish
It provides measures for performance measurement	It might be difficult to collect data
It identifies non-value adding activities	It might be necessary to invest

3.6 How should an ABC-analysis be implemented?

Because of MAIN's relative high direct costs, an ABC-analysis becomes more attractive to implement. According to Rchid et al., in order to implement an ABC-analysis, the following steps have to be taken:

1. The cost objects have to be defined.
2. The activities that contribute to the achievement of the cost object should be defined.
3. The cost drivers responsible for each process that measure resources usage should be defined.
4. At last, the relationship between cost object, activities and resources must be defined (Rchid, Bouksour, & Beidouri, 2013).

According to Berry and Jarvis, there are four steps for calculating product costs when using an ABC-analysis. These four steps are suit with the four steps Drury recommend (Drury, 2012) and are as follows:

1. *"Identify major activities.*
2. *Collect overhead costs in a cost pool for each major activity.*
3. *Determine the cost driver for each activity.*
4. *Trace the cost of the activities to the products, using the cost drivers as a measure of demand".*

Kaličanin and Knežević also developed a scheme for implementing an ABC-analysis. This to-do list is largely similar with the standards of Rchid et al, although it is a bit more sophisticated. It contains 7 steps:

1. *Identifying the types of costs according to their allocation: direct costs, traceable costs, and non-traceable costs.*
2. *Determining the costs of certain activities and procedures related to non-traceable costs (they are assigned to activities on the basis of assessment or they are dealt with as expenses for an accounting period).*
3. *Identifying cost drivers and output measures of given activities (both primary activities and secondary activities).*
4. *Cost assignment of secondary activities to primary activities based on output measures of secondary activities.*
5. *Compiling a list of activities for each cost object.*
6. *Determining activity costs of cost objects.*
7. *Direct costs and non-traceable costs (if there is a possibility of assessment) are added to activity costs to determine the total costs of cost objects (Kaličanin & Knežević, 2013).*

This research will use the implementation scheme of Kaličanin and Knežević as a guidance because it is a sophisticated way for implementing an ABC-analysis and it covers all the parts of Rchid et al. implementing scheme and Berry and Jarvis' steps for implementing an ABC-analysis.

3.7 Substitutes of ABC-analysis

The implementation of activity-based costing also causes difficulties. It takes time and money to implement an activity-based costing analysis. This is a major barrier for companies in order to implement an ABC-analysis (Kaplan & Anderson, 2004). Another barrier that could rise is that operations are too complex to implement an ABC-analysis properly. The ABC-analysis also use proportionality and separability assumptions which do not fit with reality (Homburg, 2005). Therefore, Homburg suggests data envelopment analysis as an alternative for ABC-analysis. The main advantage of data envelopment analysis over an ABC-analysis is that it does not determine the cost driver rates ex ante, reducing information cost. Kaplan and Anderson suggest a time-driven activity-based costing model, which is more transparent and easier to implement. So according to literature, there are

substitutes of an ABC-analysis. These will not be further elaborated on because it is not relevant for this research.

4. Research Method

In this chapter, the kind of research and its methodology will be discussed. Furthermore, the choices that have to be made according through the ABC implementing scheme, which is elaborated on in the previous chapter, will be explained.

4.1 Kind of research

This research is a design research. A design research tries to solve a business problem in an academic way, following steps which are represented in figure seven (Visscher de, 2015). In this case, the company, wants to implement an activity-based costing analysis in order to create a more accurate cost overview. So MAIN's current problem is that the costs aren't allocated in a proper way, which leads to wrong cost prices for the services and products MAIN delivers. Academic literature was used in order to explain the principles of activity-based costing and to explain how implementation of this method works in practice. MAIN already diagnosed this problem and made the choice to implement an activity-based costing analysis. This research focuses on creating an ABC-analysis template that could easily be used by the company. In order to collect data, the actual costs of MAIN of January-October 2015 were used because these costs were the most recent available numbers and these costs best represent reality. In order to analyse the data, several bookkeeping programs are used. Also Windows Microsoft Excel was used in order to analyse the data and to create a simple module that could create an ABC-analysis on monthly or yearly basis. The results are going to be compared to sales prices. The comparison reflects whether the theory of ABC-analysis is still applicable in practice or that it is outdated. That is why it is also a research with academic interest; is the theory applicable in real life?

