MASTER THESIS

‘Cost allocation and customer profitability at TKF, from ABC to CPA’

PUBLIC VERSION

UNIVERSITY OF TWENTE.

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‘Cost allocation and customer profitability at TKF, from ABC to CPA’

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Preface

This report is the result of a research that is executed to obtain my Master of Science degree in Business Administration. During the studying year 2009/2010 I followed the master track Financial Management at the University of Twente. This master study made it possible to broaden and deepen the knowledge that I gained during the bachelor study Business Administration. Because of my interest in the fields of business economics and finance, I wanted to perform my master assignment on a financial topic that would be valuable to a company. Fortunately, B.V. Twentsche Kabelfabriek (TKF) has given me the opportunity to study a financial subject in a practical situation. In February 2010, I had two conversations with Walter Heerts, CFO of TKF, about possible research topics. Already in the first conversation, it became clear that studying the allocation of overhead costs would be very useful to the company. Since cost allocation had been an interesting topic during my study, the choice for this topic was easily made. I would like to thank TKF and especially Walter Heerts, for the possibility to carry out this challenging research.

Performing this research and writing the report could not have been done without the help of several persons. First, I would like to thank Peter van der Voort, commercial controller at TKF, for introducing me into the company, for continuous help with problems and for compiling several important lists of information that were needed in this research. Next, I would like to thank Marc Nijland, controller at TKF, for helping me with problems in the process of cost allocation and for guiding me to follow the right direction in order to reach the research goal.

I also want to thank the supervisors of the University of Twente. First, I would like to thank Prof. Dr. Ir. Marc Wouters, with whom I had several interesting conversations both at the University and at TKF. This resulted in valuable information and understandable ideas for performing the research as well as writing the report. Next, I would like to thank Dr. Tom de Schryver, for critically looking at the report and for coming up with several valuable adjustments to the report.

Many conversations were required for the execution of this research with persons of several departments at TKF. Conversations have taken place with persons from sales, research & development, expedition, administration and new business development. I would like to thank the interviewees for providing the information that was necessary to execute the research. Finally, I would like to express thanks to the people from the administration/finance department of TKF for creating a pleasant working atmosphere.

Haaksbergen, November 2010
Rob Altink

Summary

This financial research is entitled 'Cost allocation and customer profitability at TKF, from ABC to CPA'. ABC stands for Activity-Based Costing, whereas CPA stands for Customer Profitability Analysis. As can be seen, this thesis is focused on allocating costs after which customer profitability is analyzed. Performing the research is done for the company B.V. Twentsche Kabelfabriek (TKF). This is a cable-producing company in the Netherlands that was founded in 1930. Its mission is "to be the most innovative and market-oriented company in the cable industry by offering high quality and customized cable solutions for a reliable infrastructure" (Website TKF). The future plans of TKF show that the company wants to focus more on complex projects that are developed in consultation with customers.

In general, complex and customer-specific orders demand more efforts from companies than standard orders. By these efforts, supportive activities are meant that are not directly related to making end products, which are mostly cables. These indirect efforts result in indirect costs. By increasing indirect costs, it gets more important to deal with those costs accurately. At the same time, it is logical that the amount of efforts varies across customers. Some customers can require many visits from sales, huge efforts in developing a new product and additional actions from expedition. Consequently, profitability of such customers in reality will be lower than for customers which demand only few additional efforts. In the current situation, costs are allocated by using an average add-on of X percent above product costs. In this way, indirect costs are basically spread among customers, but are not assigned to customers which are responsible for those costs. Therefore, the following research question is formulated:

How should overhead costs be allocated at TKF to identify the profitability of each of their customers/customer groups?

In order to answer this question, several sub questions have been formulated. From the above discussion, it is clear that a new way of dealing with overhead costs is desired in order to get a more precise analysis of customer profitability. To reach this, revenues of customers should be matched to the costs that are made by these customers. This can be done by applying a method called Activity-Based Costing (ABC). In this approach, two steps need to be performed. First, costs are assigned to activities that take place at TKF. Second, activity costs are allocated to customers or products by using appropriate cost drivers. The relevant costs in this research are indirect costs at TKF that are not processed in the product cost of cables and components. A large part of the indirect costs at TKF is incurred at the following five departments: sales, Research & Development (R&D), expedition, administration and New Business Development (NBD). These departments are analyzed in this research since the activities at these departments result in many indirect costs. Next, those activities and resulting costs can have an important impact on the perceived profitability of customers.

Indirect cost allocation at TKF

The ABC method requires that first activities, costs and cost objects are known and analyzed before the actual cost allocation can start. In this case, cost objects are products as well as customers. For each of the five departments, a division is made of the activities that take place at these departments. Subsequently, the costs are analyzed for each department. Relevant costs are primarily labor costs and therefore labor is an important factor in the cost allocation process. Besides analyzing each department individually, also the total indirect costs at TKF for the year 2009 are analyzed. This showed that the amount of indirect costs represented X percent of the product costs, instead of the X percent that was thought of. This can be caused by a growing importance of indirect costs.

However, also variances in sales volume and changes in prices of raw materials can have an important influence. Finally, products and customers are analyzed before allocating costs. Products and customers are both categorized in six groups. A combination of both categorizations that is made by TKF is presented in the table below. This table is called a product/market matrix. It shows for example that customers belonging to the customer group energy can order products of all six product groups.

TKF's product/market matrix

Customer groups→ Product groups↓	Energy	Installation	Industrial	MENO	Infra	Broadband
Energy						
Installation						
Instrumentation						
Telecom fiber						
Telecom copper						
Telecom trade						

With respect to the allocation at TKF, two approaches are chosen. The first one is a general cost allocation. Here, indirect costs are allocated to customer groups and product groups. This is done by using activities that take place at TKF and by selecting appropriate cost drivers. The final result of this allocation is the product/market matrix filled with indirect costs. Important to notice is that not all costs can be allocated and that about five million of indirect costs are left and considered as general. These general costs can be allocated by using an add-on above the product costs. The second allocation approach is a detailed cost allocation. This allocation is not focused on groups but on offers that are related to customers. Indirect costs are assigned to offers to get a more accurate picture of the expected return that is made on offers. At this early stage, adjustments can be made to offers that can increase profitability. In the detailed cost allocation, an excel sheet is used that serves as a schedule for offers. In the sheet, a part of the relevant information needs to be filled in by sales staff of TKF. The use of the schedule will not only increase accuracy of profitability expectations, but can also make sales staff more aware of the effect of indirect costs. In the schedule, indirect activities can be processed that have a direct relationship to individual customers or products. Activities that are related to groups of products or customers are processed in a matrix of remains in the detailed cost allocation.

The actual allocation at TKF is described for each of the five departments separately. Here, a distinction is made between first computing activity costs and second selecting the right cost drivers and computing cost driver rates. Calculating activity costs is based on time consumption that is indicated by interviewees at TKF. Subsequently, the average labor cost of one Full-Time Equivalent (FTE) is used. Selecting appropriate cost drivers is done by analyzing the relation between activity and customer/product and also by considering the availability of data. Based on activity costs and the type of cost driver, rates are set up that are used in the allocation. These rates make it possible to fill the product/market matrix in the general cost allocation. Beside this, a part of these driver rates can be used in the schedule for offers.

Customer profitability at TKF

When costs are allocated more accurately, also profitability can be assessed more accurately. Also in describing profitability, a distinction is made between general and detail. With respect to general profitability, profit margins are presented in the product/market matrix. In analyzing profitability, a comparison is made between the old allocation method and the new ABC method. In this way, it can be seen that some product/market combinations have higher or on the other side lower profit

margins in the ABC-method. Higher profit margins indicate that less indirect costs are allocated in the ABC-method. Lower profit margins indicate that more indirect costs are allocated in the ABC-method. This comparison is presented in the table below. In the table, the (+) signs mean favourable differences in profit margins and the (-) signs mean unfavourable differences in profit margins.

*Comparison of old allocation method and ABC-method**

Customer groups → Product groups ↓	Energy	Instal.	Industry	Rail	MENO	Broad-band
Energy	+	0	--	0	--	+
Installation	+	0	--	0	--	0
Instrumentation	0	-	--	0	--	0
Telecom fiber	+	0	--	0	--	0
Telecom cable	0	0	--	0	--	0
Telecom trade	0	--	--	--	0	--
Total	+	0	--	0	--	0

** The following categorization is used:*
(0) = difference in net profit margins between -0,9% and 0,9%
(-) = unfavourable difference in net profit margins between -1,0% and -1,9%
(+) = favourable difference in net profit margins between 1,0% and 1,9%
(--) = very unfavourable difference in net profit margins between -2,0% and more
(++) = very favourable difference in net profit margins between 2,0% and more

With respect to detailed profitability, the schedule for offers is applied to some offers that are selected from the ERP-system of TKF. The required information is filled in the excel sheet, after which total indirect costs are known. Eventually, the profit margins are presented for the offers, together with the total value that is added by TKF concerning the offers. Applying the schedule for offers showed that the amount of indirect costs can be an important determinant of profitability of offers. In all three examples that are presented in this thesis, a clear difference can be seen between the old allocation method and the new ABC-method.

Conclusions

Several factors cause customers to be more or less profitable than was expected by only looking at gross profit margins. In other words, some customers require more efforts than others. In this case, it is primarily about supportive efforts that cause indirect costs. An accurate allocation of those costs is needed to determine the return that is made on customers more precisely. This can be done by applying an Activity-Based Costing method. The allocation showed that the availability of data created restrictions for the choices of cost drivers that had to be made. This made it necessary to make assumptions and use estimations in some instances. Expanding the reporting of information and making more effective use of available information can lead to a more accurate allocation in the future. In this way, also more price analysis of profitaiblity can be achieved that can be used in future decision-making.

Table of content

1. Introduction to the company TKF

This research is performed for the Twentsche Kabelfabriek (TKF), a cable-producing company in the Netherlands that was founded in 1930. Since its founding, TKF has developed from a local Dutch cable producer to a technology leader of cable solutions servicing customers all over the world (*Website TKF*). TKF is part of the TKH group. The TKH group is specialised in developing and delivering systems and networks for the provision of information, telecommunication, electrotechnical engineering and industrial production (*Website TKH group*). The group is especially focused on innovation in order to prepare clients for the future. By expanding the collaboration between the operating companies, the TKH group can respond to market trends and new technical possibilities. The emphasis on innovation also counts for TKF, as an important operating company within the group. The mission of TKF is "To be the most innovative and market-oriented company in the cable industry by offering high quality and customized cable solutions for a reliable infrastructure" (*Website TKF*). These solutions are efficient and cost-effective. Offering cable solution to customer problems is a focus that is developed in the last years. The idea is that TKF performs the whole process from development of cables and components, producing and delivering them and providing the required support for customers after delivery. The future plans of TKF that are formulated in 2010 show that TKF wants to focus more on complex projects that are developed in consultation with customers. The share of revenues that are gained from mass-products has to decrease compared to previous years.

The remainder of this chapter consists of four parts. First, the current situation is discussed with respect to the allocation of indirect costs at TKF. Here, the reason for performing the research is elaborated. Second, the products that are made at TKF are described. Third, a general description of the production process is given. Finally, an introduction is given about the customers to which TKF delivers their products. Here, also some references are given. Introducing the products, production process and customers of TKF should give more clarity about the type of business TKF is active in. However, the remaining part of this thesis is focused on cost allocation and profitability. Therefore, first an analysis of cost allocation and profitability in the current situation is given.

1.1 Indirect costs at TKF

Indirect organization costs have increased significantly in the past decades. This can be due to the increased emphasis on fields such as research & development, logistics and marketing. However, most companies still use relative simple methods to allocate these costs and in some cases they are not allocated at all (*Cooper & Kaplan, 1988*). This development also applies to TKF. Indirect costs, often called overhead costs, are becoming more and more important to the organization. Therefore, it can be valuable to review the process of handling overhead costs.

In the current situation, a distinction is made by TKF between production costs and indirect overhead costs. All costs where a direct relation is visible with the production of cables are included in the product cost. Other costs are overhead, incurred at supporting or staff departments. Examples of these indirect costs are sales service, Research & Development and administration expenses. In this research, the terms indirect costs and overhead costs are used interchangeably to refer to costs that are not included in the product cost.

At the moment, all customers are treated the same way with respect to indirect costs. Above the product cost, an add-on of about X percent is used by TKF to allocate indirect costs. Two problems appear with this method. The most important problem is that all customers are burdened with an equal percentage of indirect costs, while there can be great differences in the amount of supporting

activities that a customer requires. One customer can be treated as profitable, whereas in reality this customer requires so much supporting activities that the X percent add-on is not enough. Then this customer can be very unprofitable. Also the opposite effect can be found; customers that were thought to be loss-making can become profitable when a more accurate allocation method is used. The other problem is that overhead costs are barely taken into account by sales employees when bargaining with customers about prices and other conditions. This is quite strange because indirect costs represent a large share of the total costs nowadays. TKF expects this share of indirect costs to further increase in the future. A reason for this can be that TKF focuses more on innovative, customer-specific cable applications instead of mass products. This requires more efforts from the Research & Development, sales and expedition department.

From the above analysis, it seems that the average X percent add-on is not a right allocation method for TKF. A more accurate allocation of indirect costs can be achieved by looking at what efforts are required for certain products or customers and how this influences the costs that are incurred. This allocation makes it possible to assess the returns made on customers more accurately, both in history and in the future. The assessment can be an input to see whether there are possibilities to improve the profitability of customers. So the reason for performing this research is to develop a way of allocating costs that gives a more accurate picture of customer profitability. This is what is aimed at in this study by looking at processes and efforts that take place at relevant supporting/staff departments. The allocating of these indirect costs is based on the booking year 2009.

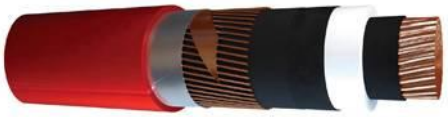
1.2 Products at TKF

TKF offers a wide variety of products. In general, the products can be classified into two groups:

- Cables for the distribution of energy
- Cables and products for the distribution of information

When looking at the distribution of energy, low voltage (0,45 – 1 kilovolt(kV)), medium voltage (6 – 30 kV) and high voltage (35 – 66 kV) cables are offered. Cables for the transport of energy can for example be used for installation, shipping and railway. As an example, two types of cable that are used for the distribution of energy are presented below.

Figure 1 : Twenpower Medium Voltage cable



Source: Leveringsprogramma TKF (2007)

Figure 2 : Twenkaplus Low voltage cable

Source: Leveringsprogramma TKF (2007)

The plastic installation cable of figure 1 has a voltage of 8,7/15 kV. It has a single wire and a conductor of copper. Twenpower MV cables are applied for the transport of energy for among others public utilities, industry and utility building. The installation cable of figure 2 has a voltage of 0,6/1 kV. It has a conductor of copper and has a flame retardant cable sheath. Consequently, these cables are applied in low voltage installations that have high fire safety requirements.

Cables for the distribution of information can be optical fibre cables, telecommunication cables and coaxial cables. Next, TKF offers Telecom Products and Systems (TPS), which are components that are used for the connection of different cables. In most cases, these products are bought from suppliers and assembled by TKF. As an example, three types of cables are presented below that are used for the distribution of information.

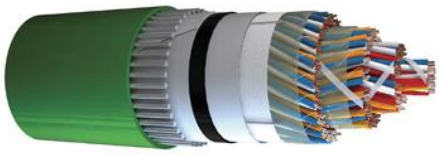
Figure 3: Twenkaship cable

Source: Leveringsprogramma TKF (2007)

Figure 4: Optical fibre cable (LTC)

Source: Leveringsprogramma TKF (2007)

Figure 5: Telephone cable



Source: Leveringsprogramma TKF (2007)

The marine cable of figure 3 can handle 250 Volt. It has conductors of copper that are beaten together and has a flame retardant cable sheath. The purposes of this kind of cables are signalling, instrumentation and data communication on ships. The optical fibre cable that is presented in figure 4 is a Loose Tube Cable (LTC), which indicates that there are several loose fibers side by side in small tubes. The fibre cable is filled with gel to protect the cable from water. The cable is metal free and is longitudinal water-protected. The optical fibre cable is used outside houses for the transfer of data. The telephone cable of figure 5 is a plastic cable that is used outside and is suitable for underground laying the ground. The cable is transverse longitudinal watertight and contains water stops. Applications of this specific telephone cable are: local telephony, ISDN and signalling and control purposes.

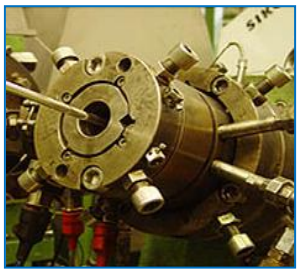
The cables that are presented above give an indication of the different products that are offered by TKF. However, it is important to notice that these cables are only a few of the many different types of cables that are available. Next, each cable type has many different versions since customers require specific features of the cable, for example with respect to flexibility and the height of the voltage of the cable.

1.3 Production process at TKF

Each type of cable requires its own type of producing. The process of making an optical fibre cable is for example very different from the process of making medium voltage installation cables. However, to describe the production process of cables at TKF, the general steps in making cables for the distribution of energy are discussed below and presented in figure 6. It should be kept in mind that this is a simplified and basic discussion of the production process.

Figure 6: Basic production process of cables at TKF

1. Drawing wire. The first step is drawing wires of copper, which is done by different machines. The wires are made thinner until the right diameter is reached that is needed in production. The smallest diameter of these wires can be 0,1 mm. In other cases, aluminum is used in cables as conductor instead of copper. Logically, in fiber cables fibers are used as conductor.



2. Insulating. Second, insulating materials are added to the conductors to avoid the electrical energy flowing to the wrong place. A conductor that is provided with insulating materials is called a core. Examples of insulating materials are polyethylene (PE) and Polyvinylchloride (PVC).

3. Stranding. Third, the cores that are produced in step 2 are now beaten together to form a bundle. Such a bundle can consist of adjacent parallel cores, pairs of cores or quartets of cores. The choice of the bundle is dependent on the specific application. Pairs of cores for example provide a lot of flexibility of the cable and quartets of cores can increase the transmission distance.

4. Sheating. Finally, a sheath of insulating materials is applied to the bundle of cable to ensure safety. The thickness of these sheaths depend upon the electrical load. In many cases aluminum foil is used to protect the cable from outside electrical faults. In some cases, metal mesh is applied around the cable to shield against external interference and as an additional mechanical protection.

Source: internal presentation TKF, 2010

1.4 Customers at TKF

The products that are described above are offered to a diverse customer base. Customers can be for example municipalities, large production groups as Akzo Nobel, technical wholesales such as the 'Technische Unie' and large constructors as Volker Wessels. As indicated on the company website, TKF focuses on a number of market areas. These are:

- Broadband
- Energy distribution
- Marine & Offshore
- Railinfra
- Housing
- Utility
- Industry
- Civil engineering

Below, a few references are discussed that show the diverse type of both products and customers.

1. Municipality of Rotterdam

- Place: Rotterdam, the Netherlands.
- Period: 2004-2006.
- Applications: The ACE-concept of TKF is used for a project called 'Nesselanden'. This is a total concept that involves a new vision on building fibre optic networks. ACE consists of products and components and offers complete solutions. For this specific project, about 6000 homes in Rotterdam are connected to the fibre network.

2. Rijkswaterstaat

- Place: several locations at the 'Betuweroute', the Netherlands.
- Period: 2004-2005.
- Applications: These projects involved delivering energy cables, optical fiber cables and fiber components for the connection of cables that are used in tunnels. The projects were completed in collaboration with major building contractors.

3. Subsea 7 "Seven seas"

- Place: shipyard the Merwede, the Netherlands.
- Period: 2006-2007.
- Applications: The seven seas is a pipelay and construction vessel. It has an advanced flexible pipelay system capable of operating in water depths of up to 3000 meters (Website subsea 7). TKF has delivered several Twekaship shippingcables for this vessel.

4. Water- en energiebedrijf Aruba (WEB Aruba)

- Place: Aruba.
- Period: 2009
- Applications: This project is called "Vader Piet", which is a wind farm in Aruba. For this project, TKF was responsible for cabling, engineering, assembling and completing both 60 kV high voltage cables and fiber components. The wind farm is now connected to the existing network of Aruba with a 60 kV connection, which can provide 20% of the electric energy in Aruba.

5. Deventer hospital

- Place: Deventer, the Neterlands.
- Period: 2006-2007.
- Applications: Multiple types of cable are produced and delivered for this Dutch hospital. These cables are Twenkaplus installation cables, functional integrity cables, signal cables and control cables.

2. Research plan

In this research, the focus is on analyzing customer profitability by allocating indirect costs more accurately. In the previous chapter, the reason for starting a research about cost allocation and customer profitability at TKF is described. In this chapter, the research plan is discussed, which describes how the research is executed at TKF. First, the research goal and overall research question is given. These are set up in consultation with the supervisors. To support the research goal some sub questions are formulated. Answering these questions should eventually lead to reaching the goal. A description is given of both the research method that is most appropriate in this case and the data that will be used. Finally, a research model is set up that indicates what steps are followed to reach the research goal. This model also describes how the thesis is structured and what time planning is used.

2.1 Research goal & questions

In chapter 1, an analysis is made of the current situation and the reason for starting the research. Two elements are central: the allocation of overhead costs and the profitability of customer groups or specific customers. Therefore, the goal of this research can be formulated as follows:
Research goal: *To develop a more accurate way of allocating overhead costs for TKF that leads to a more precise analysis of the profitability of customers/customer groups.*

By the word accurate, it is meant that customers will be held more responsible for the costs they make than what is done in the current allocation process. A more precise analysis of profitability indicates that more costs are taken into account when looking at the margin that is made on customers. The research goal should be reached by answering the overall research question, which is formulated as follows:
Research question: *How should overhead costs be allocated at TKF to identify the profitability of each of their customers/customer groups?*

This question is still very general. Therefore some sub questions are set up that in the end should lead to answering the overall research question. These questions are processed into separate chapters in this thesis. The sub questions are:
1. Which processes and activities can be identified at TKF?
2. How can costs be categorized at TKF?
3. What does theory say about cost allocation?
4. How can costs from relevant cost centres be allocated at TKF?
5. How can customers and products be categorized at TKF?
6. How can a system of customer profitability be developed?

2.2 Research method & data

In scientific research, several methods have been used, such as experiments and surveys. The choice of these methods depends on the research goal and how data can be gathered in the best way. The method that best fits this research is a case-study. This type of research is based on limited information, where mostly the focus is on one company, as is the case in this research. It combines business practice with science and also allows students to supplement their studies with gaining practical experience (*Blumberg et al., 2008*). Case-study research is chosen because it makes it possible to describe and analyze TKF intensively. It is also a flexible approach because several sources of information can be chosen. A disadvantage of this method is that it is hard to make generalisations

to other companies or groups. However, this is not the goal of this research, so the case study is appropriate in this research.

The case-study method will provide relevant data that can be used for answering the research question. Ryan et al. (*2002*) distinguish five sources of data that are used in case studies:

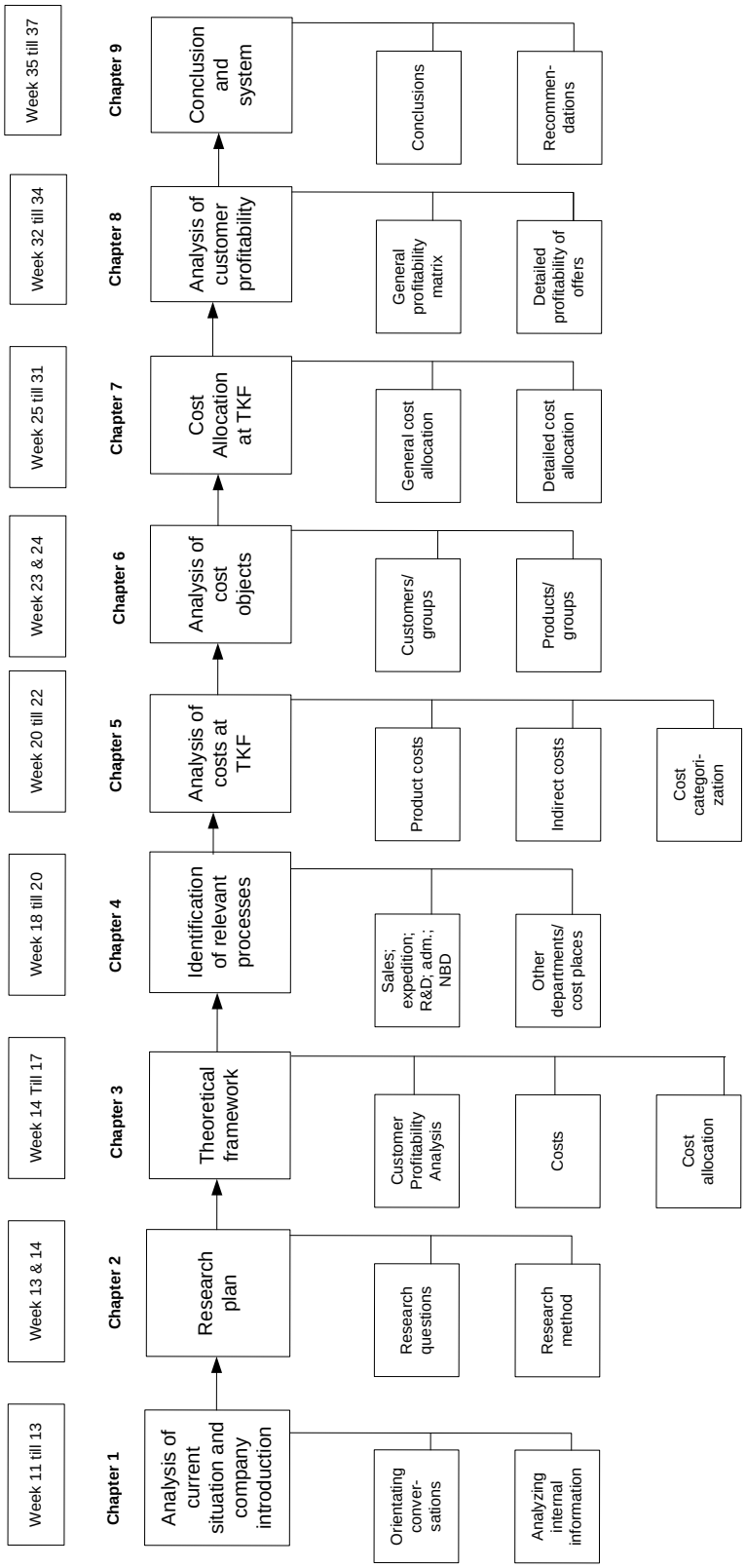
- Artefacts: these are tangible items, such as formal reports and statements, informal records etc.
- Questionnaires: these can be useful to obtain evidence from a number of people.
- Interviews: This is the type of evidence most usually associated with case research. Most often they are more informal than interviews used in surveys.
- Observing actions and meetings: attending meetings can be an important source of data for accounting researchers.
- Assessing the outcomes of actions: here the actions performed by the researcher or by the subjects being studied are measured.

In this research, artefacts and interviews are used. The interviews will be used to identify company processes and to see by what factors costs at TKF are driven. The type of interviews can be divided into structured, semi-structured or unstructured. In this study mostly semi-structured interviews are used, that start with rather specific questions but allow the interviewee to follow his or her own thoughts later on (*Blumberg, 2008*). This data source will lead to primary data, which is qualitative. With respect to artefacts, information is especially digital and is obtained from TKF's ERP-system. The ERP-system of TKF is called Navision. These two definitions are used interchangeably in this thesis to describe the system. In other cases, formal reports are analysed to derive useful information. This way of gathering data leads to secondary data that is both quantitative and qualitative.

2.3 Research model & structure

The research model consists of nine steps and can at the same time be seen as the structure for this thesis (see figure 7). The first step is to define the reason for performing this research and therefore a description of the current situation is given. This is done by having orientating conversations with people inside TKF and by analyzing internal information. The analysis has lead to the development of a research plan, where among others the research questions and research method are described. The third step consists of a theoretical framework. Here, the central elements of this thesis are elaborated by reviewing the literature. With respect to profitability, a popular approach known as Customer Profitability Analysis (CPA) is described. This approach gives insights into the profitability of individual customers, as well as the distribution of profitability across the customer base (Van Raaij, 2005). Next, a theoretical analysis of overhead allocation is given by defining costs and the different cost allocation methods that are available. The approach taken in this study is to look at processes and efforts and then see how indirect costs can be allocated. Therefore, before looking at the cost side, the relevant activities performed at TKF concerning overhead are identified and described in chapter four. These activities have to do with: sales, expedition, research & development, administration and new business development. The fifth step consists of an analysis of the relevant costs at TKF and how they can be categorized. Central elements are product costs and non-production overhead costs. Before allocating costs at TKF the cost objects are described. Cost objects are activities for which a separate measurement of costs is desired, such as a product, service or department. In this research, these will be customers and customer groups on the one side and products and product groups on the other side. The actual allocation of costs is performed in step seven. After that, an analysis of customer profitability can be made, where amongst others profit margins are elaborated. The final step is to give conclusions about cost allocation and customer profitability. This contains giving recommendations for TKF and advice with respect to the implementation and use of the allocation method and approach for analyzing profitability.

Figure 7: Research model & structure of thesis



3. Theoretical framework

The theoretical framework defines the concepts that are central to this research. It indicates what is already known in the literature. Here, information that is gathered from study materials and scientific studies is used. This chapter can be roughly divided into four parts. First, customer profitability is described since analyzing profitability more accurately is the main goal of this research. The second part contains a theoretical discussion of the different types and multiple meanings of costs. The third part is an analysis of the various approaches that are found in the literature about allocating indirect costs. The fourth part is an elaboration of the allocation method that is chosen in this research. Finally, conclusions are given with respect to what is discussed in this theoretical framework and what theory will be used in this thesis.

3.1 Customer profitability

According to Noone & Griffin (*1999*), the long-term viability and success of the organisation will depend on how the profit yield from customer relationships is managed. Therefore, firms need to know how profitable their customers are and by what factors profitability is driven. In this part, an approach called Customer Profitability Analysis (CPA) is discussed. Next, other considerations are discussed that influence the assessment of customers. The last part that is discussed concerning customer profitability is about the factors that cause some customers to be more profitable than others.

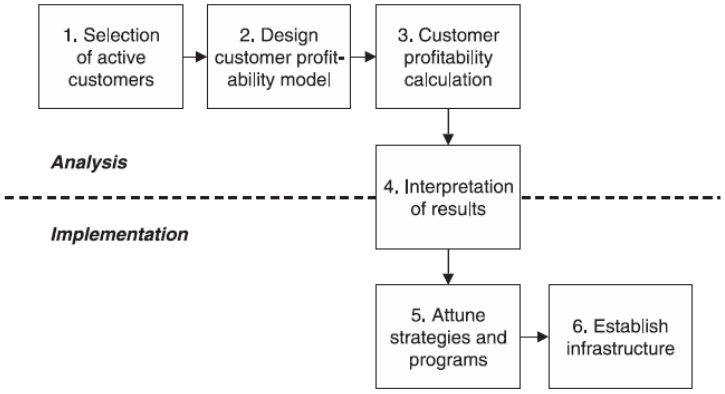
3.1.1 Customer Profitability Analysis (CPA)

An approach that is often used in the literature to describe customer profit is Customer Profitability Analysis (CPA). CPA is a technique that examines revenues, costs and profit by an individual customer or customer group. Van Raaij (*2005, 373*) defines CPA as "the process of allocating revenues and costs to customer segments or individual accounts, such that the profitability of those segments and/or accounts can be calculated". According to Pfeifer et al. (*2005, 14*), customer profitability is "the difference between the revenues earned from and the costs associated with the customer relationship during a specified period". So this method gives an idea of the degree of profitability and the distribution of costs and revenues over customers. The analysis generates new opportunities for the firm in three business areas (*Van Raaij et al. 2003*):

- Cost management and profit improvement programs. CPA reveals the link between activities and resource consumption, and therefore points directly to profit opportunities.
- Pricing decisions, bonus plans and discounts to customers. Prices can now reflect the fact that filling some orders cost more than others do. The analysis may also help in revising existing discounting structures to improve profitability.
- Segmentation and targeting strategies. A classification based on volume and profitability can provide direction for customer retention and customer development programs, particularly with respect to sales potential.