4.2 Data collection & analysis

As already mentioned, real cost figures of MAIN of January - October 2015 are used in order to calculate an accurate cost rate per activity. These cost figures are obtained using MAIN's accounting systems; Lodder, AS400 and Finsys5. The necessary information could be exported into Excel. It appeared from the data that there were costs that had too much overlap with two or more activities (overhead costs). These costs could be allocated to a single activity, however in practice it is a quite inefficient process, which causes MAIN a lot of time and therefore extra costs. For example, consider employees of the financial department. These employees are responsible for all of the three divisions. There

could be kept up how much time they spent on each division. This is however a very time consuming process which will not be very reliable because the time spent on a division could vary over time. So it is a very inefficient process. Therefore, the costs that could not be assigned to a specific activity are allocated using the proportional by volume method. This contains that the costs are allocated as follows: a percentage of the overhead costs are allocated to the different activities. This percentage is based on the already assigned costs per activity divided by the total already assigned costs. In formula form, it could be described as:

$$Xy = \frac{AACRy}{AATC} * TOC$$

Where	Xy	= Overhead costs x assigned to activity y
	$AACRy$	= Already Allocated Costs per Activity y
	$AATC$	= Already Allocated Total Costs
	TOC	= Total Overhead Costs

This formula was deduced from Schotanus' proportional by volume method, which state that the total gains and costs of a purchasing group of companies are allocated to single companies and Kellner, Otto and Lienlands cost-proportional allocation method (Kellner, Otto, & Lienland, 2014). The amount that is allocated to a single company depends on the number of items it orders (Schotanus, 2007). Kellner et al., 2014, transformed this method into a cost-proportional allocation method, which allocate overhead costs according to the proportion of individual costs of projects. This research allocate overhead costs according to activities according through the proportion of direct costs per activity, as stated by the previous formula, because the different divisions of MAIN could be considered as individual projects and the formula could be easily applied and adjusted.

4.3 Choices made in order to implement ABC-analysis.

In order to use the implementation scheme of Kalićanin and Knežević as a guidance for implementing an activity-based costing system, several choices have to be made. This chapter discuss which choices are made during the seven steps of the implementation scheme.

4.3.1 Identifying the types of costs according to their allocation: direct costs, traceable costs and non-traceable costs.

In order to assign costs to activities, there first have to be made a distinction between direct costs, traceable costs and non-traceable costs. In this case, direct costs are the costs that could directly be assigned to activities, such as labour and material costs. Labour costs that directly could be assigned to activities are the labour costs of skippers, sailors, truck drivers, lab technicians and cleaners. Labour costs that could not directly be assigned to activities, such as the costs of financial or human resources department, are treated as an overhead rate; these costs are divided by the three different divisions on basis of a percentage, which is elaborated on in chapter 4.2. Also representation costs are an example of non-traceable costs.

In figure eight, there is given an example of the output that was generated from the accounting programs MAIN uses. In total, the output gives 920 cost items. Normally, this number is too high, there is a risk that cost items are not used or that there are multiple cost items for the same costs; therefore overview could be lost (Kroon, 2015). However, in this case the number of cost items is high because costs are subdivided into several cost types per ship or truck. In order to create a better overview, cost types are generalized into ledger numbers, which is graphically shown in figure nine. These ledgers were first divided into the three divisions of MAIN, afterwards the ledgers were divided into direct costs, traceable costs and non-traceable costs. Ledgers, that could directly be traced to one of the three divisions, but not directly traced to an activity were labelled: '*Kosten direct toe te wijzen aan divisie*'. It could be seen as indirect costs or traceable costs of a division. So in fact, there are two kinds of indirect costs for MAIN: indirect costs for the whole company and indirect or traceable costs for the divisions. Ledgers that were not traceable were labelled: '*Indirecte kosten*'. Ledgers that could be traced to an activity were labelled with the name of that matching activity.

4.3.2 Determining the costs of certain activities and procedures related to non-traceable costs.

As mentioned in previous paragraph, ledgers were first allocated to one of MAIN's three divisions, when they were traceable. Non-traceable costs were allocated into a so-called overhead division. These overhead costs were divided among the divisions Terminal, Logistics and Cleaning using the 'proportional by volume'-formula that has been introduced in chapter 4.2. It also occurred that some ledgers could partly be allocated into divisions. For example the maintenance ledger. Parts of the maintenance costs could directly

be allocated to divisions, for instance maintenance of trucks could be allocated to Logistics. However, maintenance to the head quarter could not be allocated directly towards one of the three divisions. This problem was solved by allocating the maintenance cost types one by one towards a division.

4.3.3 Identifying cost drivers and output measures of given activities

According to Schniederjans and Garvin (1997), the selection of cost drivers have to be based on following rules:

- “1. Pick activity drivers that match the type of activity.
2. Pick activity drivers that correlate well with the actual consumption of the activity.
3. Reduce the number of unique drivers.
4. Pick activity drivers that encourage improved performance.
5. Pick activity drivers having a modest cost of measurement.
6. Minimize use of activity drivers that require new measurements.” (Schniederjans & Garvin, 1997)

These rules are based on multiple activities that could have multiple activity drivers. However, in this case there are not many activity drivers because of the nature of the activities that are executed by MAIN. Because the divisions Cleaning and Terminal have one core activity, cleaning of tanks and recycling of waste material, the direct and indirect costs of these divisions could just be add up. It is not realisable to split up the indirect costs in different activities, because it will be a time-consuming process which is subject to great diversity. Therefore, the indirect costs will be add up to the direct costs for the divisions Cleaning and Terminal. The output measure for the division Cleaning will be the amount of hours spend by employees on the primary activity, so the hours of actual cleaning. Because time spend on secondary activities is subject to great diversity, it is not realisable to assign costs towards activities like setting up of invoices, planning et cetera. Therefore these costs are seen as indirect costs and use the same output measure as the primary activity. The cost driver behind the output measure of the cleaning department, hours spend on cleaning, is the salary of the cleaning personnel.

The costs of the division Terminal are, just like the costs of the Cleaning division, are caused by core activities: the recycling of oil, oil-water mixtures and fuel remnants. Also for this division, it is not realizable to come up with output measures for the secondary activities, due to the fact that secondary activities like planning, setting up invoices, payment

of employees et cetera are subject to diversity. The costs of recycling oil are subscribed to recycling oil, the costs of recycling oil-water mixtures are subscribed to recycling oil-water mixtures and the costs of recycling fuel remnants are subscribed to recycling fuel remnants. There are also some costs which could not be described to one of the three main activities. Based on the proportional-by-volume formula, there will be made a distinction on how much of the costs are subscribed to recycling of oil, how much of the costs are subscribed to recycling of oil-water mixtures and how much of the costs are subscribed to recycling of fuel remnants. The output measure will be the amount of recycled oil, oil-water mixtures and fuel remnants. The cost driver of the Terminal division are the prices paid for used oil, oil-water mixtures and fuel remnants.

The costs of the division Logistics could be divided into five cost pools: costs of collecting waste materials by trucks, costs of collecting waste materials by ships, costs of delivered water in Den Helder, the costs of delivered shore power in Den Helder and the costs of activities executed by third parties. The output measure for collecting waste materials by trucks is the total amount of hours worked by truck drivers. Because truck drivers have to wait while oil, oil-water mixtures or fuel remnants are pumped into the truck, there has been chosen for the total amount of hours worked by truck drivers as output measure instead of, for instance, the amount of kilometres driven by trucks. The cost driver for this cost pool is the salary of truck drivers. For the same reason, the output measure for collecting waste materials by ships is the amount of worked hours by skippers and sailors and the cost driver for this cost pool is the salary of skippers and sailors. The output measure for costs of delivered water in the harbour of Den Helder is the amount of delivered water, the output measure for shore power is the delivered amount of shore power.

4.3.4 Cost assignment of secondary activities to primary activities based on output measures of secondary activities.

Due to the nature of activities that are provided by MAIN, especially service-focussed, it is not possible to come up with different output measures for primary activities as well as secondary activities. Therefore, the output measures of primary activities are also used for secondary activities.