In the literature, two perspectives of customer profitability can be found. Retrospective profitability is a historical perspective that investigates what has been the absolute and relative profitability of each customer or customer group over some defined past period. The prospective view focuses on the future and investigates what the profitability will be (*Jacobs et al. 2001*). Ideally, customer profitability is based on individual customers. However, this is not always possible, for example for banks that have a large customer base. Then the organizations can concentrate on customer segment profitability analysis by combining groups of customers into meaningful segments (*Drury, 2008*).

Figure 8: CPA implementation steps

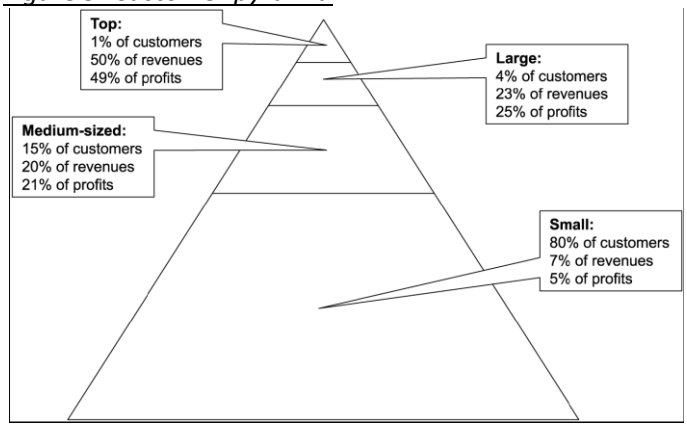


Source: Van Raaij et al., 2003.

Van Raaij et al. (*2003*) have developed an overall implementation approach for CPA (see figure 8). The first step is to identify the active customers of a firm. Then a model for customer profitability has to be set up. This is done by identifying cost drivers and allocating costs to customers based on their consumption of resources. After this, customer profitability can be calculated by filling the model with data. In the fourth step results have to interpreted, where probably unexpected profitability figures will arise from rough calculations. The results may also indicate that refinements of the model are needed. The interpretation leads to possible strategies and programs for improving profitability and to the development of an infrastructure for continued use of customer profitability analysis.

Analyzing customer-related expenses and comparing this with their revenues gives a company insight in customer profitability. Customers can be ranked by order of profitability based on Pareto analysis. This analysis describes that a very small proportion of items usually account for the majority of the value (*Drury, 2008*). This is also mentioned by Cooper & Kaplan (*1991*) when they describe the well-known 80/20 rule; 80 percent of sales generated by 20 percent of customers. This distribution is also found by Howell & Soucy (*1990*). Other studies showed an even more extreme picture. Van Raaij et al. (2003) found that for a firm producing and selling professional cleaning products, 20 percent of customers were responsible for 95 percent of profits. In Cooper & Kaplan (*1991*) a company was cited were 20 percent of customers were generating 225 percent of profits. From this, it seems that companies can face a low number of profitable customers and a large number of barely profitable or even loss making customers.

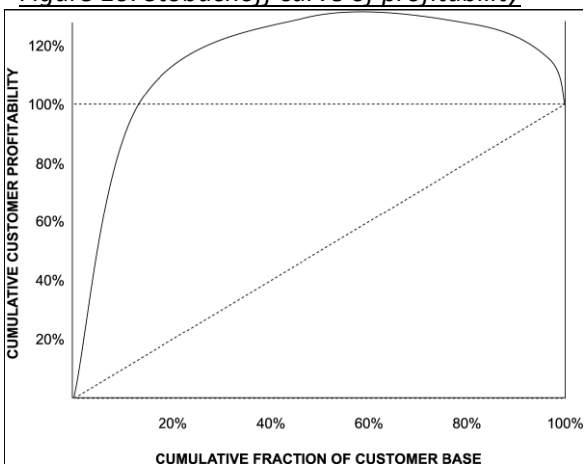
Figure 9: Customer pyramid



Source: Van Raaij, 2005

Customer profitability can be presented in a customer pyramid (see figure 9). Here, the customer base is split into four tiers, based on revenue or profit. Comparisons can be made among top customers, large, medium-sized, and small customers (*Van Raaij et al., 2003*).

Figure 10: Stobachoff curve of profitability

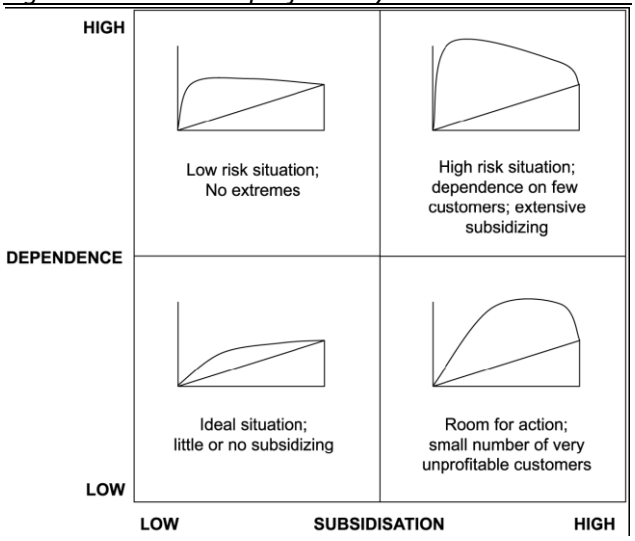


Source: Van Raaij, 2005.

Another possibility to graphically represent the distribution of profitability is the Stobachoff curve, which is presented in figure 10. Storbacka (*1998*) introduced the Stobachoff curve to describe the profitability among products or customers. On the horizontal axis, customers or products are ranked from the most profitable ones to the least profitable ones. The cumulative profits are plotted on the vertical axis. This curve will often show a cumulative profit that quickly crosses the 100 percent line, dropping back to 100 percent cumulative profitability after all unprofitable customers have been added to the total (*Van Raaij et al. 2003*). Kaplan & Atkinson (*1998*) describe this distribution of profitability as the "whale curve". Companies encounter this curve in activity-based cost systems built for business units that meet two rules:

- large expenses in indirect and support resources
- diversity in products, customers, and processes

Figure 11: Customer profitability distribution and risk



Source: Van Raaij, 2005

The shape of this stobachoff curve is an indication of the vulnerability of the customer base. A large area under the curve means that some customers with very high profits subsidize other customers

with negative profits. When combined with a measure of dependency, the vulnerability of the customer base can be determined (*Van Raaij et al. 2003*). This leads to four possible combinations. Risk is high when a company depends on a few large customers that subsidize many loss making customers. If the opposite is true, a company experiences an ideal situation. This can be seen in figure 11.

3.1.2 Considerations with respect to customer profitability

So far, it seems that analyzing revenues, costs and profit gives a clear picture of customer performance. However, other factors should be taken into account to get a more complete idea of customer profitability. Horngren et al. (*2000*) mention five other factors that managers should consider in deciding how to allocate resources across customers:

- Short-run and long-run customer profitability. Profitability of customers can change, so an analysis of one point in time can give misleading information.
- Likelihood of customer retention. The more likely a customer is to continue doing business with a firm, the more valuable the customer.
- Potential for customer growth. This factor will be influenced by the likely growth of the industry and the likely growth of the customer.
- Increases in overall demand from having well-known customers. The reputation of a certain customer can help in receiving new orders from other customers.
- Ability to learn from customers. Customers willing to provide ideas about new products or ways to improve existing ones can be especially valuable.

A prospective approach that is used in the literature to describe customer value and customer assessment is customer lifetime value (CLV). In the literature, different definitions are given to CLV. Here, three of them will be mentioned. Pfeifer et al. (*2005, 17*) define customer lifetime value as “the present value of future cash flows attributed to the customer relationship”. Hwang et al. (*2004, 182*) describe it as “the sum of the revenues gained from company’s customers over the lifetime of transactions after the deduction of the total cost of attracting, selling, and servicing customers, taking into account the time value of money”. Finally, the definition of CLV given by Gupta & Lehmann (*2003, 11*) is “the present value of all future profits generated from a customer”. So instead of valuing customers based on their past behaviour, customer lifetime value looks at its potential. The customer relationship typically begins with investments to attract the customer. Over time, acquisition costs and other early investments can be recovered. As the relationship matures, the customer’s sales volume may grow and can become more profitable (*Epstein et al., 2008*). So a company need to assess the potential of the customer relationship and what cash flows this will produce in the future.

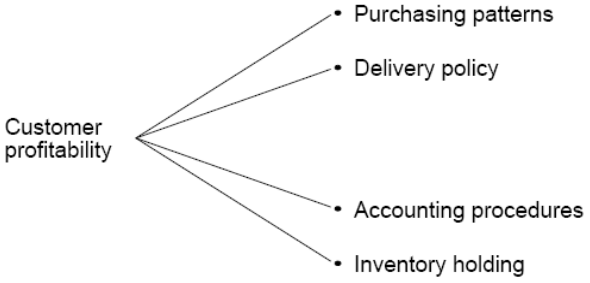
From the above analysis, it seems that various factors of the customer relationship can influence the value that is given to customers. Simply analyzing revenues, costs and margins will not be sufficient in making important decisions considering customers. These decisions can for example have to do with whether or not to accept a large offer or to spend more time on customer retention for certain valuable customers. In these cases, other commercial issues of the relation between company and customer will be crucial. However, having a clear picture of the return made on customers or customer group can be very useful. In the next part, factors are discussed that influence the return that is made on customers.

3.1.3 Factors influencing customer profitability

According to Noone & Griffin (*1999*), the traditional approach to managing the yield from customer relationships focuses on revenue yield. Emphasizing revenues is an approach that is essential in the short term as pricing is market driven. In addition, revenue data by customer groups in most cases can be sourced directly from the information systems of companies. Van Raaij et al. (*2003*) confirm the above statement. They argue that while most firms will know the customer revenues, many firms

are unaware of all costs associated with customer relationships. In general, product costs will be known, but sales and marketing, service, and support costs are mostly treated as overhead. From all this, it seems that Customer Profitability Analysis focuses more on the distribution of costs than on the distribution of revenues. Consequently, "the key to CPA lies in the selection of an appropriate method of matching costs with customer groups" (*Noone & Griffin, 1999, 112*). Before performing a customer profitability analysis, it is important to know the causes of the customer-related costs.

Figure 12: Factors influencing customer profitability



Source: Smith & Dikolli, 1995.

Smith & Dikolli (*1995*) have identified four factors that influence customer profitability (see figure 12). First, certain purchasing patterns can influence profitability. Low discounts en few customer visits can for example be profitable, whereas the opposite is unprofitable. Second, delivery policy should be taken into account. Here, the location of the customer, the number of deliveries and further requirements are important. A third factor is accounting procedures. As an example, the costs for debtor collection support can vary whether a customer pays on time or late. The last important expense factor is inventory holding. It can make a significant difference whether deliveries are predictable or that deliveries are required at irregular times.

Table 1: Characteristics of high and low cost-to-serve customers

High cost-to-serve customers	**Low cost-to-serve customers**
Order custom products	Order standard products
Small order quantities	High order quantities
Unpredictable order arrivals	Predictable order arrivals
Customized delivery	Standard delivery
Change delivery requirements	No changes in delivery requirements
Manual processing	Electronic processing (EDI)
Large amounts of presales support (marketing, technical and sales resources)	Little to no presales support (standard pricing and ordering)
Large amounts of postsales support (installation, training, warranty, field service)	No postsales support
Require company to hold inventory	Replenish as produced
Pay slowly (high accounts receivable)	Pay on time

Source: adapted from Kaplan & Atkinson (1998)

Quite similar to the four factors that are discussed above, Kaplan & Atkinson (*1998*) have formulated characteristics of high cost-to-serve and low cost-to-serve customers. These characteristics can be seen in table 1. Customers can create high cost because of for example: small order quantities, customized delivery, large amounts of presales support and paying slowly. Examples of low cost characteristics could be high order quantities, standard delivery, little to no presales support and paying on time. As an example, in table 1 it can be seen that customers that order customized products are more costly to serve than customers that order standard products. These customized products can demand a lot of effort from Research & Development. In order to have an accurate

analysis of customer profitability, customers that order products for which R&D efforts are needed, should also be burdened with the costs of those R&D efforts.

Similar to products, also customers differ in their consumption of resources. The size and number of orders, the number of sales visits, the use of helpdesks, and other services can be very different for each customer (*Van Raaij et al., 2003*). Consequently, also the costs of the customer relationships are varied, which leads to different levels of customer profitability. Making differences in high cost-to-serve customers and low cost-to-serve can be done by accurately allocating indirect costs. This is also mentioned by Kaplan & Atkinson (*1998*). They argue that Activity-Based Costing (ABC) enables managers to identify the characteristics that cause some customers to be more expensive or less expensive to serve than others. Information technology makes it possible to record and analyze more customer data at the customer level, such as the number of orders, number of service calls etc. (Van *Raaij et al., 2003*). By using this information, it becomes possible to actually calculate customer profitability. Concluding, allocating costs of the customer relationship is very important in analyzing customer profitability. Activity-Based Costing and other possible allocation methods are discussed in part 3.3. Before discussing these methods, the different definitions of costs are identified.

3.2 Costs

According to Kaplan & Atkinson (*1998*), costs arise from the acquisition and use of organizational resources, such as people, equipment, materials, outside services and facilities. When organizations use resources to perform activities, the financial system records costs. In addition, Drury (*2008, 27*) emphasizes the link between resources and costs. He describes costs as “monetary measures of the resources sacrificed or forgone to achieve a specific objective”. The term cost has multiple meanings and different types of costs are used in different situations. Some of these cost meanings and classifications are discussed below.

3.2.1 Direct/indirect

In the beginning, a rough distinction can be made between direct and indirect costs. This classification is based on the relevant type of cost object. A cost object is “any activity for which a separate measurement of costs is desired, for example a product, service, department or customer” (*Drury, 2008, 47*). Direct costs are then those costs that can be specifically and exclusively identified with a particular cost object. Indirect costs on the other hand cannot be identified specifically and exclusively with the object (*Drury, 2008*). So it depends on how the resources are related to a certain object. A specific cost can be both direct and indirect. The salary of a department supervisor would be a direct cost for the department but an indirect cost for a specific product or customer (Horngren et al, 2000). Direct costs can subsequently be traced to cost objects and indirect costs have to be allocated. Indirect costs are often called overhead costs.

3.2.2 Variable/fixed

The distinction between variable and fixed costs has to do with the behaviour of costs. Variable costs vary in direct proportion to the volume of activity while fixed costs remain constant over wide ranges of activity for a specified period (*Drury, 2008*). Variable costs can be for example material usage and fixed costs can be for example depreciation on assets. A further type of cost behaviour is named step-fixed costs. Here, fixed costs remain constant within a given period and within specified activity levels, but they eventually increase or decrease by a constant amount at various critical activity levels (*Drury, 2008*). According to Van Damme (*2002*), fixed costs can also vary independent of the activity level. This can be the case when management decides to increase wages or to lay off employees. This makes it difficult to label costs as either fixed or variable. Berry & Jarvis (*2006*) argue that not all costs fall neatly within these categories and therefore it may be necessary to make simplifying

assumptions about how costs behave for decision-making. Horngren et al. (*2000*) identify three key ideas when classifying costs into their variable and fixed components:

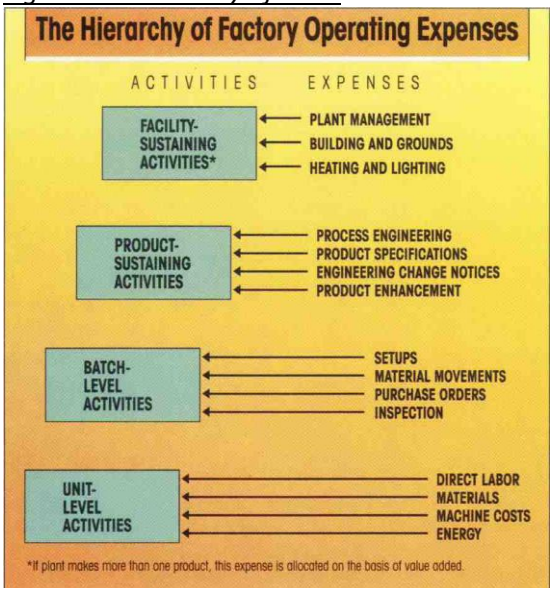
- Choice of cost object. A particular cost item can be variable with respect to one cost object and fixed with respect to another.
- Time horizon. In the short run, more costs are handled as fixed whereas in the long run it is more likely that the cost will be variable. Normally a time horizon of one year is used when looking at costs.
- Relevant range. Outside the relevant range, the behaviour of variable and fixed costs changes, causing costs to become nonlinear.

3.2.3 Relevant/irrelevant costs

Relevant costs are those costs that change because of a certain decision, while irrelevant costs do not change because of such a decision (*Van Damme, 2002*). Also Drury (*2008*) emphasizes that the relevance of future costs is determined by the decision that is made. An important principle is established regarding the classification of cost: namely, that in the short term not all costs are relevant for decision-making. Finally, Berry & Jarvis (*2006, 381*) define relevant costs and benefits as follows: "Relevant costs and benefits are those that relate to the future and are additional costs and revenues that will be incurred or result from a decision".

3.2.4 Hierarchy of costs

Figure 13: Hierarchy of costs

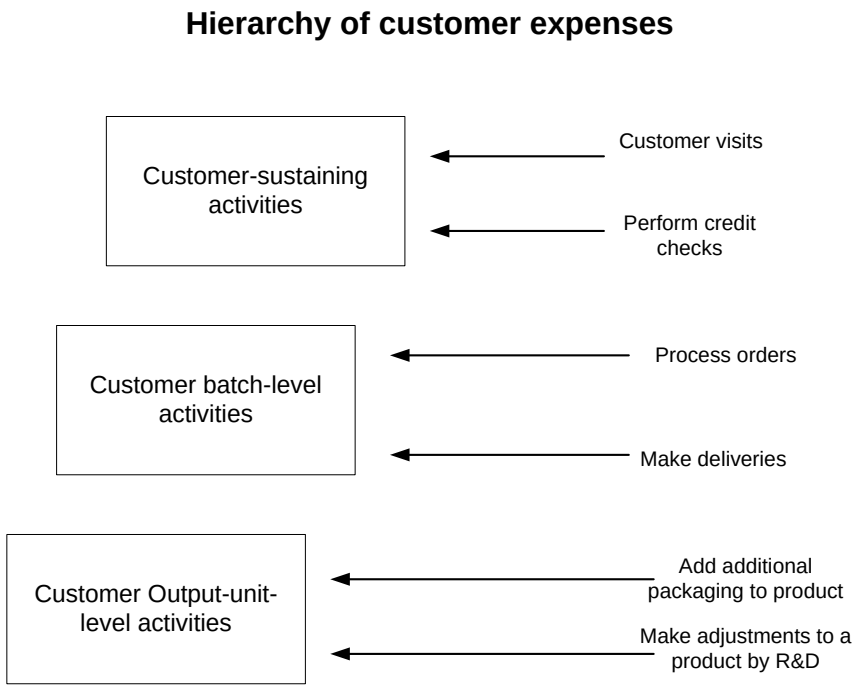


Source: Cooper & Kaplan (1991)

Some activities are performed on individual units, whereas others are performed on batches or on the overall capability of the company to produce the product. Cooper & Kaplan (*1991*) state that managers need to distinguish the expenses consumed at the unit level, from the expenses of resources used to process batches or to support a product or a facility. They established a hierarchy of expenses and activities, consisting of unit-level, batch-level, product-sustaining and facility-sustaining activities (see figure 13). This hierarchy shows that product-related activities do not affect facility-level costs. Only unit, batch, and product-sustaining expenses should be assigned to products, while facility-level expenses are kept at the plant level (*Cooper & Kaplan, 1991*). Also Noone & Griffin (*1999*) argue that not all costs can be attributed to customers. If a customer does not cause a cost to be incurred in the first place, that cost should not be assigned to them. An example of such a non-attributable cost is auditing accounts. Horngren et al. (*2000*) apply the concept of hierarchy of costs

to customers. In figure 14, the hierarchy of customer expenses is presented. This figure is adapted from the categorization made by Horngren et al (*2000*). In the figure, facility-sustaining activities are excluded, since the other three activities are the most important.

Figure 14: Hierarchy of customer expenses



Source: adapted from Horngren et al. (2000)

- Customer output-unit-level costs; resources sacrificed on activities performed to sell each unit to a customer.
- Customer batch-level costs; resources sacrificed on activities that are related to a group of units sold to a customer.
- Customer-sustaining costs; resources sacrificed on activities performed to support individual customers.

In figure 14, several examples are given for the different types of customer activities. An example of an activity that is performed for a single customer can be making adjustments to a product by R&D, such as colouring a cable. A customer visit on the other hand can be an example of an activity performed to sustain customers.

3.3 Cost allocation

Cost information from the balance sheet and income statement can be very useful to determine the overall profitability of firms. However, there is also need to discover the individual or group profitability of products and customers. Berry & Jarvis (*2006*) identify several purposes of using product cost information:

- To control costs; actual costs will be compared with planned costs and then actions can be taken to reach targets.
- To aid planning; the costs of products can be a useful base for estimating future product costs in the planning process.

- For valuing inventories; product costs need to be determined to value the finished goods and work in progress for inclusion in the balance sheet and income statement.
- To aid the setting of selling prices; in marketing it is often said that prices are determined on market forces. However, in some situations, particularly when there is little competition, prices are often set with reference to product costs.
- To ascertain the relative profitability of products; management will mainly favour selling its most profitable products and then knowledge of product costs is essential.

In order to create product or customer cost information, the costs from accounting reports have to be assigned in a systematic and accurate way. As indicated in the previous part, direct costs can be traced to cost objects and indirect costs have to be allocated. Cost allocation is "the process of assigning costs when a direct measure does not exist for the quantity of resources consumed by a particular cost object" (*Drury, 2008, 48*). In history, companies have worked with different allocating methods. The most important methods are described in the next section. The discussion of the allocation methods should result in a justified choice of one of the possible methods that will be used in this research.

3.3.1 Traditional allocation

The first group of allocation methods are the traditional costing systems, also often named as absorption costing or full costing. These systems are developed in the early 1900's and are still widely used today. They can be seen as a simplistic approach to assign also indirect costs to cost objects (*Drury, 2008*). Several authors mention that traditional cost allocation consists of a two-stage process (*Berry & Jarvis, 2006; Drury, 2008; Kaplan & Atkinson, 2000*). In the first stage, overhead costs are assigned to cost centres, which are normally departments. The costs for support or service departments are assigned to production departments. In the second stage, the costs are allocated from the departments to the cost objects. This takes place by the use of selected cost drivers. Lal & Srivastava (*2009, 324*) define a cost driver as "a factor, such as the level of activity or volume, that causally affects costs (over a given time span)". In traditional methods, a small number of cost drivers is used, typically direct labor, machine hours or volume. The basic assumption is that products in high volumes demand high indirect costs and products in low volumes consume less indirect costs (*Bruggeman et al., 2005*). Drury (*2008*) also states the fact that in traditional costing systems only volume-based cost drivers are used. The assumption is then that the overhead consumed by products is highly correlated with the number of units produced. According to Glad & Becker (*1995*), the historical cost accounting systems can be regarded as appropriate for the era and environment in which they were applied: proportionately high direct labor inputs; limited, simple product lines; low overheads; and relatively expensive recording and processing of data.

3.3.2 Direct costing/marginal costing

Another possibility is to include only variable or direct costs in product pricing instead of the full-costing approach of traditional allocation systems. This method is often named as direct costing or marginal costing. Fixed costs are not allocated to the product, but are considered as period costs and charged directly to the profit (*Drury, 2008*). The separation of fixed and variable costs helps to provide relevant information about costs for making decisions. These relevant costs are required for a variety of short-term decisions, for example whether to make a component internally or to purchase externally, as well as problems relating to product-mix (*Drury, 2008*). Fixed costs are in the short run assumed to remain constant and therefore variable costs represent the only incremental costs that are relevant for making short-run decisions (*Drury & Tayles, 1994*). An argument for using direct costing can be that the process of absorbing overheads, although based on clearly identified criteria, is relatively arbitrary (*Berry & Jarvis, 2006*). The use of different bases for apportioning overhead costs will invariably result in differing amounts of costs being assigned to products or customers. The cost of a product will therefore often depend on the choice of the allocation basis

that is used. This argument is then used to classify only direct/marginal costs as product costs and other costs as period costs.

3.3.3 Activity-based costing

As a reaction to problems and limits with traditional costing methods, a more accurate approach was developed during the 80's by well-known accounting researchers Cooper and Kaplan: activity-based costing (ABC). At that time, product lines and marketing channels have proliferated. Direct labor represents a small fraction of corporate costs, while expenses covering factory support operations, marketing, distribution, engineering, and other overhead functions have exploded (*Cooper & Kaplan, 1988*). Many new costs appeared, such as market and other research, prototyping and training. All these developments made the traditional costing systems less useful. Similar to traditional allocating, two stages in the process can be identified. However, there are some important differences. First, overhead costs are assigned to activities instead of departments. Activities can be for example processing customer orders, purchase materials, introduce new products etcetera. Second, costs of support/service centres are not reallocated to production centres, but costs are assigned directly from support centres to cost objects. Third and most important, ABC has a greater number of cost centres in the first stage and a greater number, and variety, of cost drivers in de second stage (*Drury, 2008*).

So for each activity a cost driver rate is calculated and this rate is used to drive activity costs to products, services or customers (*Kaplan & Atkinson, 1998*). Contrary to traditional allocation methods, the emphasis is not on volume cost drivers, but on activity drivers. Goebel et al. (*1998*) argue that this leads to a transaction-based allocation, because it focuses on individual activities that occur within a firm to provide its various goods and services. Examples of such cost drivers are the number of product deliveries, the number of orders that are processed and the number of inspections. Such an allocation provides companies with more accurate information for decision-making purposes. In order to develop this activity-based cost allocation, Drury (*2008*) distinguishes four steps: Identifying activities, assigning costs to activity cost centres, selecting appropriate cost drivers for assigning the cost to cost objects, and assigning the cost of the activities to products. According to Ben-Arieh & Qian (*2003*), the advantages are the following: improve the accuracy and relevance of product costing, provide timely cost information suitable for decision-making and allowing more detailed tracking of indirect cost-to-cost objectives.

Figure 15: Example of Activity-Based Costing (ABC)

Activity	% of Time Spent	Assigned Cost	Activity Quantity	Cost-Driver Rate
Process customer orders	70%	$392,000	49,000	$8 per order
Handle customer inquiries	10%	$56,000	1,400	$40 per inquiry
Perform credit checks	20%	$112,000	2,500	$44.80 per credit check
Total	**100%**	**$560,000**		

Source: Kaplan & Anderson (2004)

An example of Activity-Based Costing that is developed by Kaplan & Anderson (*2004*) is given in figure 15. This table presents three distinct activities: processing orders, handling inquiries and performing credit checks. In the second column, the time consumption is given as a percentage of the total. Subsequently, activity costs can be calculated which are presented in column three. As can be seen in the last column, respectively the number of orders, the number of inquiries and the number of credit checks are chosen as cost drivers. In total, this example has 49.000 orders, 1.400 inquiries and 2.500 credit checks. Finally, the average rate for each cost driver can be calculated. These rates can be used the allocate the total costs to customers.

3.3.4 Time-driven activity-based costing

The activity-based costing method also has some disadvantages. Bruggeman et al. (*2005*) mention five shortcomings of ABC: it is not sufficient accurate, it becomes too complex, the development of ABC takes much time, it is hard to keep up-to-date and it assumes that full capacity is used in practice. These problems have resulted in the development of time-driven activity-based costing (TDABC) by Kaplan & Anderson (*2004*). In this method, the time it takes to fulfil a certain activity plays a crucial role when costs are assigned. Two estimations are important: the unit cost of supplying capacity and the time required to perform a transaction or an activity (*Kaplan & Anderson, 2004*). In this way, the activity cost driver rate is calculated. Another characteristic is that TDABC works with practical capacity, so that existing products and customers are not burdened with the costs of unused capacity. Time-driven ABC leads to: more accurate product costs, faster implementation, easier to add complexity to the model and is easier to maintain (*Bruggeman et al. 2005*). The method uses estimations of the time it takes to perform a certain activity and of the practical capacity within a company. Therefore, an extensive time registration of employees is not needed. As said, TDABC makes it easier to add complexity to the cost allocation. This can be done by using time equations, in which several characteristics are processed that cause processing times to vary (*Kaplan & Anderson, 2004*).

So far, it seems that time-driven ABC only has advantages compared to traditional ABC. However, there are also some disadvantages. First, TDABC can result in new estimation errors. The minutes that are spent on an activity can be estimated incorrectly, which leads to measurement errors (*Bruggeman et al., 2007*). Next, Kaplan & Atkinson (*1998*) mention that using duration drivers is more expensive to implement, since the time for each driver has to be known before costs can be allocated. The time of each activity is an additional and more expensive piece of information. Further disadvantages of this allocation method are discussed in part 3.4.

Figure 16: Example of Time-driven Activity-Based Costing (TDABC)

Activity	Quantity	Unit Time	Total Time Used (in minutes)	Cost-Driver Rate	Total Cost Assigned
Process customer orders	51,000	8	408,000	$6.40	$326,400
Handle customer inquiries	1,150	44	50,600	$35.20	$40,480
Perform credit checks	2,700	50	135,000	$40.00	$108,000
Total Used			**593,600**		**$474,880**
Total Supplied			**700,000**		**$560,000**
Unused Capacity			**106,400**		**$85,120**

Source: Kaplan & Anderson (2004)

In figure 16, the example that was presented earlier is now applied to Time-Driven Activity-Based Costing. In this new method, duration drivers are used instead of transaction drivers that were used in ABC. The first step is to estimate the average time of performing the three activities. This average time combined with the total number of orders, inquiries and credit checks results in the total time that is spent on each activity (see column four). Considering the fact that the cost of using one minute is $ 0,80 (total costs divided by total minutes supplied), the cost-driver rates can be calculated by using the unit times that are given in column three. The cost-driver rate of processing customer orders is then 8 times $ 0,80, which yields a rate of $ 6,40. Multiplying the rates by the total minutes that are used for each activity yields the total costs for each activity. In this example, it can be seen that customers are not burdened with the costs of unused capacity ($ 85.120). Allocating costs by using TDABC in figure 16 yields different activity costs and cost-driver rates than by using ABC in figure 15. In this example, average unit times are used instead of time equations. These equations make it possible to include other factors in the activity rates that influence the time it takes to perform the activity. For the activity processing orders, such factors can be: new or existing

customer and standard or expedited order. The time it takes to process an expedited order of a new customer can for example demand more time from sales staff.

The four allocation methods that are described in this chapter are summarized in table 2 below. From the table it can be concluded that ABC and TDABC are the most advantageous methods. These methods take all indirect costs into account and are both relative accurate methods. The choice between ABC and TDABC is discussed in part 3.4.

Table 2: Evaluation of the four allocation methods

Methods → *Dimensions ↓*	**Traditional**	**Direct/marginal**	**ABC**	**TDABC**
Costs included	Full costs	Variable/direct	Full costs	Full costs
Cost centres used	Departments	Departments	Activities	Activities
Allocation bases	Volume drivers	Direct costs	Transaction/ duration drivers	Duration drivers
Number of drivers	Low	Low	High	High
Effort needed	Moderate	Low	High	Moderate/high
Level of accuracy	Moderate/low	Low	Moderate/high	High

3.4 Choice of allocation method; ABC versus TDABC

Since traditional ABC and time-driven ABC have the most advantages compared to the other methods, a choice will be made between these two methods for allocating indirect costs at TKF. In this part, the advantages and disadvantages of ABC and TDABC are discussed first. After this, several practical factors at TKF are mentioned that influence the choice between the two methods.