Because the secondary activities of the Terminal and Cleaning division are activities, like planning and financial activities, which are subject to great diversity, the costs of these secondary activities are based on the output measures of the primary activity. The prime activity of the Terminal division is recycling of oil, oil-water mixtures and fuel remnants. Because the primary as well as the secondary activities have the same output measure, the

costs of the primary and secondary activities could be add up and divided by the output of recycling. There has been chosen to split the costs of recycling oil, oil-water mixtures and fuel remnants while using the proportional-by-volume method, because these volumes all move along a different recycling process. The amount of recycled oil, oil-water mixtures and fuel remnants becomes the output measure for the division Terminal.

Because Cleaning also has one prime activity and some supportive secondary activities which costs could not be divided due to diversity in these activities, the costs of prime and secondary costs are summed up and divided by the total hours worked by cleaners; the output measure of the prime activity.

The Logistic division has some primary activities, which are supported by the same secondary activities. Therefore, the total costs of the secondary activities are summed up and allocated to the costs of prime activities based on the proportional-by-volume formula, which is described in chapter 4.2. The prime activities have the following output measures, as described in the previous chapter:

Table 2. Prime activity and its output measure.

Prime activity	Output measure
Logistics, transport by truck	Number of hours worked by drivers
Logistics, transport by ship	Number of hours worked by skippers
Logistics, water supply	Amount of m ³ water delivered
Logistics, power supply	Amount of kWh delivered
Logistics, third parties	No output measure ²
Cleaning of tanks	Amount of hours worked by cleaners
Terminal, recycling	Amount of recycled oil, oil-water-mixtures and fuel remnants

4.3.5 Compiling a list of activities for each cost object

As already described in previous chapters, each cost object exists of a prime activity and some secondary activities that could not be split up due to diversity in this secondary activities. These activities are labelled as holding activities. Therefore, an overview of the cost objects and related activities is given in table 3.

² Because there are no activities related to work of third parties except hiring them and making of invoices. The cost for these activities are already assigned as indirect costs.

Table 3. Cost object and their related activities

Cost object	Activities
Logistics- Trucks	Logistics, transport by truck + holding activities
Logistics- Ships	Logistics, transport by ship + holding activities
Logistics- Water	Logistics, water supply + holding activities
Logistics- Shore power	Logistics, power supply + holding activities
Logistics- Third parties	Logistics, third parties + holding activities
Cleaning	Cleaning of tanks + holding activities
Terminal	Recycling collected materials + holding activities

4.3.6 Determining activity costs of cost objects.

The activity costs were assigned to the cost objects in the Excel file which was developed in order to create a better overview of costs. In figure nine, a part of the Excel file is shown. In order to get a full overview of the activity costs, the Excel file should be checked. Appendix A gives an overview of how the excel-file should be used. The final results are shown in chapter five.

4.3.7 Direct costs and non-traceable costs are added to activity costs to determine the total costs of cost objects

Figure nine gives a brief view of how the costs are assigned towards the different activities. In order to get a full overview of the activity costs, the Excel file should be checked. Appendix A gives an overview of how the excel-file should be used. The results are shown in chapter five.

5. Results

5.1 Costs per activity, division and revenue per division

As described in chapter four, first there was looked which costs belonged to which division. Also the revenues per division are taken in consideration. This led to the following cost per division, including holding costs, and revenues per division:

Table 4. Costs and Revenues per division.³

DIVISION	TOTAL COSTS	REVENUE
TERMINAL	€	€
LOGISTICS	€	€
CLEANING	€	€
TOTAL	€	€

Because table four gives an overview of the total costs and revenues per division, the figures are round up or down to whole figures. However, some of MAIN's services compete on figures after the comma. Therefore it is important that when looking at a detailed level, the figures must not be round up or down.

These costs were assigned towards the activities that are carried out by each division. This led to the following costs per activity:

Table 5. Cost price per activity.⁴

Terminal	
Costs of recycling used oil per ton	€
Costs of recycling oil-water mixtures per ton	€
Costs of fuel remnants per ton	€
Logistics	
Costs of water per m3	€
Costs of power per kWh	€
Costs Logistics- Ships per hour	€
Costs Logistics-Trucks per hour	€
Cleaning	

³ Information is confidential

⁴ Information is confidential

Costs Cleaning per hour	€
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These costs exist of direct costs, traceable and non-traceable costs and indirect costs.