3.4.1 Advantages and disadvantages of both methods

ABC: advantages

One of the main assumptions of ABC is that products or services have higher costs when more activities are needed (*Bruggeman et al., 2007*). As indicated in part 3.3.3, ABC takes all costs into account, uses activities as an intermediate step in the allocation and uses more drivers in the actual allocation. In an ABC system, every cost assignment to a cost object should be transparent and traceable, via cause-and-effect relationships, to the demand of resources by the cost object (*Kaplan & Cooper, 1998*). The factors that are described above lead to a more accurate estimation of product costs compared to traditional allocation methods and direct/marginal costing. More accurate product costs are required for decision-making purposes so that can be distinguishes between profitable and unprofitable cost objects (*Drury, 2008*).

ABC: disadvantages

In part 5.3.4 several disadvantages have already been mentioned. These were: ABC is not sufficient accurate, it becomes too complex, the development takes much time, it is hard to keep up-to-date and full-capacity is assumed to be used (*Bruggeman et al., 2005*). Bruggeman et al. (*2007*) mention other disadvantages of ABC that have to do with cost estimation errors. Three types of errors can arise. First, a specification error occurs when the wrong driver is used. Second, an aggregation error occurs when activities that have a different driver are combined into one activity. Third, measurement errors can occur because of difficulties in the assignment of resources to activities and because of errors is measuring the drivers. By splitting activities into several separate activities with their own driver, more specification errors and measurement errors can occur. Therefore, it is important to notice that refinement of the ABC system does not necessarily have to lead to more accurate estimations of product costs (*Bruggeman et al., 2007*).

TDABC: advantages

Many advantages of time-driven ABC have already been mentioned. This method is developed as a reaction to the disadvantages of the traditional ABC-method. The main advantages are therefore the following: more accurate product costs, faster implementation, easier to add complexity to the model and is easier to maintain (*Bruggeman et al., 2005*). These advantages are found in five case studies of companies by Bruggeman et al. (*2007*). As indicated by Kaplan & Anderson (*2004*), time equations that are used in TDABC can capture the complexities of business more simply than the traditional ABC system. Consequently, it is assumed that TDABC can best be used in environments that are complex and dynamic. Other advantages that are mentioned by Bruggeman et al. (*2005*) are: TDABC shows overcapacity, it gives information about the efficiency of company processes and it has predictive value with respect to the costs of certain future actions.

TDABC: disadvantages

Two disadvantages of time/driven ABC are already mentioned in part 3.3.4. First, measurement errors occur in estimating the number of minutes that are spent. Second, the development and use of this system still requires much effort in knowing the time of each activity. By evaluating the use of TDABC, Bruggeman et al. (*2007*) found that four factors can cause differences in time estimations. These are:

- Inadequate definition of the activity
- Incorrect structure of the time equation
- Incorrect estimation of the time
- Process changes within the company

Next, some other variables within companies can strongly influence the accuracy of time estimations. These are the motivation of employees with respect to giving the required estimations and the choice of the organizational level that is addressed (*Bruggeman et al., 2007*). In an experimental setting, Cardinaels & Labro (*2006*) studied the determinants of measurement errors in TDABC. They found that more than 77 percent of the participants consistently overestimate the time they spent on activities by 37 percent on average. Next, in an exit questionnaire participants indicated a much higher level of confidence in percentage estimations than in absolute (minutes) estimates. Considering the importance of time estimations in time-driven ABC, these incorrect estimations can be crucial.

3.4.2 Practical implications

The theoretical discussion of ABC and TDABC does not automatically lead to the choice of one of the methods. Both methods have their advantages and disadvantages. Here, practical factors are needed to see what method is the most appropriate to TKF and to this research. Since the theoretical discussion showed that time-driven ABC is the most accurate approach especially in complex environments, it should be investigated whether this method is applicable. Below, some practical information is given to be able to make a decision.

Several conversations have taken place for gathering information to be able to allocate the indirect costs at TKF. In these conversations, activities, cost drivers and cost objects were discussed. For each activity, it was already difficult to find one driver that causally explains the relation between activity and cost object. This type of driver was unknown to the company. Next, the interviewees were asked about the time it takes to perform an activity. In these conversations, it was indicated that estimating activity times is very hard, since a lot of factors influence the time it takes to perform an activity. However, the factors that were mentioned by interviewees were quite ambiguous. As an example, sales employees mentioned that some specific customers demand more time in processing orders. However, no company names were given and it would be too complex and time-consuming to analyze what customers demand more time from sales and subsequently to receive estimations of this additional times. In accordance to this, the R&D manager indicated that the time it takes to

process R&D projects and requests is always estimated based on feelings and experience of R&D employees. However, definitions of the factors that influence the time of these R&D activities could not be given. Consequently, it would be extremely difficult to set up time equations.

According to Bruggeman et al. (*2007*), for the development process of a time-driven ABC system, it is important to spend sufficient attention to the definition of the activities, the right specification of the time equations and the right estimations of activity times. Next, TDABC requires a professional implementation approach and a powerful and reliable software tool. As said, sufficient attention should be given to setting up time equations and using the right estimations. However, it is already mentioned that this would be very difficult. Deeper analysis of all the factors that influence activity times would be too complex and time-consuming for this master thesis.

Concluding, applying Time-Driven Activity-Based Costing in this research would be too difficult. As a result, traditional Activity-Based Costing is chosen. Here, the time consumption of employees is analyzed by using percentages instead of the time it takes to perform an activity. This is consistent with the finding of Cardinaels & Labro (*2006*) that persons indicated a much higher level of confidence in percentage estimations. While ABC is mostly seen as less accurate than TDABC, using ABC would practically be most applicable in this research. The assumption is that using this method would still result in a sufficient accurate allocation of indirect costs.

3.5 Conclusion

The returns that are made on customers can be analysed by means of a theory called Customer Profitability Analysis (CPA). By this approach, revenues and costs are allocated to customer segments or individual accounts, such that the profitability of those segments and/or accounts can be calculated (*Van Raaij, 2003*). The distribution of customer profitability can among others be presented in a customer pyramid and in a Stobachoff curve. The shape of this curve gives an indication of the vulnerability of the customer base. In the literature, retrospective and prospective profitability can be found. Where retrospective profitability looks at the profitability of customers in a past period, prospective profitability focuses on future profitability. In this research, both types of profitability are chosen and elaborated for TKF. Next to customer profitability analysis, other characteristics of the customer relationship determine the value that can be given to customers. One of such an approach is Customer Lifetime Value (CLV), which values customers based on its potential instead of its past behaviour. There are several factors that cause some customers to be expensive to serve and others low cost-to-serve. Examples of such factors are order quantity, customized versus standard delivery, time of payment and the number of visits to a customer. Since the distribution of revenues across customers is mostly known, analyzing the distribution of costs across customers is very important in analyzing customer profitability. Therefore, the allocation of indirect costs is crucial in determining profitability.

Costs can be categorized in different ways. In this theoretical framework, a distinction is made between direct/indirect, variable/fixed, relevant/irrelevant and different hierarchies of costs. For the purpose of this research, relevant costs are non-production indirect costs, often called overhead costs. The classification of variable and fixed costs and the hierarchy of costs is applied in this thesis in chapter five. With respect to the allocation of overhead costs, four different allocation methods are described. These are traditional methods, direct/marginal costing, activity-based costing (ABC) and time-driven activity-based costing (TDABC). From the analysis, it seems that ABC and TDABC are the most advantageous methods, since they take all costs into account and are more accurate than the other two methods. In investigating whether TDABC is applicable to TDABC, it seemed that it was difficult for interviewees to give information about activity times. Next, further analysis about activity times and time equations would be too complex and time-consuming for this research.

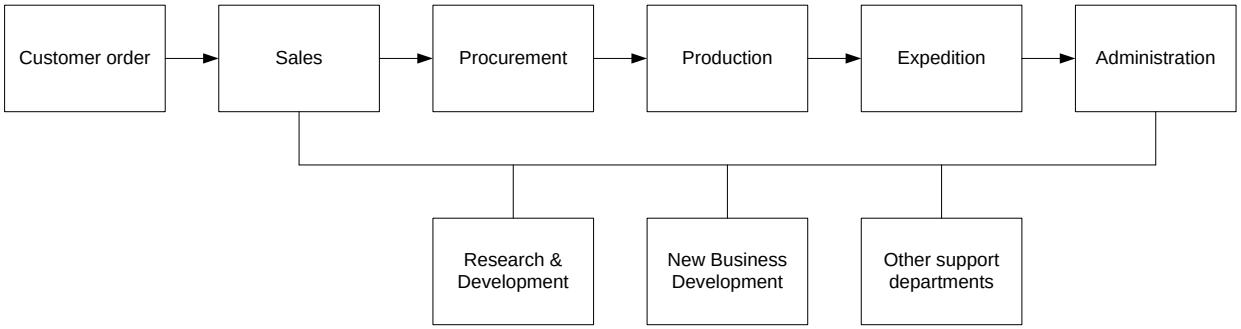
Consequently, Activity-Based Costing is chosen for the allocation of indirect costs. This approach is elaborated in the remainder of this thesis.

In this theoretical framework, customer profitability is elaborated before discussing costs and the different allocation methods that are available. In contrast to this, in the remainder of this thesis, the opposite direction will be followed. Here, the allocation of indirect costs is performed before analyzing customer profitability. In accordance with the activity-based costing approach, before the actual allocation, activities, costs and cost objects are elaborated in respectively chapter four, five and six. The actual allocation of indirect costs at TKF is discussed in chapter seven.

4. Which processes and activities can be identified at TKF?

Costs do not arise without a reason. They are the result of efforts or activities performed within the company. According to Cooper & Kaplan (1991), the developers of activity-based costing (ABC), activities make a demand on the organization's resources. ABC systems recognize that many organizational resources are required not for physical production of units of products, but to provide a broad array of support activities (Kaplan & Atkinson, 1998). Therefore, it is interesting to look at processes and activities performed at TKF before costs are discussed. As a consequence, activities are discussed below, whereas costs are analysed in chapter five. A basic process flow at TKF is given below in figure 17.

Figure 17: TKF's basic process/departments

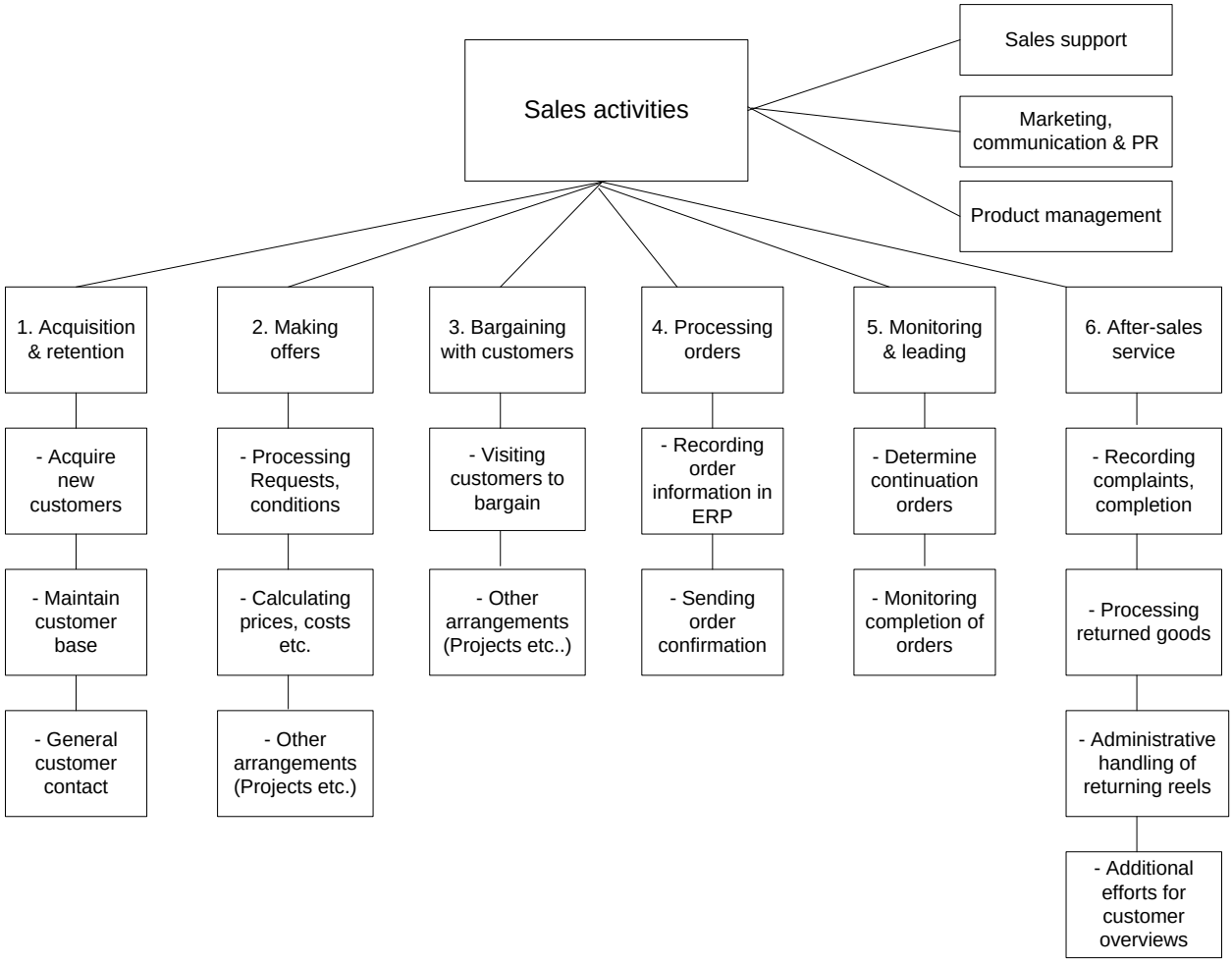


A customer order will arrive at sales, where several activities take place before involving other departments. Before cables are produced, sales should identify whether materials have to be purchased by procurement or that the current storage of materials is sufficient. After production, it is up to expedition to make the cables ready for delivery. This includes among others putting the cable on a ring or on a reel. Finally, the administration will complete the transaction and perform other activities. Not parts of this primary process are supporting departments such as Research & Development (R&D) and New Business Development (NBD). These departments however cause overhead costs and are thus included in the figure above. Other supporting departments or cost centres such as Human Resources (HR), computerisation (ICT), reception, canteen and works council barely have a relation to customers or products. Therefore, the activities that are performed at these cost centres are not discussed in this chapter. The costs with respect to procurement and production are processed in the product cost and should therefore not be analyzed in this research. In the end, the following departments are important concerning non-production overhead costs: Sales (with sales support and product management), R&D, Expedition, Administration and New Business Development. The processes within these departments are discussed below. For each department, a graphical representation of the relevant activities is given. However, it should be noticed that processes and activities are described for the year 2009. The assumption is that these processes and activities remain relatively the same for 2010.

4.1 Sales activities

The sales force at TKF can be divided into sales managers, account managers and inside staff. The sales managers give directives about customer orders and need to sign contracts with important customers. Account managers are externally oriented. They search for new customer contracts, can visit these customers and also bargain with them about orders. The inside staff is more internally oriented and consists of commercial and administrative employees. The sales activities can be roughly divided into the following six activities:

Figure 18: Sales activities



1. Attracting new customers and customer retention.

New customers at TKF can arise in two ways; customers can come to TKF and place an order and TKF can look out for new customers and projects by themselves. This searching for customers is done by account managers and can demand a lot of effort. Therefore, it is interesting to focus on customer retention where it is argued that the effort is less. If customers are kept satisfied future revenues will be more secure. This activity also consists of the general customer contact of account managers, such as granting information and answering phone calls.

2. Making offers.

Incoming requests are collected and selected by inside sales staff. After the selection, commercial sales employees can decide to make an offer. Determining prices and other specific conditions with the customer is done in consultation with account managers. After this calculation phase, the offer is sent to the customer. This offer can be based on several arrangements that are established with the

customer. First, there are annual arrangements, where the prices and discounts for a given period are prescribed. Second, there can be a project arrangement, where an approximate size and delivery period is indicated for a certain project. Third, a blanket order can be used, where the prices, amounts and types of cables are indicated, but where the actual time of delivery is not entirely known. When there is a real instruction to deliver cables this is called an order. In this case, the offer turns into an order. However, orders can also be received directly at TKF when customers order products for example by telephone. The price of the order can come from the above arrangements but can also be adjusted to a specific situation.

3. Bargaining with customers.
In many cases, the customer does not directly accept the offer that is made by internal sales staff. In this case, bargaining can be needed about specific conditions, such as prices, delivery and payment conditions. Account managers can then visit the customer and bargain until an agreement is reached.

4. Processing orders.
This activity is entirely executed by inside staff employees. The official order is set up by commercial sales employees and recorded by administrative employees. Recording order information is done in the ERP-system according to prescribed procedures. As said earlier, the ERP-system of TKF is called Navision. The relevant conditions, additional requirements and customer information are included in the system. It is recorded whether it is an order based on normal conditions or that it is based on a project agreement, an offer or the annual contract with the customer. The number of deliveries, whether they are speed orders and the terms of payment are also recorded. Having a single delivery instead of many small ones is more profitable for both TKF and the customer, because less administration and expedition efforts are needed.

5. Monitoring and leading.
After TKF has received the order and processed it into the system, there are still some sales activities left. Inside sales staff has to determine the continuation of orders. These persons have to monitor how the orders are executed. In most cases, this is about whether production and delivery times are reached. When it is required, sales staff can lead this process.

6. After-sales service.
After the execution of orders, several activities for the sales department can be identified. First, when the customer has complaints a complaint registration system will come into operation. There are certain steps to follow. Inside sales staff has to assess whether an account manager or R&D person has to visit the customer. It can also be possible that the cable is sent back to TKF. After that, the commercial and financial completion of the complaint takes place. The second activity is the registration of cables that are returned. This can be caused by mistakes made by customers or by TKF. Frequent communication with the customer is required here. Third, inside sales people are active in the administrative processing of returning cable reels. TKF expects that cable reels are returned within one year from Dutch customers. The last after-sales service is the additional efforts with respect to customer reports. This information consists for example of revenue overviews, project overviews, delivery schedules and remaining orders.

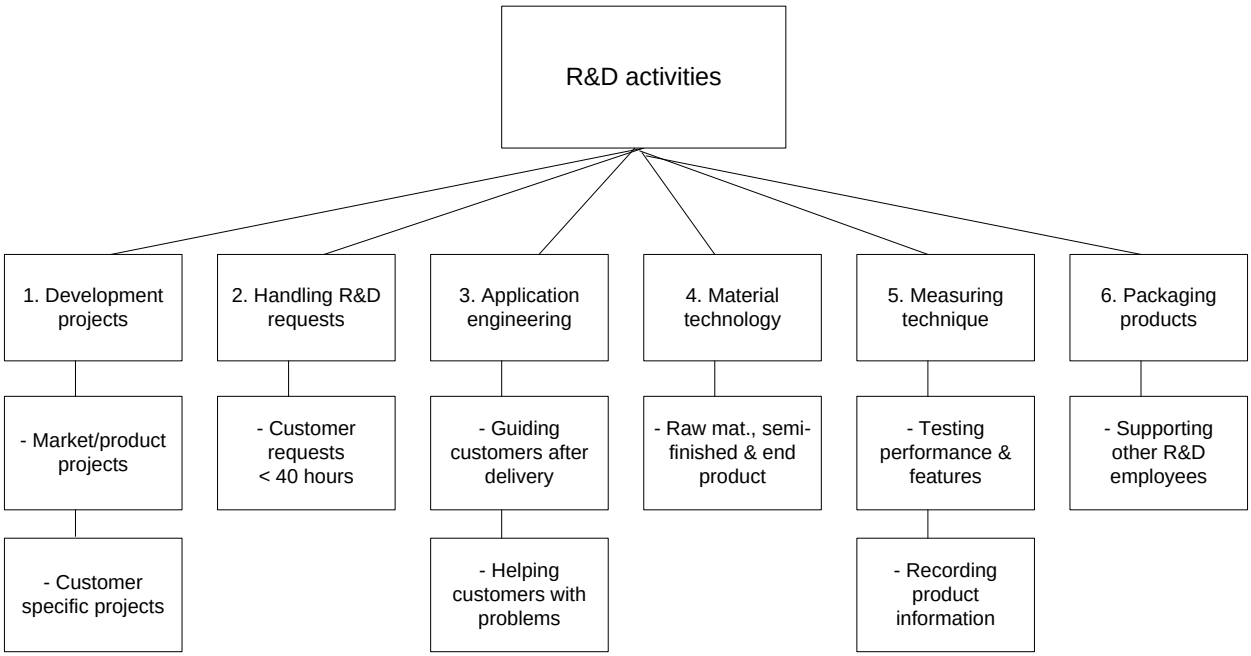
There are still some sales activities left that are not discussed yet. These have to do with three kinds of employees; sales support staff, marketing, communication & PR staff and product managers. First, there is a sales support staff that is not directly involved in the sales process. These people support and coordinate the sales employees when necessary. Activities of this group are more related to marketing, such as setting up flyers and fairs and other promoting activities. They also coordinate product management, so that managers are working with the right portfolio of products. Two persons at TKF are active in marketing, communication & PR. They belong to sales support and focus on promoting activities and the corporate identity of TKF. The last group of sales employees are the

product managers. These people focus on new product developments and have to provide TKF with the right portfolio of cables. So as a contrary to other sales persons, they are directed at products instead of the market.

4.2 R&D activities

The R&D department at TKF has grown considerably in the last decades. Now, it is one of the largest departments when looking at the number of full-time employees. The reason for this is that TKF addresses high priority to being innovative and so more effort in designing new products and improving existing ones is needed. The company also focuses more on delivering specialties, which are cable solutions that differ from usual ones. This also makes the involvement of R&D employees more important. The R&D department is divided into five groups that are based on market segments: Broadband, Installation & Marine, Energy & Renewable, Rail & Industry and Materials. R&D employees belong to one of these categories. The activities that are performed by R&D can be described as followed:

Figure 19: R&D activities



1. Development projects

The main task of the R&D department is to develop new cable products, systems and solutions in a market-oriented way (TKF R&D bulletin, 2010). This is done by means of projects. Most of these projects concern the development of new applications that are directed to market segments or to the general market. Only about twenty percent of these projects are related to a specific customer. Before launching such customer-specific R&D projects, a business case has to be made. First, R&D employees have to estimate the hours they will spend on the project and what the other costs will be. This is combined with information from sales about specific sales costs and the expected revenues and margin. When all information is gathered and the project looks promising, R&D can start the development. Several people within R&D are responsible for the design and development of applications. These employees have knowledge about the market and are specialised in certain segments. Next to the design of new products, this activity consists of processing product data into a configuration database and developing and guiding test cables.

2. Handling R&D requests

This activity concerns fulfilling requests that are related to specific customers. They are received by R&D when a customer orders products that do not exist at TKF or when existing products have to be adjusted by R&D. Compared to development projects, customer requests require less time from R&D employees. The general rule is that requests that require more than 40 hours are turned into customer-specific projects. Employees at the R&D department spent about X percent of their time on this activity. A customer request can be for example developing a complete new cable application or colouring a specific type of cable.

3. Application engineering

The R&D activities are not only about designing and developing new products. A separate activity concerns helping and guiding customers after delivery of the cables. The help of an employee of TKF can be a condition that is included in an arrangement with the customer. It can also be possible that the customer encounters problems for which the knowledge and experience of an R&D employee is needed. Application engineering can then be seen as a service that is delivered to the customer. This activity conforms to the development at TKF that now not only cables are produced and delivered, but also whole cable solutions can be offered.

4. Material technology

This activity concerns all the different materials that are used for the cables and other applications that are delivered. These can have to do with end products, as well as raw materials or semi-finished products. It is useful to have specialized employees for the handling of all materials.

5. Measuring technique

Measurements have to be performed to see the performance and specific features of new and existing cables. This is important information to know before launching a new cable or other application. This activity can also be performed when a customer demands additional product information that is not readily available.

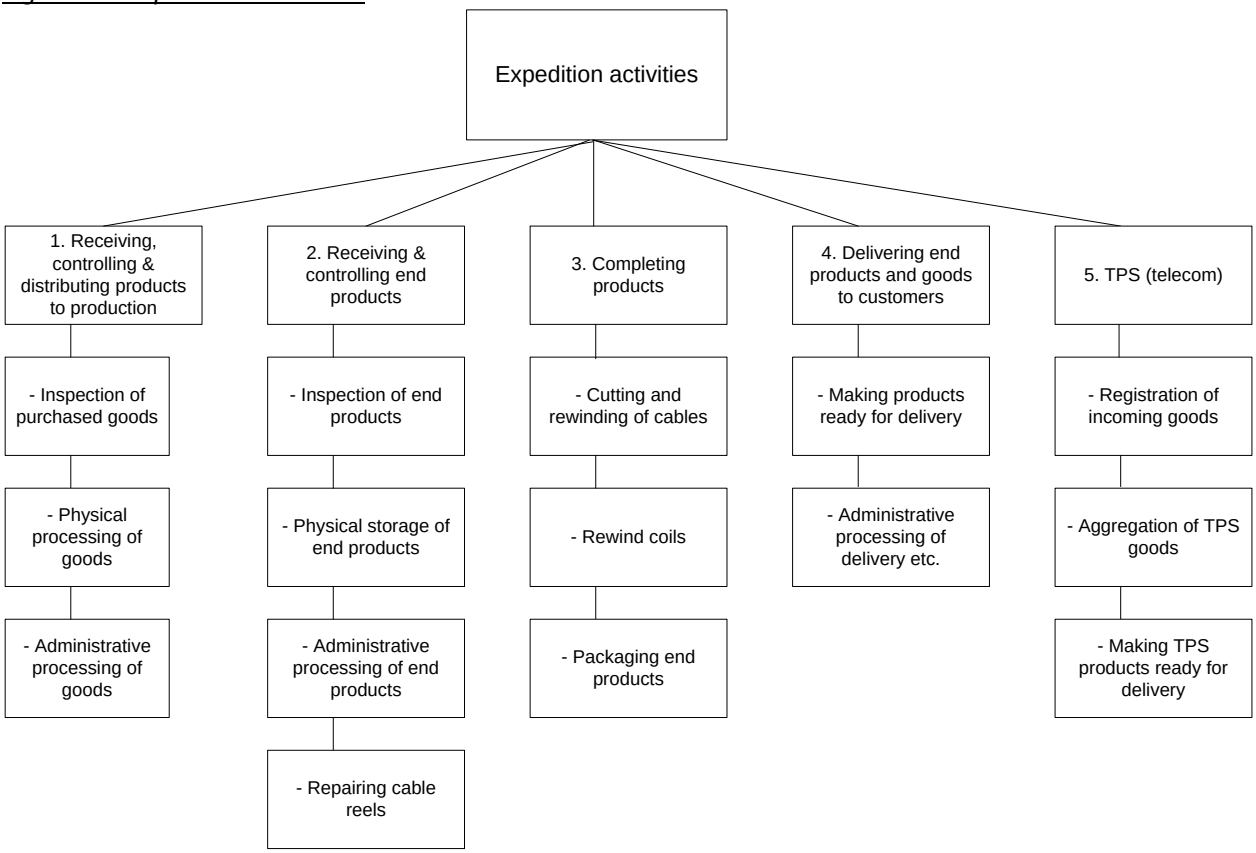
6. Packaging products

Packaging cables or other applications can be a significant cost type for TKF. Therefore, it is useful to review current packaging methods and to search for new, better, opportunities. This is done in this sixth R&D activity, which is performed by one employee. It is a supportive activity, since it can be related to all R&D employees.

4.3 Expedition activities

The expedition department at TKF performs the activities between the production of the cable and the actual delivery to the customer. The department can be divided into three groups. First, there are two shifts that both have a shift leader and expedition employees. Next to this, there is a small group of transport planners. Finally, the third group is a combination of the storage and TPS (Telecom Products and Systems), which is a separate activity and has to do with all telecom activities. The following activities at expedition can be distinguished:

Figure 20: Expedition activities



1. Receiving, controlling and distributing products to production.

The raw materials and other products that are purchased by the procurement department need to be inspected by expedition. After this, the materials are held in storage until they are needed by production. Next to the physical flow of products, people at expedition also have to book the changed status of products into the administration system.

2. Receiving and controlling end products.

The end products will first go to inspection and then the cable and reel is transferred to expedition. This department identifies the products and performs an administrative inspection on them, where among others the ID of the cable reel is checked. After that, the cable reels go outside and in the administration system it is indicated at what place they are stored. For shipment of the cable reels overseas, also document completion is performed by expedition. An additional activity is the repair of cable reels. Reels that are used more than one time may have to be repaired and this is done at the carpenter's workshop at TKF.

3. Completing products (cutting & rewinding).

Of course, TKF prefers to receive only customer orders of complete cables and cable reels. However, in practice this is not the case. Often customers only want pieces of cables or additional product operations may be needed. The additional operations that have to be performed on cables make a difference on the indirect costs for TKF cables. It can be that cables are divided into pieces, which are subsequently formed in rings, instead of putting them on cable reels. These cable rings are normally sold from storage, where large number of them are put on pallets. However, the activity that results in the highest costs is cutting and rewinding of cables for customers. This activity is performed when customers demand a shorter cable length than the usual size. Therefore, the cable will have to be cut and generation of the cable to another (smaller) cable reel is required.

4. Delivering end products and goods to customers.

The transportation of cable reels is not performed by TKF but is outsourced to other companies. Deliveries within the Netherlands are performed by established transport operators. TKF has long-term contracts with these companies. The activities that have to be performed by expedition have to do with making products ready for transport. The cable reels are put on a truck with the help of a forklift truck. Than the transport operator will secure them and make the delivery. For export, in most cases additional packaging of cables and reels is needed before delivery can take place. This can consist of putting small cable reels on pallets and putting a protection of wood on the bigger cable reels. Additional packaging is done at the 'carpenter's workshop' of TKF. For the delivery of products to customers, there are three categories:

- National deliveries. This still forms a large extent of the revenues at TKF. The cables are delivered by transport operators and TKF can self release them at the preferred location.
- Road transport and Europe. A number of transport companies perform the deliveries based on geographical locations (divided into Scandinavia, Germany and mid-southern Europe.
- Transport overseas. Most often this concerns transport to Suriname or to the Antilles islands, where TKF has performed several projects in history.

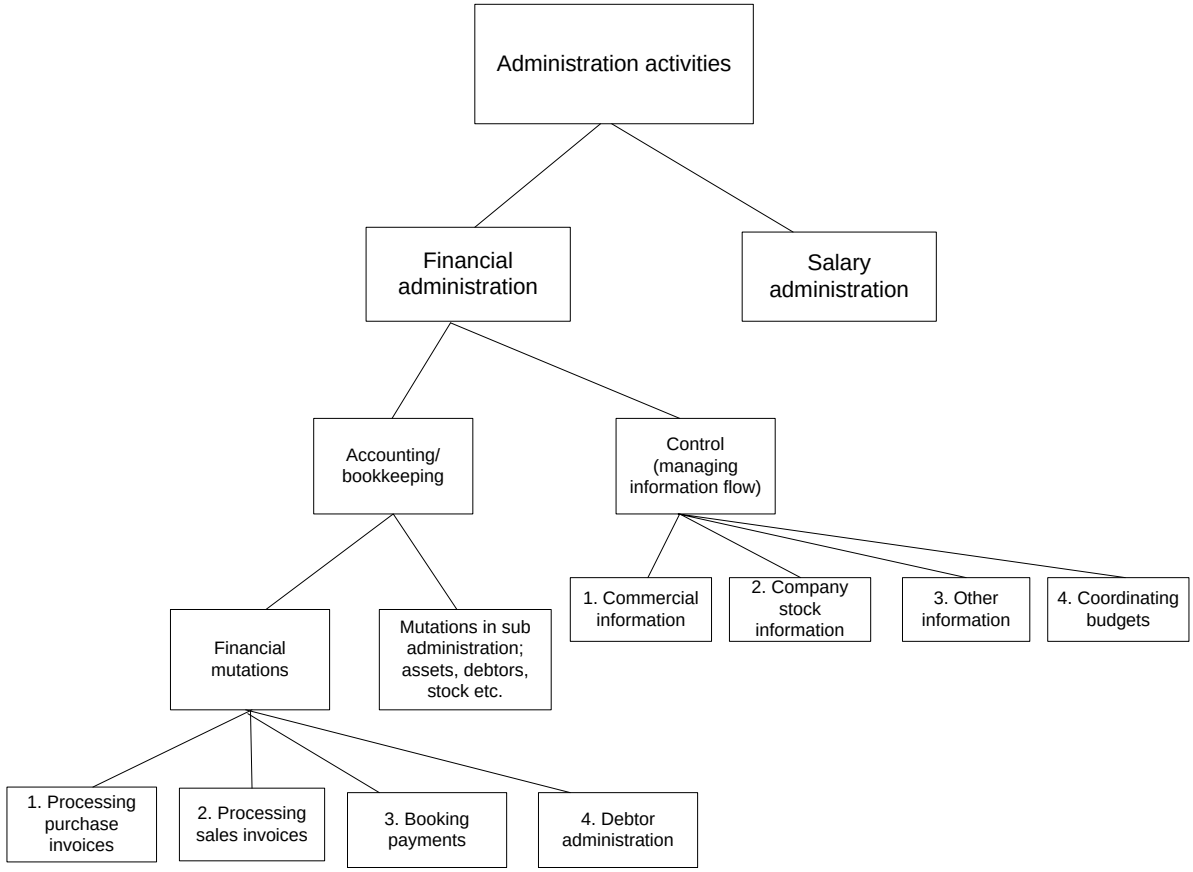
5. TPS (Telecom Products and Systems).

This category of activities all has to do with telecom products, which are mostly used to connect cables. A part of these products is entirely built by TKF and some of them are purchased and then delivered to customers. It includes the registration of incoming TPS goods, aggregating them and making them ready for delivery.

4.4 Administration activities

The administration department primarily concerns the financial administration and also consists of the salary administration as a separate activity. By analyzing activities of the financial administration, a distinction is made between accounting and control.
Accounting at TKF has to do with financial mutations and mutations in the sub administration. The following administrative activities can be identified:

Figure 21: Administration activities



- Financial mutations:

1. Processing purchase invoices.

The administration department receives three kinds of purchase invoices: invoices for raw materials, non-product related invoices and invoices without an order). These have to be processed, which has to do with checking the value added tax percentage and other information and confirm or adapt this into the information in the system. Four possible kinds of payment are possible, which have to do with whether normal/fast payment and national/international payment is required. One of these kinds is chosen and the invoices will be filed. When there are no problems the payment is then booked into the system.

2. Processing sales invoices.

When expedition has confirmed that the cables are ready for delivery the administration books the deliveries and also the revenue into the system. The order information is checked and the invoice is booked and sent to the customer. At this moment, the order value can be booked as revenues. Beside regular invoices, administration also has to process credit notes. Credit notes are made and sent to the customer when an invoice that was sent earlier was incorrect or for what reason unfair.

Reasons for sending a credit note can be discounts, a wrong order placed by the customer or a mistake made by TKF.

3. Booking payments.
After processing the order, delivering the products and sending the invoice, administration has to book the payment into the system. This includes checking the mutations in the bank accounts and the specifications of the payments of customers. Next to incoming payments, also paying suppliers and other organizations that owes money from TKF has to be administered.

4. Debtor administration.
The last financial activity concerns administrating debtors. These have to be monitored, primarily with respect to terms of payment. Too late payment by the customer will increase costs at TKF. Therefore, the customer is called by the administration department and can also be blocked so that future transactions are not possible until the invoices are paid.

- Mutations in the sub administration:

These are all activities required to produce a correct general ledger. Examples of these activities are mutations in fixed assets, stocks of goods, debtors, creditors, cable reel administration, projects etc. When administration receives relevant information that leads to changes in the balance sheet or profit & loss account the right accounts have to be used to mutate the changes.

- Control:

This activity has to do with controlling all flows of information within TKF and to provide direction and the holding of correct and consistent reports. These activities can be roughly divided into four parts:

1. Reporting and analyzing commercial information.
This is related to what is achieved by sales and how this is in proportion to expectations. Controlling this will let you see what revenues are gained, what revenues have to be gained in the future, what returns are gained on certain product groups etcetera.

2. Controlling all the flows of information with respect to company stocks.
This is not only about the amount of stock of a certain product, but also how the products are valued, what is the consumption of materials, what stock is unsalable, what waste of materials has occurred etcetera.

3. Remaining reports, analysis and flows of information.
This is what not is described by the first two activities. It consists of for example returns on projects of TKF, pricing differences, occupation results etcetera. Also providing the TKH group with information for their TKH (annual) reports belongs to this category.

4. Coordinating budgets.
Budgets have to be set up with respect to revenues, costs, what templates will be used etcetera. The information for this is provided by other departments and is coordinated by control. Budgets have to be approved by direction and then further details can be planned.

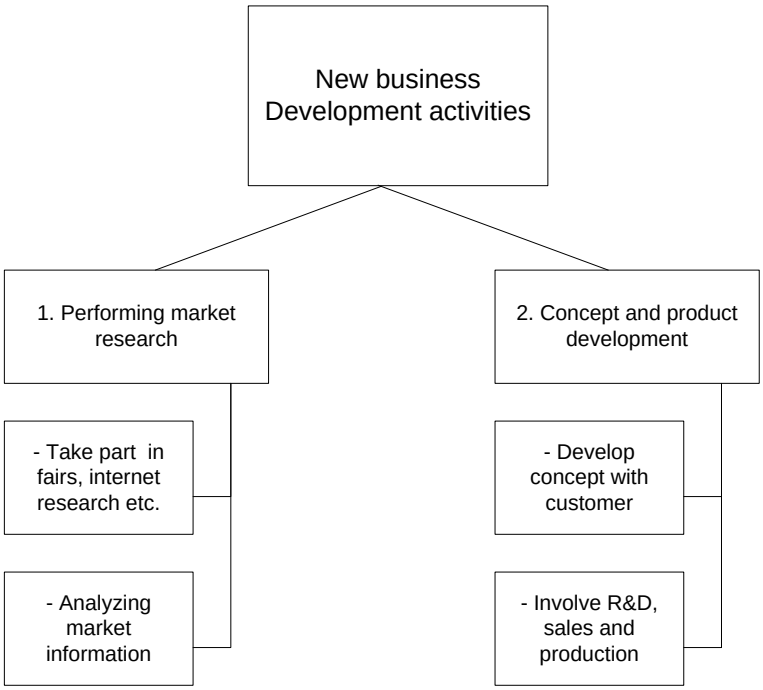
- Salary administration:

This separate administration activity belongs to the chief financial officer. People at the salary administration are active in making proposals for adaption and/or optimisation of the package of employment conditions. Further activities are setting up the payroll preparation, personnel administration and time registration and controlling mutations within these systems.

4.5 New Business Development activities

The New Business Development (NBD) department at TKF consisted of two employees in 2009. They are especially active in performing market research and other marketing activities. This is always with a certain focus on niches in the market. The distinction with the marketing activities performed at sales is that new business development focuses on developments in the market where TKF can react to in about 2 to 5 years, whereas sales is more directed to short term developments. The activities performed by NBD can be roughly divided into two elements:

Figure 22: NBD activities



1. Performing market research.

As said, this is the most important activity performed at new business development. Each employee at NBD has a special focus on certain markets. The way that market research is done can best be described as 'being in the market'. Information is then gathered for example by taking part in fairs that are focused on certain market or product developments. It is also done by performing internet research. After performing market research further analysis of the results and other information is needed. Then the most relevant market developments can be identified and NBD can see whether there are interesting market niches or not. This is the input for the TKF's management to set up the market strategies in the future. In some cases, the management determines these strategies and then NBD is put in a certain direction to perform market research. The weights placed by NBD on certain market segments can change over periods, from for example Marine & Offshore to Energy & Installation. According to the manager of NBD, market research is not performed in the commodity market anymore, but in 'higher segments'. In these segments, interesting market niches, also called target groups, are identified. This conforms to the future plans of TKF to focus more on market niches that are relative complex and customer specific, instead of the commodity market.

2. Concept and product development.

This activity concerns the further proceedings after performing market research. It is the time between analyzing market information and the actual development and production of cables or other applications. The intention is that new business development looks out for interesting projects

and has the first contact with the customers of these projects. Here, the concept of the project is developed together with the customer. At a certain point in time, sales and R&D are involved in the process. Consultation with these departments is needed to see if the project is commercially attractive to TKF and to see whether R&D can develop the required products. The other departments then perform the continuation of the projects and this can be tracked by new business development.

4.6 Other departments

There are still some activities performed at TKF that have not been discussed yet. These activities can for example have to do with management activities, IT/automating, facilitating services, canteen and human resource management. These activities are not taken into account in this research because of two possible reasons. First, the specific efforts that are needed do not, or only to a small extent, affect customer or product profitability. Activities and the resulting costs of TKF's canteen for example do not influence the assessment of a specific customer. Second, the costs that are incurred with respect to these activities are only minimal. Therefore, analyzing these efforts and costs and allocating them will be too time-consuming and will barely have benefits for this research.

4.7 Conclusion

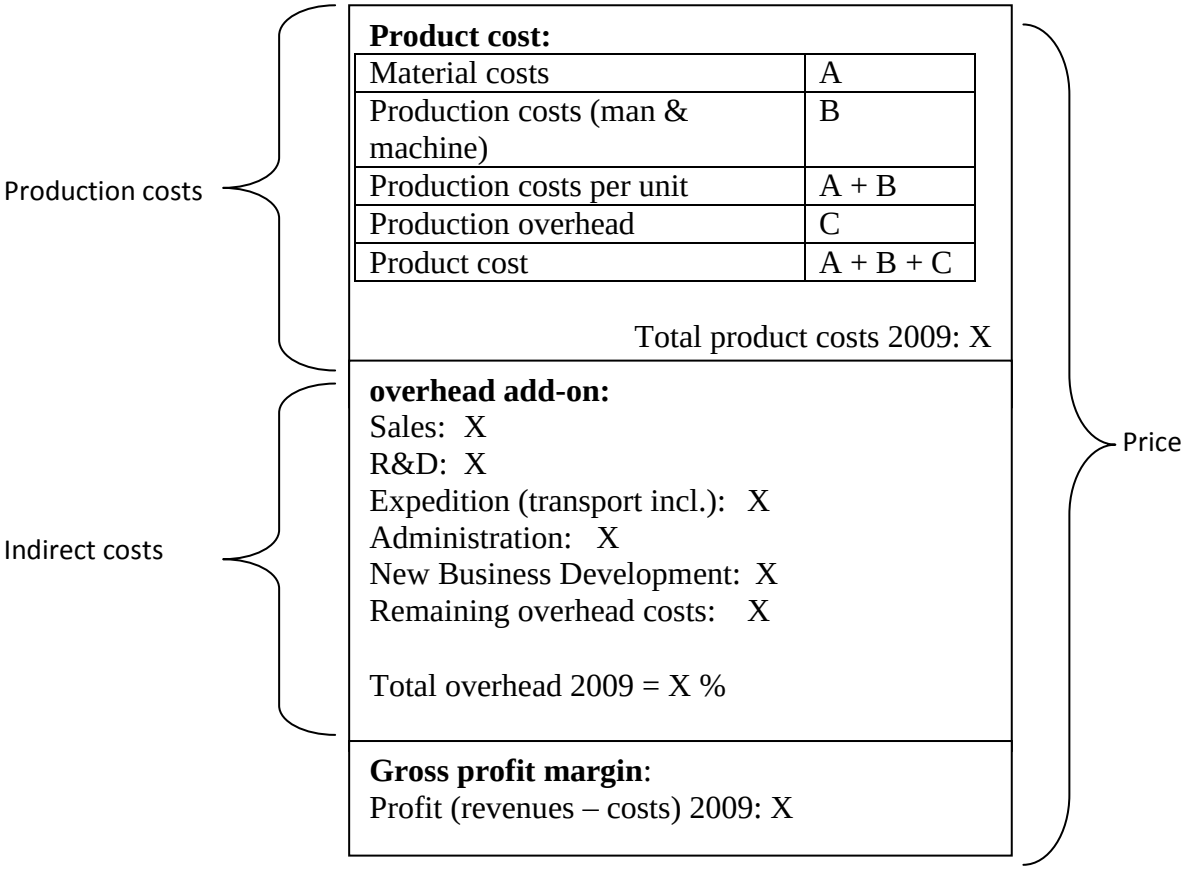
From the analysis of the basic process at TKF, five important departments have been identified that cause indirect costs. The first one is sales, where a distinction is made between the several market segments, sales support and product management. Activities for the six market segments are performed by account managers and inside sales staff. These activities mostly have a direct relationship with customers, whereas sales support and product management concerns general activities that are more related to groups of customers or products. At the R&D department, most employees are working on development projects. These projects are mainly based on certain market or product groups. Next to this, there are requests from individual customers and the other activities are more general to TKF. The biggest part of expedition activities is related to products. Of the five expedition activities that are mentioned, completing products and transporting them to customers seem to be the most important to TKF. In describing activities at administration, a distinction is made between financial mutations, mutations in the sub administration, control and salary administration. Financial mutations mostly have a direct relationship to customers. The other administrative activities, such as accounting and control, are more general and supportive to TKF as a whole. At last, new business development is doing research into existing and new markets and therefore this department has no direct relation to individual customers.

From the analysis of the activities that take place at TKF it seems that sales, R&D and expedition bring about the most important activities with respect to indirect costs. These activities cause some customers to be expensive to serve whereas other customers have low cost-to-serve, as is described in the theoretical framework. The costs that arise from performing the activities at sales, R&D, expedition, administration and new business development are described in the next chapter.

5. How can costs be categorized at TKF?

In this chapter, the costs at TKF are analysed. These costs are the result of the activities that are described in the previous chapter. At TKF, all the costs where a direct relationship can be found with cables, components or the production of them are included in the product cost. These production costs do not have to be analysed further, since this research is focused on non-production indirect costs, also called overhead costs. However, it is interesting to look at the product cost to see what costs should not be taken into account in this thesis. In figure 23, the product costs are presented together with the overhead add-on. From the figure it can be seen that in 2009, the overhead costs represented X % of total product costs. This does not conform to the X % overhead costs that was thought of by TKF. It cannot be said that this was solely caused by the growing importance of overhead costs. Another cause can be decreasing revenues in 2009 that can result in lower total product costs. It can also be possible that prices for raw materials, such as copper and aluminium, have decreased significantly in 2009, which can increase the share of indirect costs over total costs. In the next section, product costs and indirect costs are discussed separately.

Figure 23: Product costs, overhead costs and margin



5.1 Product cost

As said, all the costs that have a direct relationship with products or production are included in the product cost. In table 3, the distinction between material costs (A), production costs (B) and production overhead (C) is given. These components are discussed below.

Table 3: Product costs

Material costs	A
Production costs (man & machine)	B
Production costs per unit	A + B
Production overhead	C
Product cost	A + B + C

Source: Van der Voort (2005)

A: Material costs

The material costs are based on bills of material, where all the required raw materials and components to produce a certain cable are specified. The following calculation is used:
Material costs = amount of material x percentage of scrap x price of material.
Next to the costs of raw materials and components, the material costs also consist of an overhead percentage to cover the indirect costs of purchasing. So the costs of the procurement department are processed in the price per unit.

B: Production costs

Production costs can be divided into man costs and machine costs. For these production costs the following calculations are used:
- Operation costs:
  Net operating time x disturbance factor x cost per machine hour
  Net operating time x disturbance factor x cost per labor hour
- Set-up costs:
  (Set-up time x cost per machine hour) / batch size
  (Set-up time x cost per labor hour) / batch size

The cost per machine hour consists of the following components: depreciation, maintenance, remaining costs of production departments, indirect production costs, electricity, gas, accommodation costs and production overhead
The cost per man-hour consists of a basic hourly rate, an add-on for general indirect costs and an add-on for indirect machine-committed costs. An example of an indirect general cost type can be the salary of a lifting truck driver. Indirect machine-committed costs have to do with functions that are executed on behalf of certain machines.

C: Production overhead

The production overhead consists of indirect costs that are attributable to the production of cables but not to specific products. For every type of cable, a fixed percentage is added on to the production cost per unit to allocate these production overhead costs. The following components are partly included:

- direction
- works council
- personnel department
- administration
- facility maintaining services
- canteen
- reception
- automation/IT

In TKF's general ledger, costs are assigned to specific cost centres. Examples of cost centres are administration, management, R&D, buildings etc. Also production costs are included in the general ledger. Cost centres are then specific machine types. For the purpose of this research, this division of costs to cost centres made by TKF is not analyzed. The information that is used to allocate indirect

costs is derived from the general ledger that is found in Navision. In the next section, all costs will be described that are not included in the product cost per unit of cables and other applications.

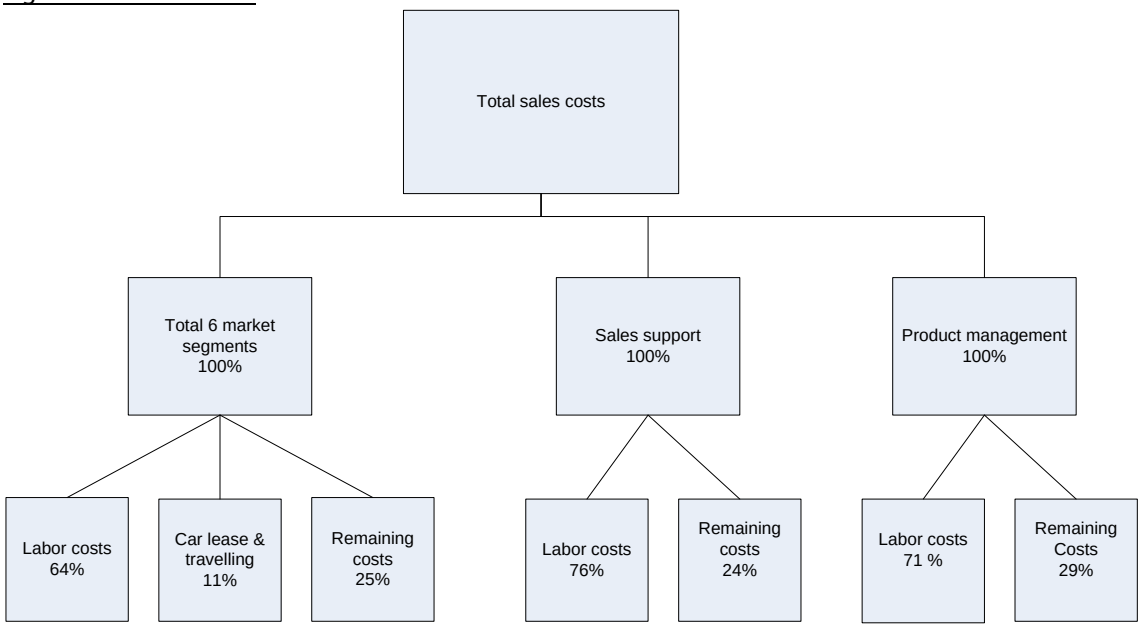
5.2 Indirect costs/Overhead costs

As indicated in chapter four, the relevant departments in this research are sales, expedition, R&D, administration and New Business Development. In this section, the most important costs of these departments are described. It is also mentioned whether the costs can be classified as fixed or variable. Finally, the hierarchy of expenses is applied to categorize costs. As mentioned earlier, these costs are the result of performing certain efforts or activities, which can be related to customers or products.

5.2.1 Sales

The sales costs consist of the different market segments (energy, rail, installation, broadband, industrial and marine), product management and sales support. As can be seen in figure 24, the six segments represent a large share of total sales costs. The most important cost type at sales is labor costs. This represents 64%, 76% and 71% for respectively the market segments, sales support and product management. These costs can be classified as fixed, because they stay relatively at the same amount at different activity levels. A small part of the sales workforce consists of temporary workers, which creates more variable labor costs. Bonuses to employees, which are also variable costs, can also take place at the sales department. The remaining costs are largely selling expenses. The biggest selling expenses are car lease, marketing and representation costs. These are variable costs and can fluctuate heavily over periods. Other possible cost types can be customer claims or complaints. Such costs arise only incidentally but can have a big influence on total sales costs. Costs at sales primarily have to do with customer batch-level activities and customer-sustaining activities. A batch-level activity can for example be processing orders into the system. A customer-sustaining activity can be visiting the customer.

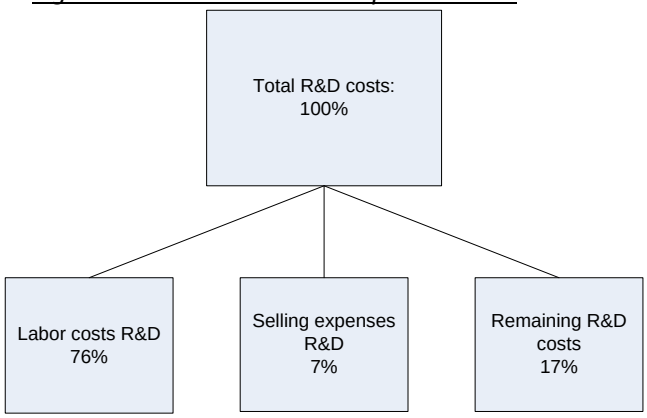
Figure 24: Sales costs



5.2.2 R&D

At the R&D department, the largest type of cost is by far labor costs. These represent about 76 percent of all costs and are the result of having X full-time employees (see figure 25). This cost type is fixed to TKF. Remaining R&D costs are largely selling expenses. Car lease and travelling expenses represent the largest selling expenses at R&D. It is difficult to classify them as either fixed or variable. Costs of car lease are more fixed to TKF, while for example travelling expenses can vary over different periods. Other costs at the R&D department represent only a small percentage of the total costs and are therefore not separately presented in the figure below. These costs are: depreciation on fixed assets, reparation and maintenance, auxiliary materials, services and general costs. The activities at R&D can be both directed to products and customers. Therefore, it is difficult to categorize them according to the hierarchy of expenses. When a customer requires a single, specific application that has to be developed by R&D, it can be seen as a customer output-unit-level activity. Testing and measuring the performance of cables can on the other hand be seen as product batch-level activities.

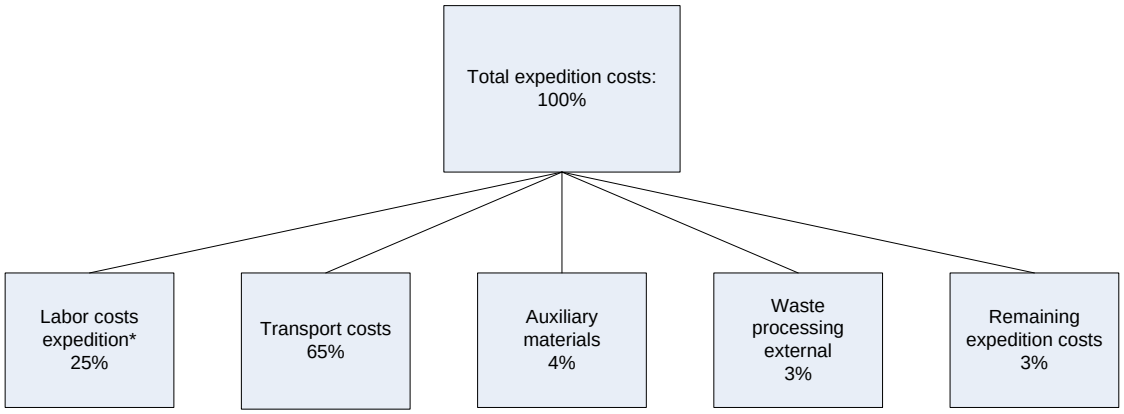
Figure 25:Research & Development costs



5.2.3 Expedition

In figure 26, transport costs are included in the expedition costs. These costs represent 65 percent of total expedition costs and are mainly variable in nature. The remaining expedition costs primarily consist of labor costs, which are again classified as fixed costs. Important to notice is that a part of the labor costs at expedition are processed in the product costs. These labor costs have to do with two expedition activities that are discussed in chapter 4. These costs are not discussed in this chapter, since the costs are not indirect. Excluding these costs is further elaborated in chapter 7. Other important expedition costs are the costs of packaging materials, other auxiliary materials and waste processing, which is done by an external company. When activity levels for expedition change, the need for auxiliary materials will change in line with this. This makes these costs variable in nature. The activities that result in the mentioned costs have to do with processing cables and other applications, such as controlling products and make them ready for delivery. This can affect both a single cable and a group of products. Therefore, these costs are especially the result of product unit-level and batch-level activities. Activities performed by expedition employees can also have to do with specific customers. They can require certain additional efforts after the production of cables. Then, costs can be classified as customer output-unit level or customer batch-level expenses.

Figure 26: Expedition costs

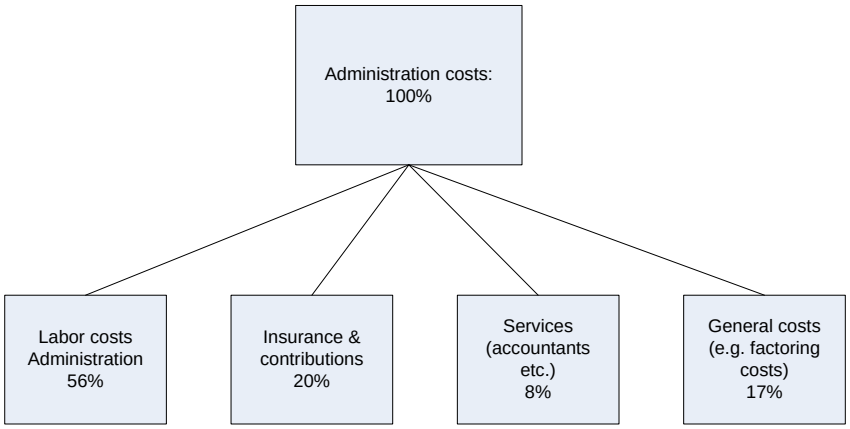


** Labor costs of expedition that are processed in the product cost are not presented in the figure*

5.2.4 Administration

Labor costs at the administration department represent more than half of the total costs (see figure 27). These are fixed costs for TKF. Insurance costs are responsible for about 20 percent of total administration costs and are mostly fixed. The largest insurance cost type is fire insurance. In the general ledger, an amount of general costs is included for administration, which largely consists of factoring costs. These costs are the result of banking arrangements for debtor financing. Part of the factoring costs is fixed and others are variable. The remaining costs have to a large extent to do with services related to administration. These can be variable but also partly fixed, such as auditing costs. The activities performed by administration employees are mainly related to customers. Processing invoices can be seen as a customer batch-level activity, whereas maintaining customer information can be seen as a customer-sustaining activity.

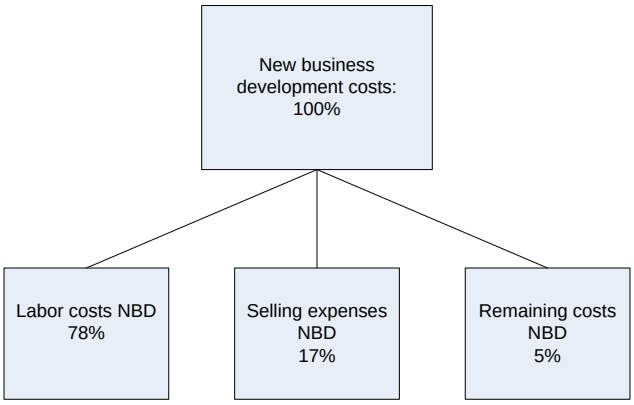
Figure 27: Administration costs



5.2.5 New Business Development

When looking at the number of employees, new business development is the smallest cost centre that is included in this research. Costs at NBD consist for nearly 80 percent of labor costs, which can be seen in figure 28. These are mainly fixed and for a small part more variable, since costs for a temporary worker are taken into account. The remaining costs are to a large extent selling expenses, consisting of travelling, car lease, inspection and other selling costs, which are more variable in nature. The activities performed by NBD are more related to customers than products. Activities performed by NBD do not have to do with a specific customer, but more with a group of them or TKF as a whole. Therefore, the activities can be either classified as customer-sustaining or facility-sustaining activities.

Figure 28: new business development costs



5.3 Remaining overhead costs

As said, not all overhead costs will be analysed and allocated in this research. The remaining costs barely have a relationship with products or customers or are only minimal to TKF. In table 4, the remaining overhead costs are presented.

Table 4: List of remaining overhead costs

Retired people
Direction
Facilitating services
Canteen
HR department
IT automating
Reception
Depreciation other cost places (sales, R&D etc.)
Rewinding machines
Works council
Remaining expedition Lochem
Total remaining overhead costs

Comparing the amount of remaining overhead costs with the total overhead costs that were given in the beginning of this chapter, it seems that the overhead costs that are not analysed in this research are only minimal. As can be seen in table 5 below, these costs represent only 12 percent of total overhead costs.

Table 5: Proportion of overhead and remaining overhead costs

Overhead; Sales, R&D, Exp., Adm. & NBD	87,47 %
Remaining overhead costs	12,53 %
Total overhead costs	100 %

5.4 Conclusion

In analyzing all costs at TKF, the year 2009 was the basis. Different categorizations are used. First, TKF's product prices are elaborated by differentiating between product cost, the percentage overhead add-on and gross profit margin. It seems that in 2009, the share of overhead costs of the total product costs was X percent, instead of the X percent that was expected. However, this can be due to variances in sales volume and changes in prices of copper and aluminium. Of all the non-production overhead costs, about 87 percent is analysed in this research. Inside and outside sales staff are responsible for the largest part of overhead costs. These employees are divided into the six market segments and the labor costs have also been traced to these six segments in the ERP-system. Another large type of cost is transport. When allocating overhead costs of the five departments, labor costs will be extremely important. Especially for sales, R&D and new business development, labor is responsible for a large share of total costs. These costs are mainly fixed, since paying temporarily employees and bonuses is relatively rare at the five departments.

The analysis of costs at TKF is used in the actual cost allocation in chapter seven. It is important to know what costs play a role at different departments. Then activity costs can be calculated by linking these costs to the activities that take place. Activity costs can then be allocated to cost objects by using cost drivers. Therefore, in the next chapter the relevant cost objects, which are products and customers, will be elaborated before allocating the costs.

6. How can customers and products be categorized at TKF?

In this part, the relevant cost objects, customers and products, are described. As said, the goal of this research is to assess customer profitability more accurately. Therefore, it is analyzed in what way customers are responsible for the overhead costs of TKF. However, some of the activities that are described in chapter four are related to products instead of customers. In the cost allocation process, products can then be used as intermediate objects to assess customer profitability. As an example, a cable that is received and processed by expedition results in overhead costs that are related to that cable. The customer that orders this cable will then also be burdened for the costs of receiving and processing that cable. Therefore, both products and customers are important to analyze.

6.1 Products

As mentioned in chapter one, a distinction can be made between cables used for delivering energy and cables and products used for the transmission of information. Cables used for the delivery of energy can be low, medium and high voltage. These are used in product groups such as installation cables, shipping cables, instrumentation cables and railway cables. Cables and products that are offered to transmit information can be divided into fibre channel cables, telecom cables, co-axial cables and TPS. Telecom Products and Systems (TPS) are mostly used for the connection of cables. Here, most articles are purchased, assembled and resold to customers. Therefore, TPS is seen as trade products by TKF. Both energy and information cables can be standard and sold from stock, but can also be produced at the request of a specific customer.

In the ERP-system, the status of products can be included. It can be indicated whether it is an end product, semi-finished product or raw material. At the administration department, a categorization of six end product groups is used to book mutations into the system. These are:

- energy
- installation
- instrumentation
- telecom fibre
- telecom copper
- telecom trade

The above classification is most often used at TKF. A further categorization is based on article booking groups. Here, it can be indicated whether it is an installation cable, shipping cable, telephone cable etc. It is also possible to categorize these products into subgroups.

6.2 Customers

TKF is doing business with individual customers as well as concerns. Contracts are first made for the whole concern, but exceptions can be made for a company or specific project. In addition, several arrangements have been made with technical wholesalers to which TKF delivers their products. In chapter one, a categorization of eight customer segments was given. However, this categorization is not used at the administration department for presented revenues, costs and other information. The most important categorization of customers that is used by TKF is based on six customer groups:

- energy
- installation
- industrial
- marine & offshore (MENO)

- infra
- broadband

Within Navision, a further classification is called customer revenue groups or customer revenue subgroups. Here, different establishments of a concern can be recognized as a group. A lot of communication takes place at this group level and also revenue information can be presented for a group or an individual customer. Further details that are added to a specific customer are: the discount group, sales department, rayon, salesman and other specific customer information.