These costs were assigned as was described in chapter four. The excel-file that was created could easily be used for future purposes. A description of how the excel-file should be used could be found in Appendix A.

5.2 The effect on cost prices when cost structure changes

5.2.1 The effect on cost prices when allocation of indirect costs does not represent reality

In order to divide indirect costs, there was chosen to apply the proportional by volume method. So indirect costs were allocated to MAIN's divisions based on the following percentages:

Table 6. Percentages of indirect costs allocated towards division.⁵

Division	% allocated indirect costs
Terminal	%
Logistics	%
Cleaning	%

This allocation method led to the cost prices per activity which were shown in chapter five. But what if these percentages are not reflecting reality? If the percentages are not reflecting reality, the cost prices are not correct as well. Therefore, there will be checked what happens with the cost prices when the allocation of indirect costs changes. This is done by upgrading and downgrading the percentage that is allocated towards each division with five and ten percent.

This led to the following cost prices:

Table 7. Cost prices Terminal by different amounts of allocated indirect costs.⁶

Terminal	% indirect costs	% indirect costs	% indirect costs	% indirect cost	% indirect costs
C.p⁷. Oil/ton	€ Δ ⁸ %	€ Δ%	€ Δ%	€ Δ%	€ Δ%
C.p. Oil-water mixtures/ ton	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

⁵ Information is confidential

⁶ Information is confidential

⁷ C.p. is an abbreviation for cost price

⁸ Δ stands for change relative to current situation

C.p. Fuel remnants/ton	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
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Table 8. Cost prices Logistics by different amounts of allocated indirect costs.⁹

Logistics	% indirect costs	% indirect costs	% indirect costs	% indirect costs	% indirect costs
C.p. Water/m3	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
C.p. Power/kWh	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
C.p.Truck/hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
C.p. Ship/hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

Table 9. Cost prices Cleaning by different amounts of allocated indirect costs.¹⁰

Cleaning	% indirect costs	% indirect costs	% indirect costs	% indirect costs	% indirect costs
C.p. Cleaning/hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

As could be seen in table seven till nine, a wrong estimation of percentages used for cost allocation could lead to great diversity in cost prices. So a different allocation of indirect costs leads to major differences in cost prices. Therefore it is important that the chosen percentages reflects reality. It appeared that the percentages, as shown in table six, used for calculating cost prices are considered as a good representation of reality, based on conversations with employees. However, a company could decide to allocate indirect costs not based on reality but on competitiveness. When it appears that the cost price of cleaning for

⁹ Information is confidential

¹⁰ Information is confidential

instance is not competitive, there could be decided to lower the percentage of indirect costs that is allocated towards cleaning. As could be seen in table nine, allocating five percent less of indirect costs leads to a reduction of € ... per hour or a reduction of ...%¹¹. However, these five percent of indirect costs do not vaporise. It will lead to an increase of costs of other activities. When these cost prices are still competitive, management could choose to alter the percentage of indirect costs which are allocated towards a division. However, the cost prices have to be closely monitored in order to ensure that other activities are still competitive. Furthermore, the cost price for cleaning is most sensitive towards changes in allocating indirect costs.

5.2.2 The effect of increased direct costs on cost prices

When MAIN attracts more work, this will lead to an increase of direct costs. Indirect costs however, do not have to increase, or increase not as much as direct costs because, for example, MAIN does not have to hire a new planning member when one more truck or ship is driving for MAIN. Assuming that the increase of direct costs equals the increase of output, the total costs per activity will be lower because the same amount of overhead is divided by an increased output. This could create a competitive advantage for MAIN. However, when applying the same logic a decrease in demand will lead to higher costs per activity. It could also happen that products used to execute MAIN's services become more or less expensive, which also create an increase or decrease in direct costs. There are a lot of reasons why the direct costs could increase or decrease.