6.3 Product-market combination

The classification of product groups and customer groups has some overlap, but is certainly not identical. Customers that are active in the installation segment will order mostly installation cables, but in some instances, also energy or telecom products are ordered. The combination of products and markets can result in a matrix (see table 6). In the current situation, a revenue report is made that indicates how product and market groups are performing. This report is based on the matrix below, which is also the format that is used for presenting budgets, realisations and their variations. In the matrix, the product groups raw materials and semi-finished products are excluded. These groups only have low revenues and the activities of sales, R&D, expedition, administration and NBD are barely related to raw materials and semi-finished products that are sold.

Table 6: TKF's product/market matrix

Customer groups→ Product groups↓	Energy	Installation	Industrial	MENO	Infra	Broadband
Energy						
Installation						
Instrumentation						
Telecom fibre						
Telecom copper						
Telecom trade						

6.4 Conclusion

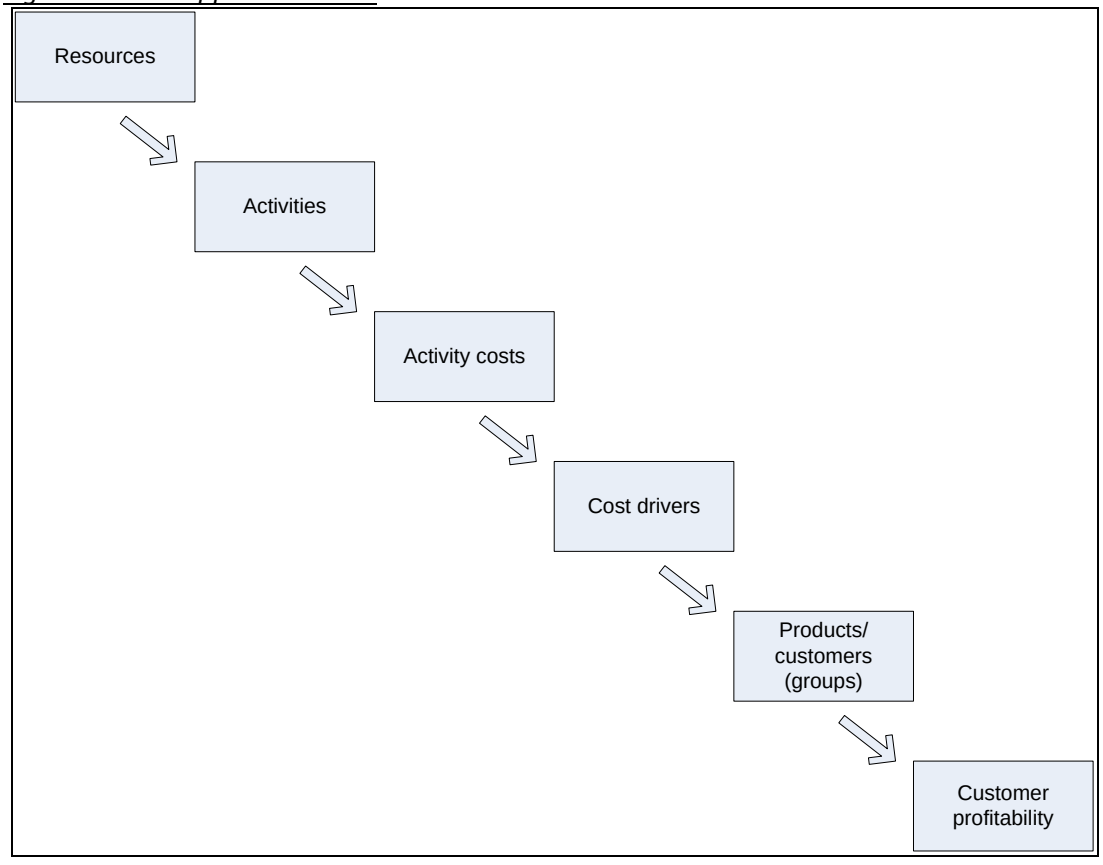
TKF offers a wide variety of products to a wide variety of customers. The cables and components that TKF offers can be used for the distribution of energy or information. These products can be categorized into product groups and more subgroups. The product groups are: energy, installation, instrumentation, telecom fibre, telecom copper and telecom trade. These products are delivered to six market groups: energy, installation, industrial, Marine & Offshore (MENO), infra and broadband. Combining the product groups and customer groups creates a product-market matrix that is shown above. This matrix is an important format for TKF in presenting revenues, gross profit margins etc. It can also be used in the cost allocation, since costs can have a relation to products as well as customers. How costs are allocated to products and customers is elaborated in the following chapter.

7. How can costs be allocated at TKF?

7.1 Introduction

As indicated in the research goal, the objective of this research is to develop an accurate way of allocating overhead costs that leads to a more precise analysis of customer profitability. Therefore, the costs that used to be included in the 'X percent overhead add-on' should be analysed. Most of these costs are the result of efforts made that are required by customers or customer groups. Not every customer requires the same type and same level of activities. This difference in resource consumption by customers is the basis of the cost allocation process. An activity-based costing approach is chosen since this makes it possible to analyse the relation between efforts made by TKF (activities) and the consumption by products or customers. By identifying what activities are required by customers or customer groups, the resulting costs can be included in a profitability analysis. So in this research, activities represent the connection between resources, mainly personnel, and customer profitability. The general steps that are followed are shown in figure 31. The first step is analyzing the resources that are important for sales, R&D, expedition, administration and new business development. The other steps in the figure are consistent with the four steps of activity-based costing by Drury (2008) that are mentioned in chapter three. After identifying activities, costs have to be assigned to activity cost centres. Subsequently, appropriate cost drivers should be found after which the activity costs can be assigned to products or customers. In the end, this should lead to a more accurate assessment of customer profitability, which will be described in chapter 8.

Figure 31: ABC approach at TKF



Ideally, all efforts and resulting overhead costs are allocated to specific customers or products by the amount of efforts they require. However, analyzing activities that take place at TKF shows that only part of the activities are related to individual customers or individual products. A distinction can be made between three types of activities:

- activities directed at individual customers or products
- activities directed at groups of customers or products
- activities that are too general to be allocated

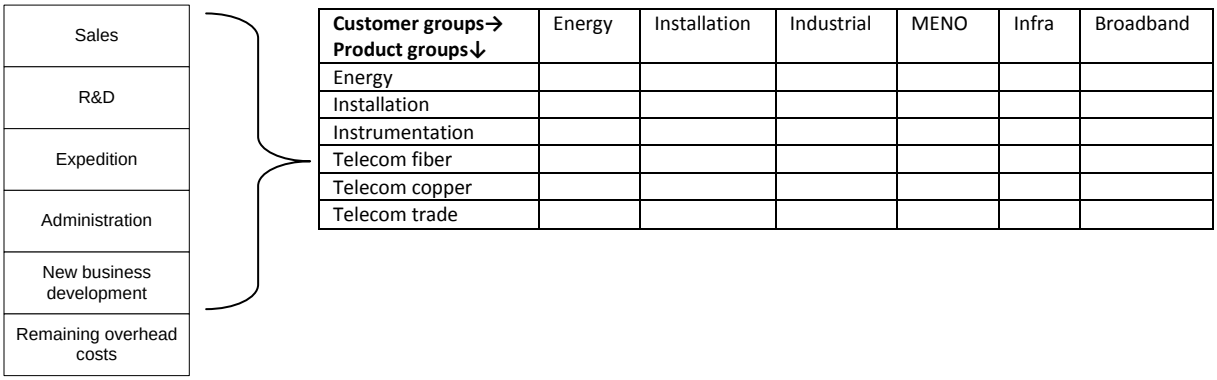
Making offers and processing orders into the system are activities performed for individual customers. Conversely, activities such as developing new product portfolios at R&D or performing market research at new business development, are directed at groups of products or customers. Finally, some indirect activities are neither related to individual customers nor customer groups. The costs of these general activities, such as costs of TKF's management and the human resource department, cannot be allocated and are excluded from the analysis in this chapter. Even for the five central departments in this research; sales, R&D, expedition, administration and NBD, a large share of the costs are too general to be allocated. Examples of such departmental overhead costs are auxiliary materials and representation costs.

With respect to activities directed at individual customer or products, a detailed cost allocation can be made. This detailed allocation will show how individual customers are responsible for certain indirect activities. In a more general cost allocation, also activities can be considered that are related to groups of customers and products. Next to group-related activities, also activities that are related to individual cost objects can be processed. In this case, the costs of for example making offers and processing orders will be adjusted to the group level. Concluding, both individual-related activities and group-related activities can be included in a general cost allocation.

7.1.1 Introduction general cost allocation

Figure 32: General cost allocation at TKF

'Traditional overhead' 'Full-matrix'



The idea of the general cost allocation is graphically presented above in figure 32. A large part of the overhead costs are related to groups of customers or groups of products. This makes it possible to use the product-market matrix that was described in the previous chapter. Here, a general cost allocation can be made that divides costs to the pieces of the matrix. The matrix can be filled in by looking at all overhead costs and the extent to which product or customers groups are responsible for the costs. Cost information for the year 2009 will be the basis. As said, costs of activities that are directed at individual cost objects as well as groups of them can be processed in the general cost allocation. Costs that are too general to be allocated are not processed in the full-matrix. Instead, a general percentage of these general overhead costs will be used, just like the former 'X percent add-on'. So in the end, the total cost of the full-matrix and the remaining overhead costs that are too

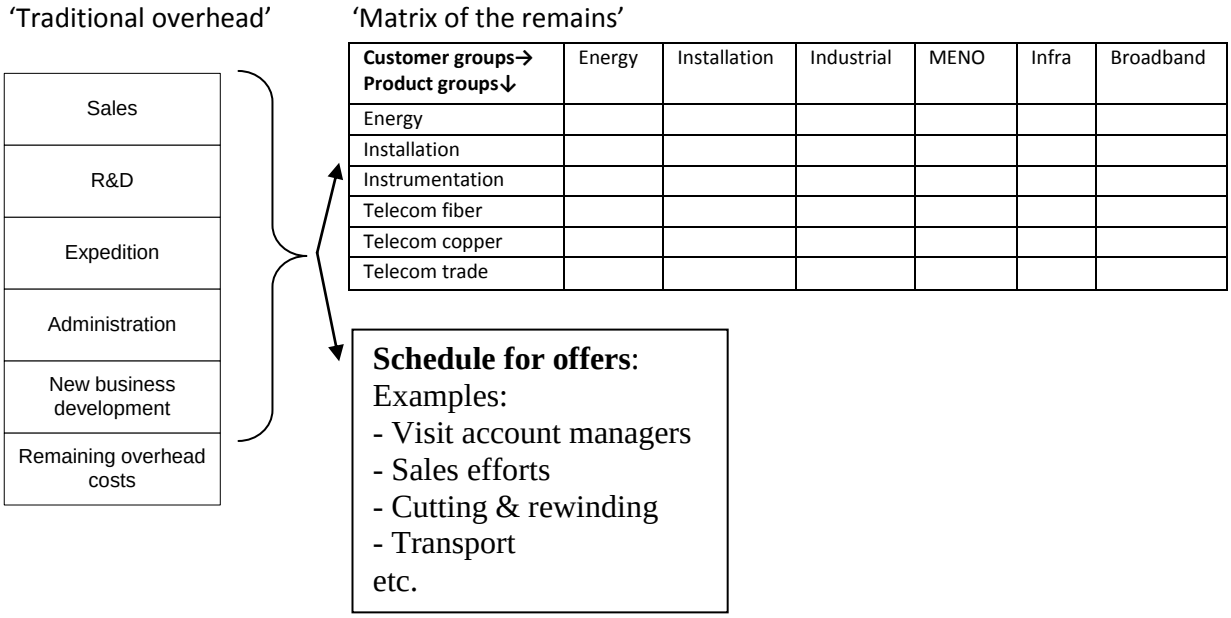
general should be equal to the amount of overhead in the old way of presenting overhead, as described in chapter five. In table 7, the indirect costs at TKF are presented. In the table, it can be seen that 63% of the costs are allocated, whereas the remaining 37% is too general to be allocated. Next, the table shows in which parts the relevant cost type is discussed. For example, the general allocation of sales costs is discussed in chapter 7.2.1. The total costs of table 7 sum op to the total amount of costs that was mentioned in chapter five.

Table 7: Indirect costs in general cost allocation

Cost type	Percentage	Chapter
Sales costs allocated	24,78%	§ 7.2.1
R&D costs allocated	7,69%	§ 7.2.2
Expedition costs allocated	28,22%	§ 7.2.3
Administration costs allocated	0,81%	§ 7.2.4
NBD costs allocated	1,50%	§ 7.2.5
Total costs allocated	63,00%	§ 7.2.6
Remaining costs of the 5 departments	24,46%	
Remaining costs of other departments	12,53%	§ 5.3
Total indirect costs 2009	100%	

7.1.2 Introduction detailed cost allocation

Figure 33: Detailed cost allocation at TKF



The idea of the detailed cost allocation is graphically presented in figure 33. As said earlier, the detailed cost allocation is chosen to be able to see how individual customers are responsible for certain activities that are performed at TKF for these individual customers. The idea here is to develop a schedule that has to be filled in by sales people when an offer is made to a customer. This schedule should consist of the most important overhead activities that are related to individual customers. By filling in the schedule, sales will get an idea of whether an offer will eventually be profitable for TKF or not. In this phase, sales is able to make adjustments to the offer that can increase the return made on this offer. Later on, when the offer is accepted by the customer or not, no changes can be made to increase profitability. Therefore, it is more interesting to apply the schedule to offers. It is important to notice that not all overhead can be processed into the schedule,

since a large part of the activities are not related to individual customers. Therefore, group related overhead activities are processed into another matrix, which will be called the 'matrix of remains'. This matrix makes it possible to consider also group-related costs in the analysis of the profitability of offers. So the traditional representation of overhead costs is now processed into two formats: a schedule for offers and a matrix of remains. The general cost allocation and detailed cost allocation are elaborated separately in this chapter. In table 8, the indirect costs in the detailed cost allocation are presented. Here, it can be seen that a part of the costs are directly allocated in the schedule for offers, whereas another part is processed in the matrix of remains. Next, table 8 shows in what parts of this thesis the relevant costs are described.

Table 8: Indirect costs in detailed cost allocation

Cost type	**Percentage**	**Chapter**
Sales costs in schedule for offers	15,60%	§ 7.3.1
R&D costs in schedule for offers	0%	§ 7.3.2
Expedition costs in schedule for offers	28,22%	§ 7.3.3
Administration costs in schedule for offers	0,81%	§ 7.3.4
NBD costs in schedule for offers	0%	§ 7.3.5
Total costs of schedule for offers	44,63%	
Sales costs in matrix of remains	9,18%	§ 7.3.1
R&D costs in matrix of remains	7,69%	§ 7.3.2
Expedition costs in matrix of remains	0%	§ 7.3.3
Administration costs in matrix of remains	0%	§ 7.3.4
NBD costs in matrix of remains	1,50%	§ 7.3.5
Total costs in matrix of remains	18,38%	§ 7.3.6
Total costs allocated	63,00%	
Remaining costs of the 5 departments	24,46%	
Remaining costs of other departments	12,53%	§ 5.3
Total indirect costs 2009	100%	

7.2 General cost allocation

As indicated earlier, in this general approach all overhead costs will be allocated to product groups and/or customer groups. In filling the product-market matrix, information about activities and costs that is already described in chapter four and five can be used. These two components have to be combined to compute activity costs. For every activity a cost driver has to be identified that provides a good explanation of costs in each activity cost pool and that is easily measurable (Drury, 2008). Therefore, it also important to check whether the data of the chosen variable is relatively easy to obtain. For an allocation based on product groups and customer groups, it should be possible to adjust the data to this group level. As indicated in chapter three, activity-based costing mostly uses transaction drivers, which count the number of times an activity is performed. When the right cost drivers are identified, they can be used to allocate the costs for sales, R&D, expedition, administration and new business development. In the remainder of part 7.2, the general cost allocation is discussed for each of the five indirect departments separately. From the above analysis, it seems that computing activity costs and finding the right cost drivers are extremely important for allocating the indirect costs. Therefore, the analysis of the five departments is divided into the following two parts:

- Computing activity costs
- Selecting drivers & allocating costs

At the beginning of each part, the main issues of the allocation is presented in a text field. These fields summarize the allocation of each department and provides more clarity about the choices that are made in the allocation.

7.2.1 Sales

Main issues in general cost allocation sales

Computing activity costs:

- Labor costs of 2009 for the 6 customer groups are the basis
- The costs of sales management are processed in the total labor costs
- The costs of car use & travelling are added to the total sales costs that are allocated
- The total costs are assigned to activities based on time consumption and the costs of one sales FTE

Selecting drivers & allocating costs:

- Appropriate cost drivers are chosen for each sales activity
- The activities processing orders, monitoring & leading and after-sales are combined into one activity
- Cost driver rates are computed for each activity
- Costs of product management are allocated based on estimations.

The most important resource that is consumed in the sales process is labor. Consequently, the allocation will mainly focus on labor costs. The sales force that is directly related to customers consists of account managers, inside commercial staff and inside administrative staff. In chapter four, it is indicated that account managers visit customers for customer retention or to bargain about offers or specific arrangements. Therefore, expenses with respect to car use and travelling to customers will also be taken into account. Within the sales force, TKF has made a distinction based on the six customer groups that it serves. Sales staff that belongs to energy will only work with offers and orders that belong to the energy market. The same holds for the other five customer groups. Within the ERP-system, sales costs are already traced to the six customer groups. These traced costs are the basis for allocating sales costs. As an example, far more employees are working for the installation group than for the energy group and therefore labor costs for installation will be much higher. This can be seen in the ERP-system where among others labor costs, car use and travelling expenses are traced to these customer groups. It is important to consider this in setting up the allocation process for sales.

Computing activity costs

Consistent with the activity-based costing approach, sales activities will be the intermediate stage between sales costs and the cost object. In this case, the cost object is customer groups. As described in chapter four, the sales activities are: customer acquisition & retention, making offers, bargaining with customers, processing orders, monitoring & leading and after-sales service. These activities all have a relation to individual customers and this makes it possible to allocate all sales costs to the customer groups. Important to notice is that the traced sales costs in Navision also consist of sales management costs. As indicated in chapter four, sales managers set directives for sales and also need to sign contracts with customers. This is also mentioned by two controllers at TKF, who argue that sales managers are working 80 percent of their time as account managers, whereas only 20 percent is directed at management activities. So in general, sales managers are externally oriented and are active in visiting customers for retention or bargaining with them. Therefore, the assumption is that sales management perform the same activities as account managers in the sales process. The cost of sales management will be allocated in the same way as the costs of account managers. In table 9, the activity costs of sales are presented, in which the total sales costs are shaded in grey. How these activity costs are computed is discussed below.

Table 9: Activity costs sales

Cust.groups→ Activities↓	**Energy**	**Installation**	**Industry**	**Rail**	**MENO**	**Broad-band**	**Total**
Group total	X	X	X	X	X	X	X
1.Acquisition/ retention	X	X	X	X	X	X	X
2. Making offers	X	X	X	X	X	X	X
3. Bargaining	X	X	X	X	X	X	X
4. Processing orders	X	X	X	X	X	X	X
5. Monitoring & leading	X	X	X	X	X	X	X
6. After-sales service	X	X	X	X	X	X	X

Computing activity costs for sales is somewhat difficult to describe since several factors influence the calculation of activity costs. This has mainly to do with the costs of sales management and car use and travelling expenses. In general, four steps are followed in computing activity costs for sales.

1. Identifying the total labor costs for the six customer groups.

These total labor costs can be directly derived from Navision. The numbers are presented in table 10.

*Table 10: Total labor costs**

	Energy	Installation	Industry	Rail	MENO	Broadband	Total
Labor costs	X	X	X	X	X	X	X

* All numbers in the table are in Euro's (€)

2. Taking the costs of sales management from the total labor costs and dividing them over the six customer groups in a new way.

As said, the costs of sales management will be allocated in the same way as the costs of account managers. In Navision, costs of sales management are assigned to customer groups in the following way:

- Installation: 1 sales manager
- Industry: 1 sales manager
- Broadband: 1 sales manager

However, in questioning sales management they indicated that some sales managers are responsible for other customer groups. They recommended the following categorization of the three sales managers:

- Energy: 0,33 sales manager
- Installation: 0,33 sales manager
- Industry: 0,5 sales manager
- Rail: 0,33 sales manager
- MENO: 0,5 sales manager
- Broadband: 1 sales manager

The labor costs of table 10 have to be adjusted to capture this new division of sales management over the six customer groups. In table 11, the new labor costs are presented that will be used in the allocation of sales costs. The reason why one piece of the tables is shaded in red is explained on page*.

*Table 11: Total labor costs adjusted to sales management**

	Energy	Installation	Industry	Rail	MENO	Broadband	Total
Labor costs	X	X	X	X	X	X	X

** All numbers in the table are in Euro's (€)*

3. Assigning the labor costs of table ? to the six sales activities.

Assigning costs to activities is done by using the time consumption of sales and an organizational scheme of the sales force. The time consumption of account managers, inside commercial staff and inside administrative staff can be seen in table 12. This time consumption is analyzed by having several conversations with sales employees.

Table 12: Time consumption sales

Sales activities	Account managers	Commercial staff	Administrative staff
1. Acquisition & retention	X	X	X
2. Making offers	X	X	X
3. Bargaining with customers	X	X	X
4. Processing orders	X	X	X
5. Monitoring & leading	X	X	X
6. After-sales service	X	X	X
Total	100%	100%	100%

Next, it is important to know how many account managers, commercial employees and administrative employees are active at the six customer groups. When this is known, labor costs can be assigned to these three functions and subsequently costs can be assigned to the sales activities. Table 13 indicates which parts of the sales force consist of account managers, inside commercial staff and inside administrative staff. In this division of the sales force, sales managers are treated as account managers and are traced to the customer groups in the same way as described on the previous page*.

Table 13: Organization of sales

	Energy	Installation	Industry	Rail	MENO	Broadband
Acc. Managers	X	X	X	X	X	X
Comm. Staff	X	X	X	X	X	X
Adm. staff	X	X	X	X	X	X
Total	100%	100%	100%	100%	100%	100%

By using table 11, table 12 and table 13, activity costs can be calculated. As an example, the costs of the activity 'making offers' for the customer group 'energy' is explained below. This activity is only performed by inside commercial staff. Activity costs can be calculated by multiplying the labor costs of energy by the time consumption (%) and the part of inside commercial staff (%). The information that is needed from table 11, 12 and 13 to calculate this activity cost is shaded in red.

4. Including the costs of car use and travelling for the activities acquisition & retention and bargaining with customers.

As said, car use and travelling expenses will also be considered for sales. These costs are mainly caused by account managers and are the result of the activities acquisition & retention and bargaining with customers. Therefore, these costs have to be added to the labor costs to calculate the costs of these two activities. The costs of car use and travelling for the six customer groups can directly be derived from Navision and are presented in table 14.

*Table 14: Car use and travellling expenses**

	Energy	Installation	Industry	Rail	MENO	Broadband	Total
Costs	X	X	X	X	X	X	X

** All numbers in the table are in Euro's (€)*

For each customer group, the costs of car use and travelling are assigned to the two activities by using the time consumption. As an example, the costs for energy are assigned to the activity acquisition & retention and to the activity bargaining with customers. This approach is also applied to the other customer groups.

In the end, the four steps that are described above lead to the activity costs that are presented in table 9. As said earlier, the costs for sales have already been traced to the six customer groups. However, the sales costs are allocated further to activities and subsequently a cost driver will be identified for each activity. In this way, TKF is able to present the sales costs also for individual customers when this is needed. This information can then also be used in the detailed cost allocation. The relevant drivers and the allocation of the sales activities are explained in the next part. In the analysis of activity costs of sales, the costs of sales support and product management are not taken into account. These activities are not involved in the direct sales contact with customers and are therefore not processed in table 9. How these costs are allocated is elaborated later on.

Finding drivers & allocating costs

After calculating the activity costs, cost drivers have to be identified that give a good explanation of the relation between sales activities and customers or customer groups. These drivers can then be used to see how customers or customer groups are responsible for the sales costs of TKF. Table 15 shows what cost drivers are chosen and what specific rates will be used in the allocation of costs at sales. In the table, the activities processing orders, monitoring & leading and after-sales service are combined into one activity called order administration. The reason for combining these three activities will be discussed later on. The information of table 15 and the chosen drivers are explained below.

Table 15: Cost driver rates sales for general cost allocation

Cust. groups/ Activities	**Cost driver**	**Energy**	**Installation**	**Industry**	**Rail/ infra**	**MENO**	**Broad-band**
1. Acquisition/ retention	% of revenues	X	X	X	X	X	X
2. Making offers	# offer lines	X	X	X	X	X	X
3. Bargaining	% of revenues	X	X	X	X	X	X
4. Order Administration*	# order lines	X	X	X	X	X	X

** Order administration consists of: processing orders, monitoring & leading and after-sales service.*

- Customer acquisition/retention

Here, a variable should be used that links the costs of visiting customers to the specific customers or customer groups. In the current situation, the number of visits, the hours that are spent at the customer and the purpose of the visit are not recorded into a computerized system. Information from customer visits is recorded into visiting reports that are collected by sales management. These reports are not available to other departments and in the current format do not provide the right data for allocating this activity. So the number of visits or the number of hours spent at customers cannot be used as cost drivers. It seems reasonable that customers that create high revenues demand more visits than customers with low revenues do. It can also be possible that growing revenues for customer groups leads to more time spent in visiting customers, for example for maintaining relationships. Therefore, the cost driver that will be used to allocate customer acquisition and retention costs will be a percentage of total revenues.

- Making offers

As described in chapter four, this activity contains processing requests and setting up prices and other specific conditions of offers. Making offers can demand a lot of time from inside commercial staff. Therefore, the cost drivers for this activity should have a clear relationship to offers. The

number of offers can easily be seen in Navision. These offers can consist of several offer lines when different cables or other components are required. It is also possible to present these offers and offer lines for the six customer groups. An offer with many lines demands a lot more effort from sales staff than an offer with only one line. In conversations with sales employees it was argued that many differences in effort can exist between types of offers and that the number of offer lines could be an indicator of these efforts. Consequently, the number of offer lines seems to be a better cost driver than the number of offers with respect to the activity making offers.

- Bargaining with customers

Here, the purpose of visiting customers is to discuss about specific conditions of offers or other arrangements with the customer. With respect to the availability of data, the same effect that was found for customer acquisition and retention is applicable to bargaining with customers. There is no information available of the number of visits and the hours that are spent. Therefore, also for this activity the costs as a percentage of revenues will be the cost driver for this activity. The assumption here is that growing revenues will increase the time spent on bargaining about offers and project- or annual arrangements. According to a sales manager, the visits to customers should always be seen in light of their revenues. The number of visits that are required can vary greatly between a customer with revenues of 4000 euro's and a customer that is responsible for 4 million euro's.

- Processing orders

This activity consists of following-up the offers that are made to customers and processing orders into the system. The chosen cost driver should give a clear picture of to what extent customer groups are responsible for the efforts made on orders by inside sales staff. The number of orders placed by customers and customer groups can easily be seen in Navision. Similar to offers, also orders can consist of many lines that represent different products or services that are ordered by customers. Considering the difference in effort that is needed to process an order with only one order line with an order that has many lines, using the number of orders placed as a cost driver does not seem accurate enough. Therefore, the number of order lines placed by customer groups will be the transaction driver for processing orders.

- Monitoring and leading

The chosen cost driver for this activity should have a clear relationship with the efforts made on monitoring and leading the execution of orders. Again, these efforts can differ greatly between the types of orders. As a consequence, the number of order lines seem to define the efforts more accurately. This cost driver is also easily measurable.

- After-sales service

This last sales activity contains several different components, such as complaints, returned goods and returned cable reels. These items are taken together since the time spent on after-sales service is not very large. Another reason is that it is difficult to find cost drivers for each different service. Customer complaints are recorded into the system and the number of complaints can easily been collected. However, the number of complaints cannot easily be presented for customer groups. Another problem is that costs of a complaint are not registered. It is also difficult to determine these costs since the complaints can also be handled commercially by delivering products for large discounts or even for free. With respect to returned goods and returned cable reels it is also difficult to determine the costs. Beside this, the overall time that is spent on these activities is low. Therefore, the variable that will be used to allocate these costs will also be order lines. The assumption is that when the number of order lines increase, the number of complaints, returned goods and returned cable reels will also increase.

From the above analysis, it seems that the availability of data creates important restrictions for allocating sales costs. Van Raaij (2005) also mentions this finding. He proposes that firms who perform the activity-based costing analysis for the first time experience that certain data is simply not yet available and that some calculations might be very costly to perform. Costs of the last three activities will all be allocated by means of the number of order lines of every customer group. Therefore, these activities can be combined in order to reduce the number of rates for the activities, which can help to clarify the allocation of sales costs. The only disadvantage then will be that costs of processing orders, leading & monitoring and after-sales service cannot be computed and analyzed separately. The cost drivers and rates of the four activities are presented in table 15. Since activity costs differ between customer groups, also different rates have to be used for each customer group. For the coming periods, TKF can use these drivers and rates for allocating sales costs to customer groups.

As mentioned on page*, the costs of sales support and product management were not analyzed in computing activity costs. In chapter four, sales support is described as a group that coordinates and supports sales staff when this is necessary. According to the manager of sales support, the sales support activities are very general in nature and it is not possible to assign the efforts and costs of sales support to customer groups or product groups. Consequently, the costs are treated as general and will not be included in the allocation. Product management on the other hand concerns activities with respect to the portfolio of products that are offered by TKF. For 2009, there were only employees working for the telecom groups. According to one of the product managers, the time consumption of product management is X%, X% and X% for respectively the product groups telecom fiber, telecom cable and telecom trade. This information results in the following table (see table 16).

Table 16: Allocation of product management

Product groups	**Percentage**
Telecom fiber	X
Telecom cable	X
Telecom trade	X
Total	X

In table 17, a table is given of the sales costs (labor + car use & travelling) allocated to the six customer groups. In this table, the activities processing orders, monitoring & leading and after-sales service are again combined into one activity called order administration. These activities are all driven by the number of order lines. The numbers in the table are identical to the number that can be found in table 9. As said, in table 9 the costs were already assigned to the six customer groups. However, now also cost drivers are identified to be able to present the costs also for individual customers when this is needed. Again, the group totals are shaded in grey in the table.

*Table 17: General cost allocation sales**

Cust.groups→ Activities↓	Energy	Installation	Industry	Rail	MENO	Broad-band	Total
Group total	X	X	X	X	X	X	X
1.Acquisition/ retention	X	X	X	X	X	X	X
2. Making offers	X	X	X	X	X	X	X
3. Bargaining	X	X	X	X	X	X	X
4. Order administration**	X	X	X	X	X	X	X

** All numbers in the table are in Euro's (€)*

*** Order administration consists of: processing orders, monitoring & leading and after-sales service.*

7.2.2 Research & Development

Main issues in general cost allocation R&D

Computing activity costs:

- The total number of FTE are assigned to the 8 R&D activities based on time consumption
- Activity costs are calculated by using labor costs of one R&D FTE
- Costs of the activities materials, packaging and R&D management are subsequently assigned to the other 5 R&D activities

Selecting drivers & allocating costs:

- In most cases it is impossible to use cost drivers for R&D
- Therefore, costs are often assigned to groups by using estimations
- In the end, 65% of the costs are assigned to product groups, whereas 35% of the costs are assigned to customer groups

Labor is the most important resource that is used by research & development. R&D costs primarily consist of labor costs and as a result, these costs are central in the allocation at R&D. The remaining R&D costs largely have to do with travelling and car lease. It is not known which R&D employees are responsible for these costs and during what activities the costs are made. Consequently, these selling expenses will not be taken into account in the allocation process and the allocation will only focus on labor costs.

Computing activity costs

Table 18: Activity costs R&D

R&D activities	Number of FTE	Costs
1. General R&D projects*	X	X
2. Customer-specific projects	X	X
3. R&D requests	X	X
4. Application engineering	X	X
5. Materials	X	X
6. Measuring	X	X
7. Packaging	X	X
8. R&D management	X	X
Total	X	X

** The activity R&D projects that is described in chapter four is split into two activities: general projects and customer-specific projects.*

The next step is to link the R&D costs to the activities that take place at R&D. As indicated in chapter four, several activities can be identified at R&D. In total, the R&D department consists of X FTE's. R&D costs are assigned to activities by looking at the time consumption of employees and by using some estimations that are made by the R&D manager. Through several interviews with the R&D manager and an R&D employee, it became possible to divide the total number of FTE over the R&D activities. This number of FTE is multiplied with the average labor costs of one FTE of R&D to compute activity costs. In table 18, the activities, number of FTE and activity costs are presented. In conversations with the R&D manager and two other R&D employees, it is mentioned that some R&D activities are more supportive to other activities. These activities are: materials, packaging and R&D management. Since these activities are supportive, the costs cannot be directly allocated to product groups or customer groups. In this case, the costs of the three activities are equally divided over the remaining five R&D activities. This is explained in the next part. It is useful to process this for the activity costs that are presented in table 18. In table 19, the activities materials, packaging and R&D management are excluded and the costs are divided to the other activities.

Table 19: Adjusted activity costs R&D

R&D activities	Number of FTE	Costs
1. General R&D projects	X	X
2. Customer-specific projects	X	X
3. R&D requests	X	X
4. Application engineering	X	X
5. Measuring	X	X
Total	X	X

Selecting drivers & allocating costs

Table 20: General cost allocation R&D

R&D activities	Allocated to cost object	Cost driver
1. General R&D projects	Product groups	Estimation manager
2. Customer-specific projects	Customer groups	Estimation manager
3. R&D requests	Customer groups	# R&D requests
4. Application engineering	Customer groups	Estimation manager
5. Measuring	Product groups	Estimation manager

After computing activity costs, the costs can be linked to cost objects by using cost drivers. The specific cost object and cost driver of each activity is presented above in table 20. Below, the allocation of each R&D activity is discussed separately. First, it is analyzed whether the activity costs can be allocated to products or customers or not. Next, the most appropriate cost driver is chosen, taken into account the availability of data. The basis for the analysis is table 19. This means that the division of R&D employees over the five activities is considered in the analysis below.

- General R&D projects

The general projects at the R&D department contain the development of new cables or components that belong to a certain product group. After completing the projects, the products can be applied in the markets that are served by TKF. So in allocating costs of R&D projects, the cost objects can be product groups as well as customer groups. In this case, product groups are chosen since the developed products can be used in more than one market segment. After analyzing possible cost drivers the conclusion is that it is impossible to use a specific driver for this activity. No variable can be found that drives the efforts made on these general projects. Therefore, an estimation will be used that indicates what part of the projects is related to the six product groups. This estimation is made by the R&D manager. He divided the total number of FTE for this activity over the six groups. The complete division of project costs can be found below in table 21. The R&D efforts and costs of general projects are now allocated to product groups based on estimations and the number of FTE.

Table 21: Allocation of general R&D projects

Product group	# FTE
Energy	X
Installation	X
Instrumentation	X
Telecom fibre	X
Telecom cable	X
Telecom trade	X
Total	X

- Customer-specific R&D projects

Contrary to the previous activity, these projects are related to individual customers. In general projects, the products that are developed will be ordered by more than one customer. For customer-specific R&D projects, it is reasonable to assume that these products will only be ordered by one single customer. Since these projects are related to customers, the resulting costs will be allocated to customer groups. From conversations with the R&D manager and an R&D employee, it seems that the number of hours worked would be the best cost driver for R&D activities. In most cases, hours are registered by the R&D department, but this data is not available to the organization. Therefore, hours cannot be used as variables that drive the costs of customer-specific R&D projects. Another possibility could be to calculate an average rate per project and to use the number of projects as cost driver. Again, the number of R&D projects is not registered and consequently also the number of

projects for every customer group is not known. Looking at a list of all current R&D projects, the R&D manager indicated that 9 out of 44 projects (about 20 percent) are customer-specific. These projects are divided as follows:

- energy: X %
- industry: X %
- broadband: X %

As said, the above division of projects is based on the list of current R&D projects. The assumption is that the percentages are relatively the same for 2009 and for the coming period. Now, the costs of customer-specific projects can be assigned to customer groups based on estimations made by the R&D manager.

- R&D requests

As said in chapter four, R&D requests are those development activities at the request of customers that require 0-40 hours of work by R&D. The requests are related to offers of products that need to be developed or adjusted to the requirements of customers. Data of the number of hours that are spent on R&D requests in 2009 is not available. Since the first of July this year, R&D is able to indicate the budgeted and actual hours spent on requests in Navision. For the allocation of costs in 2009, another cost driver has to be found. An increase in the number of offers that are received by TKF does not have to lead to an increase in the number of R&D requests. It can be that the increase in offers is mainly reached by selling already existing products. As a consequence, the number of offers will not be an accurate cost driver. For the last couple of years, the number of R&D requests varied between X and X per year. The R&D manager was able to divide the total number of requests over the six customer groups. This is done by looking at what account manager made the request and for what customer group this person is mainly responsible. Therefore, this division will not be definite but for the purpose of this research it is assumed that the indication of the R&D manager gives a good idea of the number of requests for every customer group. For 2009, the number of requests can be used as cost driver for allocating costs with respect to R&D requests. The cost allocation of R&D requests is presented below in table 22.

Table 22: Allocation of R&D requests

Customer group	**Percentage**	**Costs**
1. Energy	X	X
2. Installation	X	X
3. Rail/infra	X	X
4. Industry	X	X
5. MENO	X	X
6. Broadband	X	X
Total	X	X

- Application engineering

As described in chapter four, this activity concerns the service that is provided to customers after delivery of cables and components. According to the R&D manager, X of the X FTE that performs this activity is in reality active in measuring fibre optics cables. Therefore, X% of the costs will be allocated to the product group: telecom fibre. For the other costs, a cost driver should be used that gives an explanation of the relation between service to customers and customer groups. The visits to customers and the hours that are spent are recorded by application engineers and communicated to sales. However, it seems that this information is not used by sales. This restricts the type of cost drivers that are available. According to the R&D manager, costs are driven by the complexity of the orders and by certain choices made by TKF. An increase in the number of orders or order lines does not have to lead to increasing efforts in application engineering. Consequently, these drivers will not

be used in this case. The only information that is available is that X FTE of the X FTE is working on servicing fibre optics technologies, which is related to broadband. The remaining X FTE is working on technologies related to power cables, which belong to the customer group energy. This makes it possible to allocate X % of the total costs of application engineering to the customer group broadband and X % to the customer group energy. To clarify this, the allocation of costs will be as follows:

- Product group: X FTE = X % → Telecom fibre
- Customer group: X FTE = X % → Broadband
- Customer group: X FTE = X % → Energy
  Total: X FTE = 100 %

- Measuring technique

Measuring cables or in some cases components is not related to customers. As a consequence, the efforts and costs with respect to measuring will be allocated to product groups. This activity is not supportive to all product groups. Instead, a division of R&D FTE's that is made by the R&D department shows that X FTE is responsible for power technologies, which belongs to the product group energy. Next, X FTE is responsible for fibre optics technologies, which belongs to the product group telecom fibre. It is assumed that this division over the product groups energy and telecom fibre is relatively the same for 2009 and for the first coming years. Then, costs can be allocated to the two product groups based on the number of FTE.

Below, the activities are discussed that are equally traced to the five R&D activities that are described above. These activities are material technology, packaging and R&D management. R&D employees indicated that these activities cannot directly be allocated to product groups or customer groups. However, considering the costs as general and not allocating them will not be right since these activities are still important for the R&D department. Therefore, also the costs of these three activities should be taken into account in analyzing profitability.

- Material technology

Handling materials is done by two employees that together represent 1,2 FTE. According to the R&D manager, handling materials is seen as a supportive activity. There is no difference in efforts made for the different product groups or customer groups. Therefore, the activity materials is seen as general and the costs are equally traced to the five R&D activities.

- Packaging

As said in chapter four, the development of new packaging methods is seen as a supportive activity. This is also mentioned by the person that is responsible for packaging at the R&D department. His efforts do not focus on one or two product groups, but are equally shared among the five R&D activities. As a result, also the costs of packaging at R&D are equally traced to these activities

- R&D management

This activity is not discussed in chapter four. However, to include all R&D costs, also the costs of management should be taken into account. These costs are made by one employee, the R&D manager. As with the activities materials and packaging, the efforts made by R&D management are equally shared among the five R&D activities.

Because of shortage of data, in most cases estimations have to be used to allocate R&D costs. This could already be seen in table 20, where the allocation of R&D is summarized. As indicated before, a part of the R&D activities are related to customers and the other part to products. In table 23, the division of customer-related R&D costs is given over the six customer groups. In table 24, the division of product-related R&D costs is given over the six product groups.

Table 23: Allocation R&D to customer groups

Customer groups	**Energy**	**Installation**	**Industry**	**Infra**	**MENO**	**Broadband**	**Total**
Costs	X	X	X	X	X	X	X

Table 24: Allocation R&D to product groups

Product groups	**Costs**
Energy	X
Installation	X
Instrumentation	X
Telecom fiber	X
Telecom cable	X
Telecom trade	X
Total	X

To summarize what is discussed in this part about R&D, a table is given below that indicates how the total R&D costs are divided (see table 25). As can be seen, about 35 percent of the labor costs are allocated to customer groups. The remaining 65 percent is allocated to customer groups.

Table 25: Total division of R&D costs

Cost type	**Percentage**
Allocated to customer groups	35,41%
Allocated to product groups	64,59%
Total activity costs R&D	100%

7.2.3 Expedition

Main issues in general cost allocation expedition

Computing activity costs:

- The number of FTE are assigned to the 5 expedition activities based on time consumption
- Activity costs are computed by using the average costs of 1 expedition FTE
- Two expedition activities are processed in the product cost and are therefore not allocated
- The activity transport captures most of the expedition costs

Selecting drivers & allocating costs:

- Each activity is analyzed after which the most appropriate cost drivers are selected
- Most of the activities are related to individual products and therefore most of the costs are allocated to product groups

The expedition of TKF is located at the plant in Haaksbergen as well as at the plant in Lochem. The costs of the two expedition locations for 2009 are combined and allocated in the following part. As mentioned in chapter five, costs of transport are high and these costs are included in the analysis of expedition costs. Of the remaining expedition costs, three quarter represents labor costs and therefore labor is the most important resource that will be allocated. In trying to calculate activity costs for expedition, labor costs have to be assigned to the expedition activities that are mentioned in chapter four. These five activities are: processing materials and goods, receiving & controlling end products, completing products, transport and TPS (telecom). Next to labor costs, also auxiliary materials and waste processing were mentioned in chapter five as cost types of expedition. By what activities the costs of auxiliary materials and waste processing are caused is not known. This ambiguity together with the fact that the costs of auxiliary materials and waste processing are relatively small leads to the exclusion of these costs in the cost allocation. Consequently, only the costs of transport and labor will be assigned to the five activities and subsequently these costs will be allocated to product groups and/or customer groups.

Computing activity costs

Table 26: Activity costs expedition

Activities	# FTE	Costs	Product cost	Overhead
1. Processing materials & goods	X	X	X	
2. Receiving & controlling end products	X	X		X
3. Completing products	X	X		X
4. Transport planning internal	X	X		X
5. Transport external companies	X	X		X
6. TPS (telecom)	X	X	X	
Total	X	X	X	X

The next step is to assign labor costs to the expedition activities. The activity costs are presented in table 26 and are discussed below. Expedition employees can be divided into five different types of functions. The biggest part consists of employees that work in shifts in the factory. The remaining employee base consists of shift leaders, planners, TPS (telecom) workers and the logistics manager. The number of employees for these functions varies between 2009 and 2010 because of organizational changes. The reason for this is that the plant of TKF in Lochem is closing and that all expedition activities will only be performed in Haaksbergen ever since 2010. In table 26, the activity transport is split into two pieces. The first one encompasses the efforts that are made by TKF to plan all the deliveries to customers. The second activity concerns the actual transport of external companies and the resulting transport costs for TKF.

Table 27: Division of FTE for expedition activities

	Manager	Shift leader	Employees	Planners	TPS workers	Total
1. Processing materials/goods	X	X	X	X	X	X
2. Processing end products	X	X	X	X	X	X
3. Completing products	X	X	X	X	X	X
4. Transport planning	X	X	X	X	X	X
5. TPS (telecom products)	X	X	X	X	X	X
Total	X	X	X	X	X	X

Assigning costs to the expedition activities is done by looking at the time consumption of expedition employees. Through conversations with the logistics manager, it became possible to divide the total number of FTE to the five expedition activities. This is done by analyzing all functions at expedition. In table 27, the total number of expedition employees is assigned to the activities. Activity costs can then be calculated by multiplying the number of FTE for each activity by the average labor costs of one FTE. The controller of TKF indicated that a part of the expedition costs is included in the product cost. These are costs of internal transport, TPS (telecom) and the storage of raw materials. This affects the continuation of the cost allocation at expedition. Now, two activities are excluded from the analysis. These are: processing materials & goods and TPS (telecom). This can also be seen in table 27, where these two activities are presented as product cost, whereas the other activities are presented as overhead. Next, table 27 shows that also the managerial efforts are considered. In this case, these efforts are performed by the expedition/logistics manager. His efforts are equally divided to the five expedition activities. Taken management costs into account in the allocation of costs is

consistent with part 7.2.1 and 7.2.2. Here, management costs of sales and R&D are also included in the activity costs and subsequently are allocated to cost objects.

Selecting drivers and allocating costs

Before allocating these activity costs, appropriate cost drivers should be identified. The activities receiving & controlling end products, completing products and transport are discussed below. It is indicated whether the activities are related to product groups or customer groups and then it is identified what cost driver best explain the relation between the expedition activity and the customer/product groups. This information is also presented in table 28. Here, it can be seen that transport is divided into domestic transport and export transport. The reason for this is that these activities have different cost drivers.

Table 28: General cost allocation expedition

Activity	**Allocated to cost object**	**Cost driver**
1. Receiving/controlling end products	Product groups	% add-on to product costs
2. Completing end products	Product groups	# irregular lengths
3. Transport planning	Customer groups	# deliveries
4. Domestic transport	Product groups	# packages and type of package
5. Export transport	Customer groups	# deliveries and country

- Receiving & controlling end products

As described in chapter four, this activity concerns identifying products that come out of the production process, performing an administrative check on them and subsequently putting them into storage. Since these activities are performed on end products and are not related to customers, the costs will be allocated to product groups. According to the logistics manager, the effort of receiving and controlling end products is related to the volume of products that come out of production and the product mix. For example, controlling one big cable reel requires less effort than controlling thirty small rings of cable when looking at the value of these cables. So the chosen cost driver should be related to the products that come out of production and that are received by expedition. From information derived from the ERP-system, a list of the number of finished goods can be made.

The number of goods can be presented for the six product groups. Here, it is taken into account that many original installation cables that come out of production are split and rewinded on several smaller rings of cable. The costs can now be allocated to product groups by looking at the number of goods for every group. However, important to notice is that a part of the end products are stored and sold in other periods. There is no relation between the number of products that are stored and the products that are sold. It is not possible to present the costs of receiving and controlling end products to individual customers, since a part of the end products are stored. As a consequence, the costs related to these stored products cannot be allocated. This problem can be solved by combining the costs of receiving & controlling for every product group to the total product costs for each product group in 2009. Then, an add-on can be used on the product costs to calculate the costs of receiving and controlling end products. This method has an important advantage. By using an add-on above the product cost, the costs of receiving and controlling end products can be presented for individual products by looking at the product cost of these individual products.

Table 29: General allocation receiving & controlling end products

Product group	# goods	Perc. (%)	% Add-on
1. Energy	X	X	X
2. Installation	X	X	X
3. Instrumentation	X	X	X
4. Telecom fibre	X	X	X
5. Telecom cable	X	X	X
6. Telecom trade	X	X	X
Total	X	X	X

To clarify the allocation of receiving and controlling end products, a table is given above (see table 29). In the second column, the number of finished goods is given for the six product groups. The costs for every product group can be calculated by combining the percentages with the total costs of receiving and controlling end products. As indicated above, it is impossible to present the costs for individual products since a part of the goods are stored and sold in the future. Therefore, an add-on on the product cost is used. By dividing the costs by the total product costs, the add-on can be calculated.

So in this case, the first cost driver was not useful in allocating costs to products. By combining the first cost driver (number of goods) with a second cost driver (% of product cost), it was possible to compute an add-on for every product group so that all costs can be allocated and also presented for individual customers. The assumption is that cables with high product costs usually require more treatment of expedition than products with low product costs. This can be due to two reasons. Cables with high product costs are usually bigger than low-cost cables and most often these high-cost cables have bigger cable reels which also require more handling of expedition employees.

- Completing products (cutting/rewinding)

As indicated in chapter four, cutting and rewinding cables is an important activity of expedition that can create high costs. However, almost always these costs are not charged to customers that demand irregular cable lengths. In this part, the costs of cutting and rewinding cables by order of customers will be allocated. The efforts of cutting and rewinding are related to individual customers. On the other hand, the efforts of cutting and rewinding varies between different types of cables, depending on their diameter and length. Bigger cables require more time in cutting them and subsequently in rewinding them on reels. As a result, products are the basis and the costs of cutting and rewinding will be allocated to product groups. From information that is recorded in the ERP-system, a list can be made of all the irregular lengths of cables that are delivered to customers. This list of irregular lengths is simultaneously a list of all the cables that expedition has to cut and rewind by order of customers. It is also possible to present the list of irregular lengths for the six product groups. This is presented in table 30, together with the total lengths that are delivered. After cutting a cable, a remaining length arises that in some cases can be sold or in other cases this is a loss to TKF. The number of these remaining lengths are not taken into account in calculating the total lengths.

Table 30: Total lengths and irregular lengths divided

Product group	Total lengths delivered	Irregular lengths
1. Energy	X	X
2. Installation	X	X
3. Instrumentation	X	X
4. Telecom-fibre	X	X
5. Telecom-cable	X	X
6. Telecom-trade	X	X
Total/average	X	X

Important to recall is that the efforts for bigger cables are higher than for smaller cables. To process this effect of the type of cables, the rate for cutting and rewinding will be different for the six product groups. Information obtained from expedition indicates that there is a difference between efforts for on the one side the product groups energy and telecom-cable, and on the other side installation, instrumentation, telecom-fiber and telecom trade. It seems that the efforts for energy and telecom copper cables are four times bigger than for the other product groups. In general, the diameter of energy and telecom copper cables is bigger and thus require more handling in cutting and rewinding. Therefore, two different rates will be used in the allocation. These rates are calculated by combining three elements:

- the total costs of cutting and rewinding
- the division of lengths into the product groups
- the fact that the rate for energy and telecom cable will be four times as high as for the other product groups.

Table 31: General allocation completing end products

Product group	Total lengths delivered	Irregular lengths	Rate
1. Energy	X	X	X
2. Installation	X	X	X
3. Instrumentation	X	X	X
4. Telecom-fibre	X	X	X
5. Telecom-cable	X	X	X
6. Telecom-trade	X	X	X
Total/average	X	X	X

A side note here is that within the six product groups, a lot of variation exists between products. One energy cable can for example be 10 times bigger than another energy cable. However, in general these cables are bigger and therefore the proportion of energy and telecom copper cables requiring four times more handling than other cables, will be taken over and used in the allocation. This assumption results in table 31, where the total costs are divided over the six product groups. In the table, the total lengths, the total irregular lengths and the rates for each time a cable is cut and rewind are presented. It can be seen that most of the irregular lengths are installation cables. The table also shows that the rate of energy cables and telecom copper cables is four times as high as the rate for other cables. Finally, it is good to notice that for the product group telecom-trade, no effort in cutting and rewinding cables is required. Here, products are procured, assembled and sold to customers and this involves no cutting and rewinding of cables.

- Transport planning

As said, transport concerns on the one hand planning efforts by expedition employees and on the other hand the deliveries that are performed by external companies. In total, eleven FTE is activity in transport planning. According to the expedition/logistics manager, the efforts made by transport planners depend upon the number of deliveries they have to handle. He also indicated that it was not possible to differentiate between deliveries. Therefore, an average rate will be used to allocate the planning costs. The cost object in this case is customer groups, since deliveries are related to customers. Dividing the total costs of planning by the number of deliveries yields an average rate for each delivery. In table 32, the number of deliveries is presented for the six customer groups and subsequently the costs can be assigned to the groups.

Table 32: General allocation transport planning

Cust. groups	**Energy**	**Installation**	**Industry**	**Rail/infra**	**MENO**	**Broadband**	**Total**
# Deliveries	X	X	X	X	X	X	X
Percentage	X	X	X	X	X	X	X
Costs	X	X	X	X	X	X	X

Transport external companies

Table 33: Domestic transport and export

	Domestic (NL)	**Export**
# deliveries	X	X
Percentage	X	X
Transport costs	X	X
Percentage	X	X

The costs of delivering TKF's products by external companies can first be divided into deliveries within the Netherlands and deliveries abroad (export). Products can be exported to a wide variety of countries, such as Belgium, Spain, Aruba and Singapore. In table 33, the proportion of the number of deliveries and transport costs between export and domestic deliveries can be seen. The transport costs are found in Navision.

- Domestic transport

First, domestic transport will be discussed. The efforts and costs of domestic transport can vary largely between different deliveries. This is due to the size of the specific delivery. The size of the delivery has subsequently to do with the number of packages/products that are sent and the specific type of packages, such as small reels, big reels and rings. This should be considered in allocating the costs of deliveries within the Netherlands. Since the quantity of products is an important variable that influences the costs, a rate for each package/product that is sent will be used instead of a rate for each delivery. These rates can be found in table 34 below. The categorization that is used in the table and the different rates that are presented are explained in the remainder of this part.

Table 34: General allocation domestic transport

Type of package	Rate	# Packages	Costs
1. Rings of cable	X	X	X
2. Reels: 0 – 1.2 diameter	X	X	X
3. Reels: 1.25 – 2.0 diameter	X	X	X
4. Reels: 2.1 – 2.5small diameter	X	X	X
5. Reels: 2.5broad – 2.65 diameter	X	X	X
6. Reels: 2.8 – 3.0 diameter	X	X	X
7. Remaining packages	X	X	X
Total	X	X	X

The number of packages that are sent can easily be gathered from the ERP-system. Still, a lot of variation exists between for example sending a ring of cable and sending a big cable reel. At the expedition department, a file of an arrangement of TKF with an external transport operator for 2008 is available. This file indicates among others the transport rates of five types of cable reels, based on the diameters of reels. The rates are determined in 2008 and therefore cannot easily be applied in this thesis. However, the categorization of reels into five groups based on diameters can on the other hand be used. Next to this, also the proportion that is applied to differentiate between the smallest reel and the bigger reels is useful. According to the expedition/logistics manager, the rates of 2008 are not applicable to 2009 but the proportion that can be seen between the different rates is relatively the same. A list can be made of all the types of reels that are sent to customers within the Netherlands. Then, the number of reels can be counted for the five categories of cable reels.

As indicated before in this thesis, not only reels of cable are sent to customers. Also other types of packages should be included. These packages exist of two groups: rings of cables and remaining packages. Many cable rings are sent to customers and in most cases concern installation cables. Remaining packages are by far less frequently sent and these packages concern products of the product group telecom trade. Whereas the number of rings and remaining packages can be found in Navision, the costs of transporting cable rings and remaining packages is not recorded. However, it is still possible to estimate the costs of each type of package. As said, remaining packages are only sent for the product group telecom trade. The transport costs for this trade group (TPS telecom) is given in TKF's general ledger. Dividing these costs by the number of remaining packages yields an average rate for each remaining package. With respect to cable rings, no information is available about transport costs. The costs of sending a ring is way less than the costs of sending a reel. The rings can also be collected and put together on a pallet. Also the costs of sending a pallet is not known. This is discussed with two controllers of TKF and it is decided that a rate for each ring will be used, instead of a rate for each pallet. By comparing the costs of sending reels and rings, the rate of sending one ring of cable is determined. By using this rate, also the costs of sending the different type of reels conforms reasonably to the different rates of 2008. In the end, all domestic transport costs can be assigned to the different type of packages that are sent to customers. This was already presented in table 34. Determining the rates for the different type of packages is not sufficient for the allocation of domestic transport costs. In this general cost allocation, the costs have to be presented in the product/market matrix. Since the type of package is dependent by the type of product and its features, the costs of domestic transport will be allocated to the six product groups of TKF.

*Table 35: Cost allocation domestic transport**

Packages→ Prod. groups↓	Rings of cable	0 – 1.2 reels	1.25 – 2.0 reels	2.1 – 2.5s reels	2.5b – 2.65 reels	2.8 – 3.0 reels	Remaining packages
Energy	X	X	X	X	X	X	X
Installation	X	X	X	X	X	X	X
Instrumentation	X	X	X	X	X	X	X
Telecom-fibre	X	X	X	X	X	X	X
Telecom-cable	X	X	X	X	X	X	X
Telecom-trade	X	X	X	X	X	X	X
Total	X	X	X	X	X	X	X

** All numbers in the table are in euro's (€)*

From different sets of information that are available in Navision, a list can be made of the different packages for each product group. Above, the costs of transporting the different type of package are presented for the six customer groups (see table 35). This table shows that installation is responsible for a large share of transporting rings of cable. Next, the bigger cable reels with a diameter above 2.5 meter are mainly used for the product groups energy and telecom cable. Below (see table 36), the total costs of domestic transport are presented for the six product groups.

Table 36: Total costs domestic transport costs

Product groups	**Total**
1. Energy	X
2. Installation	X
3. Instrumentation	X
4. Telecom-fibre	X
5. Telecom-cable	X
6. Telecom-trade	X
Total	X

- Export transport

Also for deliveries to customers in other countries, it would be inaccurate to use an average rate for each delivery. This is because the costs can differ a lot when comparing for example a delivery to Germany and a delivery to Aruba. Consequently, the land of delivery is very important in allocating export costs. Obviously, again the transport costs will also differ between the quantity and type of packages that are sent. For export, this will usually concern cable reels. The number of reels that are sent to other countries can be seen in Navision. The type of reel that is sent can on the other hand not be seen in the system. However, using a rate for each reel that is transported to a single country will be inaccurate. When only one reel is delivered to a customer in Aruba, then too little costs would be assigned to these customers. Consequently, taking the quantity of reels and the type of reels into account will not be useful.

The option that is left is to use transport rates for each country that is served by TKF. The number of deliveries to each country can be found in Navision. In addition, the costs of deliveries belonging to these countries can be seen in Navision. However, for some countries only one or two deliveries have taken place in 2009. Calculating the costs of one delivery to such a country would result in unreliable transport rates. Also the costs that are assigned to the different countries in the system are not accurate. In order to determine more accurate and reliable transport rates, countries will be combined by the region to which they belong, such as Northern-Europe and South-East Asia. The total costs of export transport, number of deliveries and rates of different regions can be seen in table 37. This information is further explained below.

Table 37: Transport export; costs, deliveries and allocation rates

Regions	Costs	# Deliveries	Rate
Northern Europe	X	X	X
Western Europe	X	X	X
Eastern Europe	X	X	X
Southern Europe	X	X	X
South-East Asia	X	X	X
East Asia	X	X	X
South Asia	X	X	X
West Asia	X	X	X
North America	X	X	X
South America	X	X	X
Africa	X	X	X
Oceania	X	X	X

The regions that are used in table 38 are based on a classification of regions made by the United Nations. The rate for each region is calculated by counting the number of deliveries and costs of all the countries that belong to the region and subsequently dividing the total costs by the number of deliveries. In this way, a weighted average is calculated that creates relative accurate information for the allocation. As can be seen in the table, no reels are delivered to the regions Africa and Oceania. In order to have a rate that can be used in the future, for both continents the average rate of the Asian regions is used. The assumption is that efforts and costs of transporting to these regions is relatively the same as to Asia.

Calculating the rate of each region is however not enough. Costs have to be assigned to groups in the matrix. In this case, customer groups will be used, since the costs are driven by the land of delivery and therefore are dependent upon the customer instead of products. From information gathered from Navision, it is possible to make a list of the number of deliveries for each country and how this is divided into the six customer groups. The number of deliveries for each country can be combined to the rate that is given to regions to which the countries belong. This yields the following division over the six customer groups (see table 38).

Table 38: General allocation transport export

Customer groups	Costs
1. Energy	X
2. Installation	X
3. Industry	X
4. Rail/infra	X
5. Marine & Offshore	X
6. Broadband	X
Total	X

Similar to the cost allocation of R&D, below two tables are given that summarize the allocation of indirect costs at expedition. The total allocation of expedition costs to the six customer groups is given in table 39. Table 40 shows in what way the product-related expedition costs are allocated to the six product groups.

Table 39: Allocation expedition to customer groups

Customer groups	**Energy**	**Installation**	**Industry**	**Rail**	**MENO**	**Broadband**	**Total**
Costs	X	X	X	X	X	X	X

Table 40: Allocation expedition to product groups

Product groups	**Costs**
Energy	X
Installation	X
Instrumentation	X
Telecom fiber	X
Telecom cable	X
Telecom trade	X
Total	X

7.2.4 Administration

Main issues in general cost allocation administration

Computing activity costs:

- Only 3 activities have a clear relationship with customers
- The number of FTE is assigned to the 3 activities based on time consumption
- Activity costs are computed by using average costs of 1 administration FTE

Selecting drivers & allocating costs:

- All three activities are driven by the number of invoices
- The three activities are combined into one activity called invoice administration
- Costs of administration are allocated to customer groups

In chapter five, some important types of administration costs are mentioned. Just like the other departments at TKF, the biggest part of the costs is caused by labor. Beside labor costs, three other relative high expenses at administration were mentioned: insurance & contributions, services (accountants/auditing) and factoring. The costs of insurance & contributions and accountants do not have a clear relationship to customers or products and will therefore not be allocated. Factoring is related to customers, but it is not clear which customers are included in this debtor financing and to what limits the debtors are secured. Consequently, these costs will not be allocated and labor will be the only resource in the allocation of administration costs. A large part of the activities that are mentioned in chapter four are supportive to TKF. There is for example no clear relationship between mutations in the sub administration and customers. The same holds to everything that is related to control at TKF. These activities are seen as general and will not be allocated. Beside this, also the costs of the manager of the administration/finance department will not be considered in the

allocation. This does not conform to the other departments in this research, where management is included in the allocation process. The reason for excluding the sub administration, control and administration management in this research is that there are barely direct relationships between these areas and the performance of customers.

Computing activity costs

The administration activities that do have a clear relationship with customers are: booking payments of customers, sales invoicing and debtor administration. The costs of these activities will be allocated to customer groups in this general allocation. The activity costs are presented in table 41 and are discussed below. In the table, also the general administration activities are included and are presented as remaining administration.

Table 41: Activity costs administration

Activities	**# FTE**	**Percentage**	**Costs**
1. Invoicing sales	X	X	X
2. Booking payments	X	X	X
3. Debtor administration	X	X	X
4. Remaining administration	X	X	X
Total	X	X	X

Computing the costs of these activities is done by information that is gathered from conversations with the head of the administration. By looking at the time consumption of administrative employees, it was possible to divide the total number of FTE over the different activities. This can be seen in the second column of table 41. Costs can then be calculated by using the labor costs of one FTE at the administration/finance department. From the information of table 41, it can be seen that about three/fourth of the labor costs can be classified as general and will not be allocated to customer groups.