So in order to find out what the effect is of an increase or decrease in direct costs of MAIN's services on the cost price, there will be modelled what happens with the cost prices when direct costs increase. Hereby the assumption is made that an increase or decrease in direct costs up to 30% will not affect indirect costs. Also, it is assumed that the relation between increased output and increased direct costs is 1:1. So when the demand for oil increases with ten percent, the direct costs will also rise with ten percent. Furthermore, it is assumed that divisions are independent and therefore the costs of one division do not affect the costs of other divisions. The results are given in table ten to fifteen.

¹¹ Information is confidential

Table 10. Cost prices Terminal when direct costs increase/decrease due to an in- or decrease in demand.¹²

Terminal	Direct costs decrease of 30%	Direct costs decrease of 20%	Direct cost decrease of 10%	Current situation	Direct cost increase of 10%	Direct cost increase of 20%	Direct cost increase of 30%
Oil/ton	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€2 Δ%
Oil-water mixtures/ton	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
Fuel remnants/ton	€ Δ%	€2 Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

Table 11. Cost prices Terminal when direct costs increase/decrease while demand remains the same.¹³

Terminal	Direct costs decrease of 30%	Direct costs decrease of 20%	Direct cost decrease of 10%	Current situation	Direct cost increase of 10%	Direct cost increase of 20%	Direct cost increase of 30%
Oil/ton	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
Oil-water mixtures/ton	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

¹² Information is confidential

¹³ Information is confidential

Fuel	€	€	€	€	€	€	€
rem-	Δ%	Δ%	Δ%	Δ%	Δ%	Δ%	Δ%
nants/ton							

Table 12. Cost prices Logistics when direct costs increase/decrease due to an in- or decrease in demand.¹⁴

Terminal	Direct costs decrease of 30%	Direct costs decrease of 20%	Direct cost decrease of 10%	Current situation	Direct cost increase of 10%	Direct cost increase of 20%	Direct cost increase of 30%
Water/m3	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
Power/kWh	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
Trucks/hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
Ships/hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

Table 13. Cost prices Logistics when direct costs increase/decrease while demand remains the same.¹⁵

Terminal	Direct costs decrease of 30%	Direct costs decrease of 20%	Direct cost decrease of 10%	Current situation	Direct cost increase of 10%	Direct cost increase of 20%	Direct cost increase of 30%
Water/m3	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
Power/kWh	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

¹⁴ Information is confidential

¹⁵ Information is confidential

Trucks/ hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%
Ships/ hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

Table 14. Cost prices Cleaning when direct costs increase/decrease due to in- or decrease in demand.¹⁶

Clean- ing	Direct costs de- crease of 30%	Direct costs de- crease of 20%	Direct cost de- crease of 10%	Current situa- tion	Direct cost in- crease of 10%	Direct cost in- crease of 20%	Direct cost in- crease of 30%
Clean- ing/hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

Table 15. Cost prices Cleaning when direct costs increase/decrease while demand remains the same.¹⁷

Clean- ing	Direct costs de- crease of 30%	Direct costs de- crease of 20%	Direct cost de- crease of 10%	Current situa- tion	Direct cost in- crease of 10%	Direct cost in- crease of 20%	Direct cost in- crease of 30%
Clean- ing/hour	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%	€ Δ%

Table ten till fifteen show that an in- or decrease of direct costs has influence on the cost prices per activity. While it seems that the influence of the increases of costs, due to increase in demand for MAIN's services, do not lead to huge difference in cost prices, in such competitive industries as the logistic industry and the oil industry a decrease in cost prices could result in a competitive advantage. When direct costs in- or decrease while the

¹⁶ Information is confidential

¹⁷ Information is confidential

demand for MAIN's services and products remain the same, the in- or decrease has a huge impact on cost prices which could have tremendous consequences for the company.

6. Conclusion

In order to create a better overview of costs, there was implemented an activity-based costing system that could provide MAIN more accurate information about the cost prices of MAIN's activities. Due to the fact that the activities that are executed by MAIN mostly considers one prime activity that are supported by activities which costs could not be directed to a prime activity, overhead costs such as HRM costs or financial department costs, the developed system has more resemblances with a traditional costing system than with an activity-based costing system. Because it was also not possible to implement multiple cost drivers per activity or service, the principles of activity-based costing were seemingly not applicable for MAIN. However, the model that is developed could be thought of as, due to the fact that MAIN's services exists of one prime activity, a simplified activity-based cost model. So activity-based costing is still a theory that is applicable in practice. However, for one company it could be more applicable than to another company.