Selecting drivers and allocating costs

In the next part, the cost drivers are identified by which the allocation of administration costs can take place. Since administrative employees mostly have to do with customers, the costs of invoicing sales, booking payments and debtor administration will be allocated to customer groups. In table 42, the allocation of administration is presented. In the table, the activities invoicing sales, booking payments and debtor administration are combined into one activity called invoice administration. The reason for combining the three activities is discussed below. In the following part the three activities are discussed separately with respect to cost drivers

Table 42: General cost allocation administration

Activity	**# FTE**	**Costs**	**Cost driver**	**# Invoices**	**Rate**
Invoice administration*	X	X	# invoices	X	X
Remaining administration	X	X	-	-	-
Total administration	X	X			

** The activity invoice administration consists of invoicing sales, booking payments and debtor administration.*

- Invoicing sales

As mentioned in chapter four, this activity concerns checking the order information, booking the invoice and sending it to the customer. The effort that is needed for invoicing is determined by the number of invoices the employees have to process. Of course some invoices require more time than others. However, no variable can be found that gives a good explanation of the effort required for different invoices. Therefore, the number of sales invoices will be the best cost driver and a rate per

invoice will be used in allocating the costs. The number of invoices can be found in the ERP-system. These invoices can also be classified into the six customer groups.

- Booking payments

The payments of invoices have to be checked and booked by administration. The number of times a payment was processed is not registered and can therefore not be used as cost driver. However, payments of customers are the result of invoices that are sent by TKF. As a consequence, the effort in booking payments is determined by the number of invoices that are sent. The number of invoices will then be the cost driver for booking payments. Now, the same approach can be taken as with invoicing.

- Debtor administration

Monitoring debtors with respect to the time of payment is closely related to the former two activities. In most cases, TKF works with a standard number of days after which the invoice has to be paid by customers. If payment of customers is too late TKF can get problems with their working capital, since the value of these payments has to be financed and cannot be used for the purposes of TKF. For some customers, a lot of effort in monitoring the time of payment is required since these customers are very late in paying their invoices. For other customers, there is little or no effort needed in monitoring. However, it is not possible to identify what customers require little or much attention with respect to debtor administration. As a consequence, a general rate will be used. This will again be a rate per invoice, since monitoring and calling debtors is related to the original invoices that have to be paid.

As can be seen in the above analysis, the majority of administration activities are general and supportive to the organization. The activities that do have a clear relation to customers are driven by the number of invoices that are processed and sent by administration. These three activities can be combined into one activity since they all have the same cost driver and combining this can reduce the complexity of the allocation process. Next, the costs of these activities are relative low and therefore combining the activities will not have a large influence on accuracy. The three activities are combined into a new activity that is called invoice administration. How the total costs of invoice administration are allocated over the six customer groups can be seen in table 43.

Table 43: Invoice administration allocated to customer groups

Cust. groups	**Energy**	**Installation**	**Industry**	**Rail**	**MENO**	**Broadband**	**Total**
# Invoices	X	X	X	X	X	X	X
Costs	X	X	X	X	X	X	X

7.2.5 New business development (NBD)

Main issues in general cost allocation NBD

Computing activity costs:

- Both NBD activities are equally related to customers
- The 2 activities are combined into 1 activity called new business development
- The activity costs are equal to the total labor costs of NBD

Selecting drivers & allocating costs:

- It is impossible to use a cost driver for NBD
- Estimations are used to assign costs to customer groups

From the costs presented in chapter five it can be seen that also for new business development labor is the biggest cost type. This is the result of X FTE performing new business activities. The NBD manager is one of these employees that performed NBD activities in 2009. The total labor costs will be included in the allocation. In this case, customer groups will be the cost object instead of product groups since NBD is looking for interesting niches in the market and individual projects. The remaining NBD costs are primarily selling expenses, such as travelling expenses and costs with respect to car lease. It is not known for what customers and customer groups these costs are made. Therefore, travelling expenses are excluded from the cost allocation and labor will be the sole resource in the allocation.

Computing activity costs

As described in chapter four, two activities can be identified: performing market research and concept/product development. From conversations with the NBD manager, it is concluded that both activities are equally related to the six customer groups. This means that there is no difference between the division of market research and concept/product development over the customer groups. Since there is no difference between the two activities, they will be combined into one activity named 'new business development'. All labor costs can then be assigned to this activity, as can be seen table 44.

Table 44: Activity costs NBD

Activity	**# FTE**	**Costs**
New business development	X	X

Selecting drivers and allocating costs

There is no direct relationship between the activities of new business development and individual customers. Consequently, it is difficult to find a variable that drives the costs of NBD. According to the manager of NBD, an estimation can be made of the time consumption over the six customer groups. This is based on the number of FTE for each customer group. Combining the number of FTE of for example energy with the average costs of one FTE yields the total costs of new business development for the energy group. The allocation of NBD costs is presented in table 45 below.

Table 45: General allocation NBD

Customer groups	# FTE	Percentage	Costs
1. Energy	X	X	X
2. Installation	X	X	X
3. Industry	X	X	X
4. Rail/infra	X	X	X
5. Marine & Offshore	X	X	X
6. Broadband	X	X	X
Total	X	X	X

The number of FTE for each customer group is an estimation of the time that is spent in 2009 for each group. This estimation is made by the manager of NBD and gives a rough division of the total costs over the six customer groups. Estimations may not be very accurate, but it gives a good idea of how customer groups are responsible for NBD efforts. Beside this, the costs of new business development are relative low and therefore the consequences of not allocating these costs accurately are only little. The division over the six customer groups can change from one period to another, due to changes in the market or choices made by the direction of TKF to focus on certain customer groups.

7.2.6 Conclusion general allocation

As a conclusion from the general cost allocation, the total for the six customer groups and product groups is given in table 46. The costs of each group are calculated by summing up the costs that are assigned to the relevant group of all overhead activities. This information is not enough for filling in the product/market matrix. How the 36 pieces of the matrix can be filled will be explained in the conclusion of this chapter, which is part 7.5. Worth noticing from the table below is that the costs for the customer groups installation and broadband and for the product group installation are high compared to the costs of other groups.

*Table 46: Product/market matrix with total costs**

	Cust group	Energy	Instal.	Industry	Rail	MENO	Broadband	Total
		X	X	X	X	X	X	X
Product group	Costs							
Energy	X							
Installation	X							
Instrument.	X							
Telecom-fiber	X							
Telecom-cable	X							
Telecom-trade	X							
Total	X							X

** All numbers in the table are in Euro's (€)*

7.3 Detailed cost allocation

For the general cost allocation, it was possible to analyze all activities; activities related to individual customers, activities that were related to groups of customers or products and the more general activities that do not have a clear relationship to the specific cost objects. In the detailed cost allocation, the group-related activities will be processed in a matrix of remains. The activities that have a relationship to individual customers will be processed in a schedule for offers. The availability of data will be very important in designing such a schedule. Important to recall is the purpose of using schedules for offers. By adding the costs of overhead activities to the product costs, TKF is able to make more accurate estimations of the profitability of offers. Before offers are sent to customers, it is still possible to make changes to the offer that can enhance the profitability, for example with respect to efforts in cutting and rewinding cables. Using the schedule and taking actions to improve profitability should also increase the awareness of sales staff of overhead costs. Only considering revenues and product costs will not give a good indication of customer profitability. Activities that cause overhead costs can be very important factors in making some customers less profitable and others more profitable. However, letting sales staff to fill in an overhead schedule for offers can require time and effort of these employees. For offers with only minimal value, this will be too time consuming. Therefore, not all offers will be analyzed with respect to overhead costs.

For the general cost allocation, it was possible to analyze all activities; activities related to individual customers, activities that were related to groups of customers or products and the more general activities that do not have a clear relationship to the specific cost objects. In the detailed cost allocation, the group-related activities will be processed in a matrix of remains. The activities that have a relationship to individual customers will be processed in a schedule for offers. The availability of data will be very important in designing such a schedule. Important to recall is the purpose of using schedules for offers. By adding the costs of overhead activities to the product costs, TKF is able to make more accurate estimations of the profitability of offers. Before offers are sent to customers, it is still possible to make changes to the offer that can enhance the profitability, for example with respect to efforts in cutting and rewinding cables. Using the schedule and taking actions to improve profitability should also increase the awareness of sales staff of overhead costs. Only considering revenues and product costs will not give a good indication of customer profitability. Activities that cause overhead costs can be very important factors in making some customers less profitable and others more profitable. However, letting sales staff to fill in an overhead schedule for offers can require time and effort of these employees. For offers with only minimal value, this will be too time consuming. Therefore, not all offers will be analyzed with respect to overhead costs.

Table 47: Distribution of offers 2009

Value offers	# offers	% of total	Total value	% total value
> € 0	X	X	X	X
> € 50.000	X	X	X	X
> € 100.000	X	X	X	X
> € 150.000	X	X	X	X
> € 200.000	X	X	X	X
> € 500.000	X	X	X	X

Table 47 shows the distribution of offers when looking at the value of offers. The schedule for offers will be used for offers that have a value of € 100.000 and more. The time consumption of sales staff on the schedule will then be minimal and it is still possible to analyze a large part of the total values of offers. This can be shown by a simple calculation, where it is assumed that filling in the schedule for offers by sales staff takes 15 minutes of time. The calculation is shown in table 48.

Table 48: Time spent on schedule for offers by sales staff

# minutes spent on 1 offer	15 minutes
# minutes spent on X offers	X
# of FTE filling in the schedule	X
# minutes spent by 1 FTE in a year	X
# productive days in a year	X
# minutes spent by 1 FTE on a day	2,03 minutes

Concluding, assuming that filling in the schedule takes 15 minutes of time, the number of minutes that is spent on the schedule on 1 working day is only about 2 minutes for each Full-Time Equivalent (FTE). Consequently, the time spent on the schedule will only be minimal. However, the schedule has to be beneficial for TKF. This will be shown in the remainder of this chapter and in chapter 8.

In this chapter, the detailed cost allocation is discussed for each department separately. First, it will be decided what activities should be included in the schedule and what should be processed in the matrix of remains. After that, the approach will in principle be the same as for the general cost allocation. Resources, activities, activity costs and cost drivers will all be discussed for sales, R&D, expedition, administration and new business development. However, activity costs for the detailed allocation are the same as for the general allocation. It is therefore not needed to compute activity costs in this part.

7.3.1 Sales

Main issues in detailed cost allocation sales

- The sales activity acquisition & retention is processed in the matrix of remains
- For this activity, the same cost driver rate can be used as described in the general cost allocation
- The activities making offers, bargaining with customers and order administration are processed in the schedule for offers
- For these 3 activities the cost driver rates had to be adjusted to be able to use them for offers

In the general cost allocation of sales, it is mentioned that all sales activities are related to individual customers. For the detailed cost allocation, it is necessary to notice what activities should be processed in the schedule for offers and what activities should be processed in the matrix of remains. One of the sales activities will be processed in the matrix of remains, the other activities in the schedule. This is explained below. In table 49, the detailed cost allocation of sales and the allocation rates are presented. The second column in the table shows the different cost drivers that are used. The information of table 49 is discussed below.

Table 49: Detailed cost allocation sales

Cust. groups/ Activities	Cost driver	Energy	Installation	Industry	Rail	MENO	Broad-band
1. Acquisition/ retention*	% of revenues	X	X	X	X	X	X
2. Making offers	# offer lines	X	X	X	X	X	X
3. Bargaining	% of offer value	X	X	X	X	X	X
4. Order administration	# offer lines	X	X	X	X	X	X

** The activity acquisition/retention is processed in the matrix of remains, the other three activities in the schedule for offers.*

About 56 percent of the total sales costs will be processed in the schedule for offers. The costs of the sales activities are the same as for the general cost allocation, since the same resources are used and the costs and activities have not changed. The activity costs can be seen in table 17. The element that has changed is the cost object. Instead of customer groups, now in most cases offers are the end of the allocation process. This makes it necessary to review the cost drivers and adapt them when this is needed, since drivers now should be related to offers. Below, each sales activity is discussed separately with respect to cost drivers:

- Acquisition/retention

Above, it is mentioned that one sales activity will be processed in the matrix of remains. This concerns the first activity: customer acquisition and retention. Trying to attract new customers is not related to offers that are placed by customers. The same holds for efforts in customer satisfaction to retain the customer base. It is possible to analyze acquisition and retention on customer group level. Therefore, this sales activity is processed in the matrix of remains. It is useful to analyze how the costs of acquisition and retention were allocated in the general allocation. Here, it is concluded that no information is available about the number of visits and the number of hours that are spent by account managers. To allocate the activity costs, another variable was found. The efforts in acquisition and retention are related to revenues. For customers that are responsible for a large share of the revenues higher efforts in customer retention are needed. The time that is spent on attracting new customers is relative low. As a consequence customer acquisition will also be included and divided over the customer groups on the basis of sales revenues.

- Making offers

In analyzing the profitability of offers that are sent to customers, the efforts of calculating and making the offers should be included. The effort of making the offers is not the same for each offer. To process this variety in efforts, the number of offer lines will give a good explanation of the efforts that are made in making offers. As a consequence, the same cost driver will be used as in the general allocation. Now the costs are allocated to the specific offers that exist of several offer lines.

- Bargaining with customers

Now, the purpose of visiting customers is different from the acquisition and retention activity. The visits are now related to the offers that are placed or to other specific arrangements. Therefore, the resulting costs of bargaining with customers can be processed in the schedule for offers. Again, information of the number of visits made by account managers cannot be used. In the general allocation it is mentioned that growing revenues raises the efforts in bargaining with customers. For offers with for example a value of four million euro's, a lot more time and effort in bargaining is usually needed than for an offer that has a value of say thousand euro's. For the detailed allocation,

the assumption is that the effort of bargaining with customers is related to offer value and to the value of specific projects. The costs driver will then be offer value and a rate (%) will be used to calculate the costs of bargaining for each offer.

- Order administration

As mentioned earlier, the activity order administration consists of three activities: follow-up of orders & processing, monitoring & leading and after-sales service. These activities are related to individual customers, but not directly to specific offers. The efforts of order administration are not made in the 'offer phase', but when offers are already accepted by customers and are turned into orders. However, at the moment offers are made it is already obvious that there will eventually be efforts in order administration when offers are accepted. Therefore, the efforts of order administration should be taken into account in making offers to get a more accurate idea of the profitability of offers. In the general allocation of order administration, the number of order lines is used as a cost driver. Looking at the new cost object, the cost driver should now be related to offers. Consequently, order lines cannot be used anymore. The number of offer lines will give a good indication of the efforts of order administration that will eventually be required for these specific offers. The cost driver now changes from order lines to offer lines.

In table 49, allocation rates of the four sales activities were presented. It is important to notice that the last three activities are allocated to specific offers, whereas acquisition and retention will be processed in the matrix of remains. In calculating the rates for each activity, there is still difference made between the six customer groups. This is because there are big differences in the labor costs of each customer groups and also for example in the number of offer lines that are handled by the six groups. An offer line of the customer group industry costs more than X euro's, whereas an offer line of the customer group rail/infra costs about X euro's.

7.3.2 Research & Development

Main issues in detailed cost allocation R&D

- All five R&D activities are processed in the matrix of remains
- The detailed allocation of these R&D activities is the same as the general cost allocation of R&D

The R&D activities and the activity costs will be identical to the general allocation of R&D (see table 19). The general cost allocation at R&D showed that a large share of the activities is general and supportive to TKF. There are three activities that are related to individual customers and that also can be linked to specific offers. Consequently, in principle these three activities can be processed in a schedule for offers, whereas the other activities should anyhow be included in the matrix of remains. These other more general activities are: general R&D projects and measuring. As indicated in part 7.2.2, the activities materials, packaging and R&D management are equally divided over the other five activities. In table 50, the detailed cost allocation for R&D is presented. Here, it can be seen that all activities are processed in the matrix of remains. This is due to restrictions in data availability for selecting the right cost drivers. Next, the table shows whether the activity is allocated to product groups or customer groups.

Table 50: Detailed cost allocation R&D

R&D activity	Cost allocation	Allocated to cost object
1. General R&D projects	Matrix of remains	Product groups
2. Customer-specific R&D projects	Matrix of remains	Customer groups
3. R&D requests	Matrix of remains	Customer groups
4. Application engineering	Matrix of remains	Customer groups
5. Measuring	Matrix of remains	Product groups

All R&D activities are discussed below. It is discussed why the activities should be processed in the matrix of remains and what cost driver should be used. In most cases, information from the general cost allocation can be used in this detailed allocation.

- General R&D projects

As said above, this is one of the activities that is too general to take into account in the schedule for offers. The projects are usually not related to specific offers or customers. As a consequence, the costs of R&D projects will be allocated to product groups in the matrix of remains. This allocation is identical to the general cost allocation. It is mentioned that it is impossible to find a variable that drives the efforts in general R&D projects. Instead, estimations were used in the general allocation that are made by the R&D manager. The same estimations will be used to allocate the costs in the matrix of remains. All information can be found in table 21, where the total costs of general R&D projects are allocated to the six product groups.

- Customer-specific R&D projects

These projects belong to the activities that are related to individual customers. As a consequence, it should first be analyzed how this activity can be processed in a schedule for offers. In the general allocation of customer-specific projects, it is mentioned that hours spent on project cannot be used as cost driver since data is not available. Also a rate for each project cannot be used since the number of R&D projects is not registered. Without a variable that explains the relation between R&D projects and offers, the costs cannot be processed in a schedule for offers. Instead, this activity will be included in the matrix of remains. The same estimations will be used as for the general allocation. The costs will be assigned to customer groups by the following percentages; energy: X%, industry: X% and broadband: X%.

- R&D requests

R&D requests are the result of offers that are placed that consist of one or more products which have to be developed or adapted by the R&D department. From this, it seems that there is a direct relationship between R&D requests and offers. In the general cost allocation it is mentioned that hours cannot be used as cost driver and beside this that the number of offers will also not give a good explanation of the efforts of R&D requests. The only specific driver that is applicable is the number of R&D requests. Then, a rate for one R&D request can be used and processed in the schedule for offers. However, the number of requests for 2009 is only known at the R&D department and dividing the number of requests over the six customer groups can only be done subjectively and inaccurately. Therefore, a rate for each R&D request will not be used. The only way that is left to allocate the costs of R&D requests is using the estimations of the R&D manager. These are estimations of the number of requests for each customer group. This makes it impossible to process the activity in a schedule for offers. Instead, the costs will be allocated in the matrix of remains by the same way the costs are allocated in the general allocation. In table 22, the cost allocation of R&D requests in the general allocation can be found. As said, this is identical to the detailed cost allocation.

- Application engineering

It is useful to include the service that is provided to customers after delivery of cables in analyzing the profitability of offers. At the moment offers are made by inside sales staff, it is already possible to indicate whether service will be required by customers. However, the availability of data creates important restrictions for allocating the costs. The number of times service is provided to customers is not known and also the hours that are spent is unknown. Again, it is necessary to use information from the general cost allocation to allocate costs. Here, it is known that X FTE and X FTE works for respectively the customer groups broadband and energy. The remaining X FTE is related to the product group telecom fibre. Application engineering can therefore not be processed in the schedule for offers but will instead be included in the matrix of remains.
It can be concluded that the detailed cost allocation of Research & Development is identical to the general cost allocation. While there are three R&D activities that are related to individual customers and offers, none of them can be processed in the schedule for offers since the availability of data creates large restrictions to the allocation. Consequently, all R&D activities are processed in the matrix of remains. The elaboration of this matrix will be given in the conclusion of this chapter.

7.3.3 Expedition

Main issues in detailed cost allocation expedition

- All expedition activities are processed in the schedule for offers
- The same cost drivers are used as in the general cost allocation
- For domestic transport, the driver rate is somewhat adjusted to be able to use it for offers

In the general cost allocation, five expedition activities are mentioned that are included in the overhead of TKF. These activities are: receiving & controlling end products, completing products, transport planning, domestic transport and transport export. The other two expedition activities are related to production and are processed in the product cost of cables and components. The total activity costs in the detailed allocation are the same as the activity costs that were mentioned in the general allocation. In the general allocation, the costs of the activities receiving & controlling end products and completing products are allocated to product groups. The costs of transport on the other hand are allocated to customer groups. These activities however are not only related to groups, but also to individual products and customers. Individual products are received, controlled and when needed cut and rewind. Finally, the products are transported to customers. In offers, it is indicated what products will be sold and to what customer it is transported. Consequently, all three expedition activities are related to specific offers and can be processed in the schedule for offers. In table 51, the detailed cost allocation for expedition is summarized. Below, the information of the table is further explained.

Table 51: Detailed cost allocation expedition

Expedition activity	Cost allocation	Cost driver
1. Receiving & controlling end products	Schedule for offers	% add-on to product cost
2. Completing end products	Schedule for offers	# irregular lengths
3. Transport planning	Schedule for offers	# deliveries
4. Domestic transport	Schedule for offers	# packages and type
5. Transport export	Schedule for offers	# deliveries and country

- Receiving & controlling end products

The identification and administrative checking of cables depends on the total and type of products that come out of production. As in the general cost allocation, the list of the total number of finished goods can be used. However, an average rate for each end product cannot be used, since many products are stored and sold in later periods. The costs of receiving & controlling end products can then not be presented for individual products, which is the same problem that is mentioned in the general cost allocation. To solve this problem, again a link with product costs will be used. Dividing the total activity costs by the total product costs yields an average add-on over the product cost. Important to notice is that the number of installation cables that are received and controlled represent two-third of the total number of goods that are handled by expedition. This variation in the number of goods is taken into account by using different add-on percentages for each product group. This is also done in the general cost allocation. Now the costs of receiving and controlling can be presented for individual products and the effect of storage is minimized. In principle, this detailed allocation is again the same as for the general allocation. The difference here is that costs are calculated for offers by using the total product costs of the specific offers. The costs for receiving & controlling end products and the rates for different types of products was presented in table 29.

- Completing products (cutting/rewinding)

Cutting and rewinding cables is done at the request of customers and is therefore related to individual customers. However, the efforts and the resulting costs of cutting and rewinding depend on the specific type of cable, as can be seen in the general allocation. In the detailed cost allocation, individual products will thus also be the basis of the allocation. These individual products can be found in the offers that are made for customers.

Table 52: Detailed allocation completing products

Product group	Irregular lengths	Rate
1. Energy	X	X
2. Installation	X	X
3. Instrumentation	X	X
4. Telecom-fibre	X	X
5. Telecom-cable	X	X
6. Telecom-trade	X	X
Total/average	X	X

The different rates of cutting and rewinding for each product group have already been calculated in the general cost allocation. These numbers can again be applied in this detailed allocation and are presented above in table 52. Here, also the number of irregular lengths is given. The different rates were calculated by using the proportion that the effort for energy and telecom-copper cables is four times higher than for the other product groups. When offers are made by sales people, it is indicated if products will be delivered on regular lengths or irregular lengths. When a customer requires a cable with irregular length, a rate will be given to the specific type of cable. All costs of cutting and rewinding can then be allocated to individual products, which can be found in specific offers that are made for customers.

- Transport planning

As said, planning deliveries to customers is related to specific offers and can thus be processed in the schedule. In the general cost allocation, it is already mentioned that the efforts of planning transport depends upon the number of deliveries that have to be handled by expedition. However, the number of deliveries for a specific offer is not recorded into the system. In bargaining with offers, it is decided what will be the date of delivery. This is also indicated in Navision. So for each offer, the total number of dates of delivery can be calculated. If for example it is indicated that some products will be

delivered on the 6th of September and other products on the 27th of September, then it can be assumed that there will be two deliveries for this offer. It is possible that the actual number of deliveries differs from the method that is described above, since expedition can decide how many deliveries will be made in reality. However, the assumption is that the total number of dates of delivery is a good indication of the number of deliveries for an offer. In table 53, the activity costs, cost drivers and average rate can be seen. It is assumed that the total number of deliveries is equal to the number of dates of delivery.

Table 53: Rate for detailed allocation transport planning

Activity	Activity costs	Cost driver	# Drivers	Rate
Transport planning	X	Dates of delivery	X	X

Transport external companies

Similar to the general cost allocation, the detailed allocation of domestic transport differs from the allocation of export. How domestic transport and export can be processed in the schedule for offers is discussed below.

- Domestic transport

In the general cost allocation, it is recognized that the costs of domestic deliveries depend upon the quantity and type of packages that are sent. Since the type of package is related to the type of product, this activity is related to products and product groups. In the general cost allocation, it is also mentioned that using different rates for rings, smaller and bigger reels and remaining packages results in the most accurate allocation that is possible. However, in offers it is not indicated on what package a certain product will be delivered to customers. This is usually determined by expedition. Since sales staff cannot indicate on what packages the products will be sold, the type of packages cannot be used as cost driver. Considering the large differences in rates between for example transporting a ring of cable and the biggest reel, using an average rate for each package would be inaccurate. Therefore, another way of allocating domestic transport costs should be found that takes into account that some deliveries are more costly than others. In table 54, the detailed cost allocation of domestic transport is presented. The information of this table is discussed below.

Table 54: Detailed allocation domestic transport

Product groups	Costs	# packages	Total rate	Rate remaining	Rate rings
1. Energy	X	X	X		
2. Installation	X	X		X	X
3. Instrumentation	X	X	X		
4. Telecom fiber	X	X	X		
5. Telecom cable	X	X		X	X
6. Telecom trade	X	X	X		
Total	X	X			

From information in Navision, a list can be made of the type of package for the six product groups. In analyzing this list, large variation of the number of packages can be seen for the six product groups. Consequently, the transporting costs differ when looking at the product groups. Since the specific product groups to which products belong is recorded for offers, rates for each product group can be used in allocating domestic transport costs. Now, the total costs of for example the product group energy can be divided by the total number of packages that are sold. This yields an average rate for each energy package. This can also be done for the other product groups. However, for the product groups installation and telecom cable, the rates are not accurate enough. This is because the number of rings for these groups are relative high and therefore the rate for installation and telecom cable packages will be too low. To solve this problem, for these two product groups two separate rates will

be used, one for rings and the other rate for reels and remaining packages. In table 54, it can be seen that for the product groups installation and telecom cable two different rates are used. It can also be seen that energy cable have the highest rate for transporting, since these product are bigger and beside this also the reels for these products are bigger.

Concluding, in the detailed allocation of domestic transport the cost driver will be the number of packages for each product group. To every product that belongs to a specific offer, a rate will be given based on the product group to which the product belongs.

- Transport export

In the general cost allocation, it is concluded that transport to other countries is dependent upon the land of delivery and how many deliveries are made. In offers, the specific land of delivery is recorded and therefore the categorization into regions of table 37 can be used. However, as indicated in the part about transport planning, the number of deliveries is not exactly known at the moment offers are made by sales. Consequently, the cost driver has to be adjusted to allocate transport export in the schedule for offers. This in fact is the same problem that is described in the part about transport planning. Here, the problem is solved by looking at the number of dates of delivery for each offer, which is recorded in the specific offers. In the case of transport export, it is still possible to use these dates of delivery instead of the number of deliveries that was used in the general cost allocation. It can also be possible to use estimations of sales staff of the number of deliveries when the number of dates of delivery does not match the expectations of sales.

For each region, a rate will be used for a delivery. The assumption is that the number of dates of delivery that can be seen in offers is the same as the number of deliveries that is mentioned in the general allocation. Then, the rates can be used that were presented in table 37. Concluding, the detailed allocation of transport export can be allocated by linking the land of delivery (region) with the number of dates of delivery, which is recorded in offers.

7.3.4 Administration

Main issues in detailed cost allocation administration

- The activity invoice administration is processed in the schedule for offers
- The same cost driver rate can be used as in the general cost allocation
- Remaining administration costs are considered as general and are not allocated

In the detailed allocation of administration activities, labor is still the sole resource that will be allocated. In the general allocation, it can be seen that the majority of administration activities is supportive to TKF. These activities are seen as general and cannot be allocated. The administration activities that do have a direct relationship to individual customers are: invoicing sales, booking payments and debtor administration. In the general allocation, it is also mentioned that these three activities are driven by the number of invoices that have to be handled. Sales staff does not know the number of invoices in the 'offer phase'. The standard policy of TKF is to send an invoice at the moment a delivery is made to a customer. Therefore, the number of dates of delivery is a good

alternative of the number of invoices. Consequently, the cost driver for the three activities is the number of dates of delivery. Since invoicing sales, booking payments and debtor administration all have the same cost driver, they will again be combined into one customer-specific administration activity: invoice administration. This activity is related to specific offers that are made for customers and therefore the costs will be included in the schedule for offers. The remaining administration activities that are supportive will not be allocated and will be excluded from the analysis. In the schedule for offers, the rate for invoice administration can be combined with the rate for the activity transport planning. Both activities have the same cost driver and can therefore be combined

Table 55: Rate for detailed allocation administration

Activity	Costs	Driver	# Drivers	Rate
Invoice administration	x	# Dates of delivery	x	x

7.3.5 New business development (NBD)

Main issues in detailed cost allocation NBD

- The detailed cost allocation is identical to the general cost allocation of NBD that is described in chapter 7.2.5

In the general cost allocation of new business development, it is said that there is no direct relationship between the efforts made by the department and individual customers. Consequently, it is impossible to include new business development in the schedule for offers. In the general allocation, costs of NBD are allocated to customer groups with the help of estimations made by the manager of NBD. The costs of new business development will in the detailed cost allocation be processed in the matrix of remains by using the same estimations as in the general allocation. This can be seen in table 45. The detailed cost allocation is now identical to the general allocation.

7.3.6 Conclusion detailed allocation

In the detailed cost allocation, activities that are related to individual customers or products are processed in the schedule for offers, whereas group-related activities are processed in a matrix of remains. More clarity about the schedule for offers will be given in part 7.4. In that part, the practical design and use of the schedule will be discussed.

With respect to the matrix of remains, costs were again allocated to product groups and customer groups. At this moment, it is possible to calculate the total costs for the six customer groups and for the six product groups. These total costs are presented in table 56. Similar to the general cost allocation, this information is not enough to compute the costs of all 36 pieces of the matrix. How the combination of product and customer groups can be made is explained in part 7.5.

*Table 56: Product/market matrix of remains with total costs**

	Cust group	**Energy**	**Instal.**	**Industry**	**Rail**	**MENO**	**Broadband**	**Total**
		X	X	X	X	X	X	X
Product group	Costs							
Energy	X							
Installation	X							
Instrument.	X							
Tel-fiber	X							
Tel-cable	X							
Tel-trade	X							
Total	X							X

** All numbers in the table are in Euro's (€)*

7.4 The schedule for offers

In this part, the schedule for offers is further explained by looking at practical issues of the design and use of the detailed cost allocation. As said, detailed analysis of profitability at TKF will be based on offers that are placed by customers. It should be analysed whether these offers will eventually be profitable to the company or not. Next, sales staff has to become more aware of overhead costs. Therefore, the schedule for offers will show what factors cause overhead costs. Subsequently, sales staff has to see whether there are possibilities to reduce these costs, for example by negotiating with customers about reducing the number of irregular lengths and the number of deliveries. As described in chapter seven, several activities will be processed in the schedule. These activities, together with the relevant cost driver, are presented in table 57.

Table 57: Activities processed in the schedule for offers.

Department	Activity	Cost driver
Sales	Making offers	# Offer lines
	Bargaining	% Offer value
	Order administration	# Offer lines
R&D	-	-
Expedition	Processing end products	% Product cost
	Completing end products	# Irregular lengths
	Transport planning	# Dates of delivery
	Domestic transport	# packages/lengths
	Export transport	Country, # dates of delivery
Administration	Invoice administration	# Dates of delivery
NBD	-	-

As, said, the practical design and use of the schedule is discussed in this part. Information that is needed for computing overhead costs and profitability of offers will be processed in an excel-sheet. This sheet has to be filled with data to be able to calculate the costs of the activities that are presented in table 57. This data can be derived from Navision and in some cases has to be filled in by sales staff. The data can then be linked to the allocation rates that have been calculated in this chapter. In this way, overhead costs can be calculated. These costs are presented on the right side of the excel sheet to let sales staff see how overhead costs are incurred. Information that is processed in the excel sheet can roughly be divided in the following five parts:

- Customer-related information
- Offer details
- Charged costs
- Product-related information
- Profitability calculation

In figure 34, the excel sheet of the schedule for offers is presented. The orange parts in the sheet are the fields that need to be filled in by sales staff. The remaining fields of the sheet are subsequently automatically filled. The total indirect costs are presented on the right side of the sheet. Comparing the total of product costs and indirect costs with the revenues can yield a profit margin for an offer. Next, the total value added for an offer is presented.