As table four has shown, MAIN is making losses. When comparing cost prices to sales prices¹⁸, it appeared that the sales prices for Logistics and Cleaning were higher than the cost prices. However, the cost prices for the division Terminal exceeds the sales prices. One of the reasons why this could occur is the global decline of oil prices. In order to stay competitive, MAIN has to adjust towards the market. Therefore it is important for MAIN to analyse the Terminal division once again in order to find out whether processes could become more efficient and where costs could be saved.

Furthermore, a different allocation of indirect costs could lead to wrong cost prices. Therefore it is important that the allocation method more or less match with reality. In this case, the used allocation method gives, according to employees, a realistic view of divided indirect costs.

Tables ten till fifteen show that MAIN also has to monitor its costs closely. Increases of direct cost which appear due to higher demand will lower the cost price per activity. However, increased direct costs while demand for MAIN's services stays the same has a bigger

¹⁸ Information is confidential.

influence on MAIN's cost prices. Therefore MAIN should always keep in mind why direct costs in- or decreases.

7. Discussion

In order to create a better overview of their cost structure, MAIN wanted to implement an activity-based costing model. During this research, it appeared that implementing activity-based costing using the ABC-theory faces difficulties in practice. In order to implement activity-based costing according to theory, overhead costs should be allocated more thoroughly. This could be done by interviewing employees on how much time they spend with each of their activity or the employees could measure the time they are working on a specific activity. However, this is a very time-consuming process, which is heavily subjected to diversity. Therefore, it is not practical for MAIN to split overhead costs into such details. Instead of measuring the time spend on overhead activities, the proportional-by-volume method was used. It could be possible that due to this proportional-by-volume method too much costs are allocated to one activity and less to another activity, which has its impact on the cost prices per activity.

Another point of discussion is whether MAIN is a company in which an activity-based costing model should be applied. The developed model gives insights in the costs being made and allocate these costs towards the related activities. Because the MAIN's products and services exist of one prime activity, the cost prices could not be calculated as accurate as in a company which products and services exists of more prime activities, like manufacturing companies. Therefore, future research could draw attention towards the relation between the nature of company's activities and whether is not advisable to implement an activity-based costing model.

The way in which indirect costs are allocated towards the divisions should also be considered. When the allocation of indirect costs do not match with reality, the cost prices will also not match with reality.

Due to privacy reasons, personnel costs were allocated by the finance manager. This is one factor in the model that always have to be adjusted manually. For the financial manager, it is relatively easy to find this numbers with the help of bookkeeping programs.

Also costs of transport have to be taken into consideration. The output generated by MAIN's bookkeeping systems divide costs to a general ledger number, such as maintenance, and not to specific activities. Therefore, another tab was created in the excel-file which allocate transport costs towards activities.

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9. Appendix

Appendix A. Instruction on how to use the activity-based cost model.

The model which was created in excel has several tabs. In order to adjust information, first information has to be exported to excel from the bookkeeping programmes. This will result in the same tabs as the tab Export and the tab Kostenopstelling in the excel file. After checking whether the cost centres (named kostenplaats in the excel-file) match and there is not a cost centre deleted or adjusted, the outcomes of the new tab could be copied into the columns 'bedrag debet', 'bedrag debet cumulatief', 'bedrag credit', and 'bedrag credit cumulatief'. Also the tab Kostenopstelling should be checked on matching cost centres. When this is done, the outcomes of the new tab could be copied into the columns 'bedrag debet cumulatief' and 'bedrag credit cumulatief'. When this is done, salary costs should be manually filled in under the right divisions. The costs of transports should be copied from the tab 'Export' into tab '440 kosten vervoersmiddelen'. Again, make sure that the cost centres match. When this is done, the cost centres described 'Huisvestingskosten' should be copied from the tab 'Export' into the tab '410 Huisvestingskosten'. When this is done, the last thing that has to be done is filling in output figures in tab 'ABC'. When these steps are completed the model automatically calculate the costs per activity.