Figure 34: Excel sheet of schedule for offers

Customer-related information:

Date	19-10-10
Offernumber	
Customer number	
Customer group	

Offer Details:

Total number of offer lines	0
Total number of deliveries	
Land code	

Total articles	**0**
Total cost&discoun	**0**
Total overhead	**0**
Profit margin (P.M.)	**0%**
Value Added (V.A.)	**0%**

Old method
Profit margin

Charged cost (non articles) and discounts:

	Total								**0**
	Description				Quantity			Unit price	Total Price
	Cutting & rewinding								0
	Transport								0
	Handling								0
	Engineering								0
	Discount (must be a negative amount)								0
	Other:								0

Product-related information:

	Total								**0**	**0**		
Row	Article number	Description	Product group	Quantity	# lengths	# lrr. lengths	Packing	Unit price	Total Price	Overhead	P.M.	V.A.
1			Option									
2			Option									
3			Option									
4			Option									
5			Option									
6			Option									
7			Option									
8			Option									
9			Option									
10			Option									
11			Option									
12			Option									
13			Option									
14			Option									
15			Option									
16			Option									
17			Option									
18			Option									
19			Option									
20			Option									
21			Option									
22			Option									
23			Option									
24			Option									
25			Option									

- Customer-related information

Customer information is mostly recorded in Navision and is applicable to all offers and orders of a specific customer. Below, the information is discussed that is needed about customers.

- Date: At the top of the sheet, it should be filled in on what day the schedule is applied to an offer.
- Offer number: Of course it should be identified what specific offer will be elaborated. All offers receive a specific number by TKF so that they can be recognized. As said in chapter seven, offers will be handled that are valued above € 100.000.
- Customer number: Each customer at TKF has a specific number by which customers can be recognized. Using this customer number in the schedule makes it possible to analyze more than one offer that is placed by the same customer. After filling in the customer number, automatically the customer name will be presented in the sheet.
- Customer group: After filling in the customer number, also the customer group is presented automatically. This is important information, since some overhead costs are allocated based on the relevant customer group. For the activities making offers, bargaining and order administration the specific customer group has to be known.

- Offer details

- Number of offer lines: This does not have to be filled in by sales staff, but is automatically computed after all products have been filled in.
- Number of deliveries: Each product has a date of delivery. The total number of deliveries for all the products can then be used as the total number of deliveries. However, this is not accurate, since this number of dates of delivery most often is too low when looking at the actual number of deliveries.

- Land of delivery. For each customer, the land of delivery is recorded in Navision. This is indicated as a land code in Navision. For example, the land code of China is CN. The land of delivery is needed to see whether it is domestic transport or export. If it is export, the relevant land code leads to a transport rate that is presented earlier in this chapter.

- Charged costs

In some cases, costs are charged to customers for certain efforts that are performed by TKF. The charged costs are booked in Navision by administration staff. The reason for charging costs is mostly unknown. In general, four types of charges costs can be identified. These are:

- Cutting and rewinding costs.
- Transport costs
- Handling costs
- Engineering costs

The height of the charged costs is not based on calculations but mostly determined based on experience of sales staff. When these charged costs are taken into account also the revenues that belong to these issues have to be considered. In this way, costs can be compared to revenues. How many costs are charged with respect to a specific offer will be shown in the excel sheet.

- Product-related information

- Article number: The article numbers make it possible to see which products are ordered. This information is not used as cost driver, but is needed to see of what types of products the offer consist.
- Article description: After filling in the article number, automatically the article description will be given. Taken this description into account will increase clarity within the schedule for offers.
- Product group: After filling in the article number, also the relevant product groups are automatically filled. Since in many allocations the product group plays an important role, it is crucial to present this information in the schedule for offers. The product group has for example to be known for the activities receiving & controlling end products and cutting and rewinding cables.
- Quantity: Next, the quantity has to be filled in by sales staff. In Navision, it is recorded how many metres of the specific cable are ordered by a customer. This information can be used to calculate total product costs and revenues for a product, since prices are based on one meter cable.
- Number of lengths: The total number of meters that are ordered by customers can be processed in different lengths. For example, an offer line of 32.000 meter can be processed in 8 lengths. The number of lengths needs to be filled in to see how many packages will be delivered.
- Number of irregular lengths: The number of lengths consists of regular and irregular lengths. The total number of irregular lengths needs to be filled in for the activity completing end products.
- Packing: In Navision, a choice can be made between three possible forms of package. These are: reel, ring and remaining. The specific packing has to be known for the allocation of domestic transport and therefore has to be filled in by sales staff.
- Unit-price: This is the price of one meter of the specific type of cable. This price needs to be filled in.
- Total price: This is the total value of the products and is automatically filled by multiplying the quantity and the unit-price. The total value of the offer is needed for the allocation of the sales activity bargaining with customers.

- Remaining overhead costs: these costs are not presented in figure 34, but are definitely very important. Remaining overhead costs consists of two parts: the matrix of remains and remaining overhead that is too general to be allocated. The remaining overhead costs are computed for each offer line/product. The remaining overhead costs are automatically calculated by using the relevant product groups and the total product costs of these products.

- Profitability calculation

Profitability will be calculated on two levels. First, the profit margin (P.M.%) is computed for each offer line. By using revenues, product costs and overhead costs profit margins can be calculated for each product. However, in this case only product-related overhead costs are considered. Therefore, a second level of profitability is included. At the top of the excel sheet, the total profitability of the offer is presented. Here all costs are included and compared with revenues of the offer. All four dimensions that are described above are considered in analyzing profitability. Next to profit margin, also value added (V.A.%) will be analysed for each offer line and for the offer as a whole. The difference between offer value and materials costs is then the value added by TKF. Information about material costs is hided in the excel sheet, but is used in the calculation of value added.

As indicated earlier, in some cases sales staff has to make estimations and fill these into the excel sheet. An example of such an estimation is the number of deliveries for an offer. Beside this, very important elements of offers can be configurations and products with article number 1. Configurations are newly developed products that have not been turned into articles. This may be due to lack of product information that is available in Navision. These configurations have lack of data with respect to the specific product group and the form/completion of the cables. At TKF, article number 1 represents products that have not been developed by R&D yet. Here, no information is available about product costs, which is a crucial dimension in the allocation process. This makes it difficult to assess the profitability of these articles. Consequently, further information is needed for configurations and products with article number 1 to make it possible to assess profitability. This information has to be estimated by sales staff and filled in. In the excel-sheet, there are possibilities to add the required information. In chapter 8, the schedule for offers is applied to a selection of offers at TKF to assess profitability.

7.5 Conclusion

In allocating the costs of sales, R&D, expedition, administration and new business development, an activity-based costing approach is used. Activities represent the link between resources consumed by the department and the cost object, which can be products or customers. Information from chapter four, five and six about respectively activities, costs and cost objects can therefore be used. In this chapter, two allocations have been developed, each having a different purpose. In the general cost allocation, overhead costs are allocated to product and/or customer groups and are presented in the product/market matrix. This general allocation has to provide a quick scan of the profitability and performance of groups and the individual products or customers that belong to those groups. In this general allocation, it is also possible to analyze all overhead costs and allocate them to groups. In the detailed cost allocation, a schedule for offers is chosen that has to be used by sales staff. The overhead costs that cannot be processed in this schedule are processed in a ‘matrix of remains’. The purpose of this detailed allocation is to dig deeper into individual profitability of customers. Taking indirect costs already into account in the ‘offer phase’ has to create awareness by sales staff that overhead can play a crucial role in profitability. The intention of the schedule for offers is also to improve customer profitability by consulting with customers to lower indirect costs, for example with respect to costs of cutting and rewinding cables. This schedule will be applied to offers that have a value of € 100.000 or more. The reason for this is that the time consumption of sales staff on this

schedule will be relative low, but it is still possible to analyze about 90 percent of the total value of offers.

The first step in allocating overhead costs always was to calculate activity costs for each department. Information is gathered from departmental managers about the time consumption of employees in each department. By combining the time consumption for each activity with the labor costs of the department, it was possible to compute activity costs. In analyzing the different activities, it was found that a part of them were general in nature. Some of these activities were related to management of the departments. These management costs are considered in the allocation and in most cases equally spread over the different activities that take place at the relevant department. At administration, a lot of the activities were barely related to individual customers or products and are therefore not allocated.

In allocating activity costs, a cost driver had to be identified that explains the relation between the specific activity and cost object. Choosing such drivers in most cases was restricted by the availability of data. However, for each activity a variable is chosen that gives a good explanation of the relation between efforts and products or customers. For many activities, the allocation in the detailed cost allocation is similar to the general cost allocation. In these cases, it was possible to use the same cost driver for both allocations. In other cases however, another variable had to be found that is related to offers, since in the detailed allocation a schedule for offers is used. As a conclusion, below the two different allocations are elaborated.

General cost allocation

As said earlier, in the general cost allocation it is possible to consider group-related overhead costs as well as costs related to individual products or customers. All together, the overhead costs at TKF sum up to € X that is mentioned in chapter five. Of these total costs, about X euro is too general and are not allocated in this research. The remaining indirect costs are related to individual cost objects or to groups of them. In the general cost allocation, these costs are allocated to customer groups and product groups.

The total overhead costs for the six customer groups and for the six product groups are already known after the allocation in this chapter. However, each piece of the product-market matrix now has to be filled with overhead costs. Consequently, the total costs of the groups that are presented in table 46 have to be assigned to the 36 pieces. This can only be achieved by using one of two possible variables. These two variables are revenues and product costs. In this case, product costs are chosen because of two reasons. First, the assumption is that a customer groups that has high margins and high revenues should not be punished by getting a large share of overhead costs. If for example TKF has the ability to use 10 hours of a specific production machine, using these hours for an order of 50% margin will not create higher overhead costs than for an order with only 10% margin. This can be seen as a production approach by TKF, since they are still mainly focused on production. Second, product costs is chosen as a variable since this conforms to the original approach of TKF by using an X percent add-on above the product costs.

Figure 35: Product-market matrix filled with overhead costs

Overhead	Customer groups	Energy	Installation	Industry	Rail/infra	MENO	Broadband
Product groups							
Energy							
Installation							
Instrumentation							
Telecom fiber							
Telecom cable							
Telecom trade							

In figure 35, the overhead costs are presented in the product-market matrix. The calculation of each piece is based on product costs, which can be derived from Navision. The amount of overhead costs for each part of the matrix can be calculated by using the total overhead of the relevant customer group and product group and comparing this to the product costs of the relevant product/market combination.

Figure 36: Product-market matrix filled with overhead as percentage of product costs

Overhead	Customer groups	Energy	Installation	Industry	Rail/infra	MENO	Broadband
Product groups							
Energy							
Installation							
Instrumentation							
Telecom fiber							
Telecom cable							
Telecom trade							

As can be seen in figure 35, in total X of overhead costs are allocated in the product-market matrix. This amount of costs was also given at the beginning of chapter 7 in table 7. Concluding, the specific costs of the 36 pieces of the matrix are calculated by using product costs. By this method, the profitability of customers and groups can easily be checked at different points in time. However, the percentages of overhead costs relative to product costs will change during the year, since the number of cost drivers vary. Once a year, the allocation has to be repeated to see what will be the new percentages on product costs to have a more accurate assessment of profitability. This can only be done annually since changing overhead costs during the year will be confusing for sales staff. Consequently, this will be done at the beginning of the year.

Detailed cost allocation

Table 58: Activities, drivers and costs of schedule for offers

Department	Activity	Cost driver	Costs
Sales	Making offers	# Offer lines	X
	Bargaining	% Offer value	X
	Order administration	# Offer lines	X
R&D	-	-	X
Expedition	Processing end products	% Product cost	X
	Completing end products	# Irregular lengths	X
	Transport planning	# Dates of delivery	X
	Domestic transport	# packages/lengths	X
	Export transport	Country, # dates of delivery	X
Administration	Invoice administration	# Dates of delivery	X
NBD	-	-	X

Information for the schedule for offers is presented in table 58. Here, it can be seen that in total 9 activities are processed in the schedule. All activities of R&D and new business development are processed in the matrix of remains, since they do not have a clear relationship to individual customers or offers. It can also be seen that all expedition activities are processed in the schedule, since they all are related to individual products that are bundled in offers. In total, about X euro's are allocated in the schedule, which accounts for about 44 percent of all overhead costs. Other information that is shown in the table is the type of cost driver that will be used for each activity. To a large extent, the type of cost drivers conforms to the drivers that are used in the general cost allocation. The schedule of offers will be applied to a selection of offers in the next chapter. This should lead to an accurate assessment of the profitability of offers.

Figure 37: Matrix of remains filled with overhead costs

	Customer groups		Energy	Installation	Industry	Rail/infra	MENO	Broadband	
Product groups									
1. Energy									
2. Installation									
3. Instrumentation									
4. Telecom fiber									
5. Telecom cable									
6. Telecom trade									

Similar to the total matrix of the general cost allocation, product costs are used in computing the costs of the 36 pieces of the matrix of remains. In figure 37, the matrix of remains is presented. Here, all group-related overhead costs are processed for the detailed cost allocation. Similar to the general cost allocation, indirect costs are also presented as a percentage of the product costs. These percentages can be used in the schedule for offers and are presented in figure 38.

Figure 38: Matrix of remains filled with overhead as percentage of product costs

	Customer groups		Energy	Installation	Industry	Rail/infra	MENO	Broadband
Product groups								
1. Energy								
2. Installation								
3. Instrumentation								
4. Telecom fiber								
5. Telecom cable								
6. Telecom trade								

8. How can a system of customer profitability be developed at TKF?

In this chapter, the cost allocation that is described in the previous chapter is combined with information of TKF to assess customer profitability. In the former situation, profitability is analyzed by analyzing gross profit margins and value added. Beside this, for specific projects or large offers a business case is made that combines estimations of sales efforts, R&D efforts and expected future revenues before it is decided to undertake the project or not. However, no cost allocation is performed before making these business cases and they are not recorded in Navision. Similar to the cost allocation process that is described in this thesis, also profitability will be analysed in two ways. First, general profitability is analyzed by adding profitability information to the product/market matrix. By this way, a quick scan can be made of group profitability. Second, detailed profitability is analysed. This is done by applying the schedule for offers (excel sheet) to offers. This schedule is described in part 7.4, where it is also mentioned that the matrix of remains will be applied in the schedule for offers. Both types of profitability are separately elaborated in the remainder of this chapter.

8.1 General profitability

As said, the product/market matrix will be used for presenting general profitability at TKF. In the current situation, the administration/control department of TKF also uses the product/market matrix for presenting profitability. In the current format, revenues, gross profit margins and value added are presented. Such a matrix is applied to the year 2009 and is presented below in figure 39. The three dimensions revenues, gross profit margins and value added are separately discussed below. As can be seen in the figure, now also the product groups materials and semi-finished products are considered. This is because these groups are also included in the current analysis of profitability that is used by TKF. As said earlier, there are no indirect costs allocated to these product groups and therefore these groups were not discussed in chapter seven.

Figure 39: Basic scheme of profitability used at TKF

	Energy			Installation			Industry			Rail/infra			MENO			Broadband		
	Revenues	GM%	VA%	Revenues	GM%	VA%	Revenues	GM%	VA%	Revenues	GM%	VA%	Revenues	GM%	VA%	Revenues	GM%	VA%
Energy																		
Installation																		
Instrumentation																		
Telecom fiber																		
Telecom cable																		
Telecom trade																		
Sub-total																		
Materials																		
Semi-finished																		
Total																		

- Revenues

The revenues that were presented in chapter six are included in figure 39. These revenues are based on cables and other products that are sold to customers in 2009. At TKF, it is strictly monitored what orders will be completed in a specific month and what is already delivered. At the moment cables and components are delivered the revenues are booked. In the remainder of this chapter, the amount of revenues presented in figure 39 will be used for analyzing profitability. It is also possible to present revenues for individual customers.

- Gross profit margin (GM%)

At TKF, gross profit margins are calculated by using the revenues and product costs for a given period. Revenues less product costs is gross profit. In figure 39, this gross profit is presented as a percentage based on revenues. Gross profit margins can be computed for products, customers, offers, customer groups and product groups. In computing gross profit margins overhead costs are not considered.

- Value added (VA%)

Value added was already mentioned in part 7.4 and is further explained below. Total value added is the equivalent to revenues less outside purchases. These outside purchases are the costs of materials and outside services to produce. The amount of added value indicates to what extent the activities that take place at TKF result in increased value of the products that are offered. In general, the amount of added value is positive, since product prices will be higher than the price of materials that are purchased. From information that is available in Navision a list can be made of the total costs of materials for each group of the product/market matrix. Subsequently, material costs can be compared to revenues to calculate the added value in percentages. An offer can have a low profit margin but at the same time high value added. In some cases, it can be very interesting to undertake such an offer. This can be when TKF has unused capacity in the factory. In this case, TKF can earn a large part of their fixed factory costs back since the offer has high value added.

In the remainder of this part, the influence of the old way of dealing with indirect costs on profitability will be compared to the influence of the new way of dealing with overhead costs on profitability. This means that a comparison will be made between the old method of using an add-on (%) above the product costs and the new method of allocating indirect costs. For both methods the value added (VA%) will the same, since revenues and material costs do not change. Consequently, value added will not be considered in the comparison.

8.1.1 Profitability with old way of dealing with indirect costs

As indicated in chapter two, an add-on of X percent above the product cost is used to allocate indirect costs. In this case, all customers are treated the same way with respect to overhead costs. Considering the amount of indirect costs for 2009, not all costs can be taken into account when using an X percent add-on. As can be seen in chapter five, indirect costs represented X % of the total product costs in 2009. Consequently, an add-on of X % would then be needed instead of the X% add-on. For the purpose of comparing the old method to the new method, X % will be chosen as add-on. The reason for not choosing X% is that the number by itself is not important, but the method of using an add-on is most important. Therefore, the new method of allocating overhead costs will be compared to the method of using an X % add-on above the product costs. In figure 40, profitability is presented when using an add-on above the product cost to allocate indirect costs. As can be seen, revenues, gross profit margins (GM%) and net profit margins (NM%) are included in the figure. This last dimension is discussed below.

Figure 40: Profitability when using % add-on above product costs

	Energy			Installation			Industry			Rail/infra			MENO			Broadband		
	Revenues	GM%	NM%	Revenues	GM%	NM%	Revenues	GM%	NM%	Revenues	GM%	NM%	Revenues	GM%	NM%	Revenues	GM%	NM%
Energy																		
Installation																		
Instrumentation																		
Telecom fiber																		
Telecom cable																		
Telecom trade																		
Sub-total																		
Materials																		
Semi-finished																		
Total																		

- Net profit margin (NM%)

Compared to gross profit margins, now also indirect costs are included in the analysis. Net profit margin is then revenues less product costs and indirect costs, as a percentage of revenues. This margin is called net profit margin since now most costs at TKF have been considered. However, this cannot be seen as operating income, since other factors such as revaluations influence the actual profit/operating income that is received by TKF in 2009. The effect of the old method and the new method of dealing with indirect costs will be compared by looking at net profit margins. Therefore, net profit margins are very important in this chapter.

As can be seen in figure 40, net profit margin is for each product/market combination lower than gross profit margin. As said, this is because in gross profit margins also indirect costs are considered. However, the difference between gross profit margins and net profit margins is not X %. This is due to the fact that profit margins are based on revenues (% of revenues), whereas the overhead add-on is based on product costs (X % of product costs).

8.1.2 Profitability with new way of dealing with indirect costs

Now, profitability will be analysed after performing the ABC-analysis of chapter seven. In the general cost allocation, costs were allocated to product groups and customers groups by using the ABC-method. The reason for performing this allocation was to see which groups are more responsible for indirect costs and to see which groups are less responsible for indirect costs. The extent to which products or customers demand additional efforts from TKF is taken into account in this analysis. However, it is mentioned that a relative large part of the indirect costs cannot be allocated since these costs are too general. These costs can only be assigned to the matrix by using an add-on above the product cost. Considering the amount of general indirect costs, the add-on will be Y %. Consequently, in this part the ABC-method together with an add-on of Y % will be used. Logically, making difference in the allocation to the groups of the product/market matrix influences the profitability of these groups. The influence of this new method will again be analysed by looking at net profit margins. In figure 41, profitability is analysed when using the new way of allocating indirect costs. Again, revenues, gross profit margins (GM%) and net profit margins (%) are used in the figure.

Figure 41: Profitability when using ABC-method

	Energy			Installation			Industry			Rail/infra			MENO			Broadband		
	Revenues	GM%	NM%	Revenues	GM%	NM%	Revenues	GM%	NM%	Revenues	GM%	NM%	Revenues	GM%	NM%	Revenues	GM%	NM%
Energy																		
Installation																		
Instrumentation																		
Telecom fiber																		
Telecom cable																		
Telecom trade																		
Sub-total																		
Materials																		
Semi-finished																		
Total																		

As can be seen, the profitability of the product groups materials and semi-finished products is higher when using the ABC-method than when using an average add-on. This is due to the fact that in the old situation X % of the product costs was assigned to these groups, whereas in the new situation a lower percentage (Y %) of the product costs is assigned to these groups. In the remainder of this chapter, these product groups will not be analysed. The reason for excluding these groups is that this research focuses on end products. Both raw materials and semi-finished products do not require further indirect efforts and therefore the ABC-method is not applied to them. In the next part, the differences between the old method and the new method are further discussed.

8.1.3 Comparing the old method to the ABC-method

In the theoretical analysis, it is argued that the ABC-method is a more accurate method of allocating indirect costs. So it is assumed that this methods comes closer to the reality than using an average add-on, when looking at what products and customers are responsible for indirect costs. The two methods can be compared by looking at the net profit margins that were presented earlier. Differences between the margins of these methods are caused by differences in overhead costs. If for example the net profit margin of the old method is higher than the margin of the new method, then more overhead costs have been allocated to this group in the new method. For each product/market combination it can be identified whether more overhead costs, less overhead costs or the same amount of overhead costs are allocated to this combination when comparing both methods. The comparison between the two methods is presented in table 59. Here, the differences between the influence of indirect costs on profitability are given. The sign (-) means that the new ABC-method results in a lower margin and is thus unfavourable. This decline in net profit margin arises because more indirect costs are assigned in the new method. The sign (+) is favourable and means that less indirect costs are assigned in the new method. Next, the sign (0) means that there is

barely difference between the two methods. The sign (--) is very unfavourable and means that much more indirect costs are assigned in the new method. Finally, the sign (++) is very favourable and means that much less indirect costs are assigned.

*Table 59: Comparison of add-on (%) method and ABC-method**

Customer groups → Product groups ↓	**Energy**	**Instal.**	**Industry**	**Rail**	**MENO**	**Broad-band**
Energy	+	0	--	0	--	+
Installation	+	0	--	0	--	0
Instrumentation	0	-	--	0	--	0
Telecom fiber	+	0	--	0	--	0
Telecom cable	0	0	--	0	--	0
Telecom trade	0	--	--	--	0	--
Total	+	0	--	0	--	0

** The following categorization is used:*
(0) = difference in net profit margins between -0,9% and 0,9%
(-) = unfavourable difference in net profit margins between -1,0% and -1,9%
(+) = favourable difference in net profit margins between 1,0% and 1,9%
(--) = very unfavourable difference in net profit margins between -2,0% and more
(++) = very favourable difference in net profit margins between 2,0% and more

So the table above shows that whether the ABC-method results in higher (+), lower (-) or relatively the same (0) net profit margins. The table shows some interesting findings. As can be seen, the net profit margin for the customer group rail is relatively the same for the two methods. It seems that this group is not much responsible for causing indirect costs. For the customer groups industry and MENO and the product group telecom trade a lot of (--) signs are shown in table 59. It seems that these groups are more responsible for causing indirect costs than average and therefore have lower profit margins. Consequently, an average add-on for these groups would not be appropriate. Next, the profit margins for the customer group energy were in most cases higher for the ABC-method. This means that less indirect costs are assigned to energy in the ABC method, since energy is less responsible for indirect costs than average. When looking at the complete table, it can be concluded that for 17 of the 36 pieces the net profit margins were relatively the same (margins between -0,9% and 0,9%). This means that in 17 cases both methods result in relatively the same amount of indirect costs. However, 19 pieces have different profit margins by using Activity-Based Costing. Since it is assumed that ABC is more accurate than using an average add-on, it can also be concluded that the profit margins of figure 41 are more precise than the profit margins of figure 40.

8.2 Detailed profitability

In the detailed profitability, the returns of offers will be analysed. On the one hand, it can be determined what the return will be before accepting an offer. On the other hand, it can also be determined what the actual return was after completion. A precise analysis of the profitability of offers can only be achieved when indirect costs are allocated to these offers in an accurate way. This can be achieved by using the excel sheet that is described in part 7.4. As said, in this schedule, information can be derived from Navision and a part of the information has to be filled in by sales staff. Also remaining indirect costs will be considered in the excel sheet, which consists of two parts. First, the matrix of remains is applied to the offers by looking at the product/market combination. Here, figure 34 can be used. Second, general indirect costs are also taken into account. This is done by using the Y % add-on above the product costs of the specific offer.

The excel sheet is already described in part 7.4. As said earlier, the orange parts of the excel sheet should be filled in by sales staff and the remaining part of the sheet will then automatically be filled. In this public version of the master thesis, the schedule for offers is applied to a fictive offer. This can be seen in figure 42 and is explained below. The figure shows what information needs to be filled in and how profitability of offers can be presented.

Figure 42: Schedule for offers applied to a fictive offer

Customer-related information:

Date	25-10-10	
Offernumber	OF nr. X	
Customer number	10517	Customer Y
Customer group	BROADBAND	

Offer Details:

Total number of offer lines	5	
Total number of deliveries	1	
Land code	RU	Russia

Total articles	**169.500**
Total cost&discoun	**0**
Total overhead	**12.818**
Profit margin (P.M.)	**10,97%**
Value Added (V.A.)	**28,04%**
Old method	18.601
Profit margin	7,55%

Charged cost (non articles) and discounts:

Total									**0**
Description				Quantity				Unit price	Total Price
Cutting & rew inding									0
Transport									0
Handling									0
Engineering									0
Discount (must be a negative amount)									0
Other:									0

Product-related information:

	Total								**169.500**	**11.649**	**11,7%**	**28,7%**
Row	Article number	Description	Product group	Quantity	# lengths	# lrr. lengths	Packing	Unit price	Total Price	Overhead	P.M.	V.A.
1	77757	LTC RP 144x SM G.652D (12x12)	TEL-GLAS	50.000	1	1	haspel	1,000	50.000	8.356	-114,7%	-78,6%
2	75061	CTC 1,2kN 12x SM G.652D	TEL-GLAS	35.000	8	0	haspel	0,900	31.500	868	64,5%	74,8%
3	75407	DAC 12x SM G.657A1	TEL-GLAS	30.000	5	0	haspel	0,800	24.000	772	58,6%	65,0%
4	75095	CTC 1,2kN 2x SM G.652D	TEL-GLAS	40.000	8	0	haspel	0,700	28.000	697	68,0%	80,9%
5	75098	DAC 2x SM G.657A1	TEL-GLAS	60.000	5	0	haspel	0,600	36.000	956	65,8%	72,7%

As can be seen, the schedule is applied to an offer that consists of 5 offer lines. The offer belongs to the customer group broadband and the products will be delivered in Russia. In the figure, no charged costs are presented. As can be seen, this offer has a profit margin of about 11% and the total value that is added by TKF is about 28%. In applying the schedule for offers, comparisons can be made between the old allocation method and the new allocation method. This is also done in figure 42. The comparison shows that the profit margin in the new method is about 3,4 percent points lower than the profit margin that would be presented when using the old allocation method. Consequently, less indirect costs are assigned to this fictive offer by using the ABC method. Applying the schedule for offers to many offers would show the influence of indirect costs more accurately. However, this cannot be done in this public version. For now it can be concluded that a more accurate allocation of indirect costs leads to a more precise analysis of the expected profitability of offers.

8.3 Conclusion

In this part, general profitability as well as detailed profitability is discussed. In other words, profitability is analyzed on group-level and on offer-level. In analyzing general profitability, the product/market matrix is used. First, a basic scheme is described that is currently used by TKF to analyze profitability. This basic scheme is applied to the year 2009. In the scheme, revenues, gross profit margins and value added can be found for each of the product/market groups. After performing the general cost allocation, the goal is to see what the return is after considering product costs as well all indirect costs. Therefore, analyzing net profit margins is needed instead of gross profit margins. Here, all indirect costs can be considered. Computing net margins can be done for the old allocation method as well as for the new ABC-method. For the old method, an add-on of X % above the product costs is chosen. For both methods, revenues, gross profit margins and net profit margins are presented in the product/market matrix. Subsequently, the net profit margins of both methods can be compared in order to see which product/market combinations are favourable and which are unfavourable. Favourable means that higher margins are obtained in the ABC-method and that consequently fewer indirect costs were assigned. Unfavourable means that lower margins are obtained in the ABC-method and that consequently more indirect costs were assigned. Eventually, it can be seen that for many pieces of the matrix different net profit margins arise when using the ABC-method. Consequently, indirect costs have an important influence on profitability in the matrix.

In analyzing detailed profitability, the schedule for offers that is described in part 7.4 is used. In the excel sheet, information about specific offers is filled in after which the remaining part of the sheet is automatically filled. Subsequently, also other indirect costs are considered. This is done by using the matrix of remains and a Y % add-on of product costs for general overhead costs. In this public version of the thesis, the schedule is applied to a fictive offer.
For this offer, also profit margins are computed for the old method of allocating indirect costs. The computed profit margins of both methods can be very different. It is concluded that the influence of indirect costs on is important on offer-level. It should be kept in mind that the profit margins that are presented in this chapter are not identical to operating profit. Several factors influence the actual profit that is achieved by TKF, such as revaluations. However, the margins that are presented in this thesis give feeling about the profitability of customers or customer groups. Next, the profitability figures make it possible to compare different customers to each other.

9. Conclusions and recommendations

9.1 Conclusions

This research is focused on the allocation of indirect costs, also called overhead costs, and the analysis of customer profitability at TKF. In the current situation, indirect costs are allocated by using an X percent add-on above the product costs. This is a relative simplistic way of spreading costs over the customer base. However, in reality there can be great differences in the amount of supporting activities that customers require. This demand on supporting activities is related to the allocation of indirect costs and is eventually also related to customer profitability. Another problem in the current situation is that indirect costs are barely taken into account by sales staff. The analysis of the current situation has lead to the formulation of the following research question:

How should overhead costs be allocated at TKF to identify the profitability of each of their customers/customer groups?

Since this is a very general question, some sub questions are set up that in the end should lead to answering the above research question. These sub questions can be seen in chapter 2 and are elaborated in chapter 3 till 8. In this part, these sub questions are also be used. Each sub question is answered separately, after which the overall research question is answered in this part. The sequence of the sub questions of chapter 2 is somewhat adjusted in this part.

1. What does theory say about cost allocation?

As said, this research focuses on the allocation of indirect costs and the analysis of customer profitability. In the theoretical framework, the opposite direction is followed. First, Customer Profitability Analysis (CPA) is discussed. In this part, it is concluded that some factors cause customers to be high cost-to-serve whether other customers will be low cost-to-serve. Therefore, the allocation of indirect costs can have an important influence on customer profitability. After discussing several definitions of cost types, four possible allocation methods were analyzed. First, traditional costing systems are relative simplistic and allocate variable as well as fixed costs by using a small number of volume-based cost drivers, such as machine hours. Second, direct costing only considers variable or direct costs for decision-making. Fixed costs are then seen as period costs and are not included in the allocation. Third, in Activity-Based Costing (ABC), costs are assigned to activities and are subsequently allocated to cost objects. This is done by identifying a transaction driver for each activity. Fourth, at Time-Driven Activity-Based Costing (TDABC) the time it takes to perform an activity is the basis. This method requires time estimations of each activity and an estimation of practical capacity. In this case, duration drivers are used for the allocation. It can be concluded that ABC and TDABC consider all indirect costs in their allocation and are also more accurate than the other two methods. Some important disadvantages of ABC are identified, such as that it is complex, it is not sufficient accurate and that it requires a lot of time in implementing this method. However, also TDABC has some important disadvantages, such as that still a lot of effort is needed in developing and implementing the system. Next, measurement errors exist since many time estimations are incorrect. Some practical considerations have lead to the choice of Activity-Based Costing (ABC) for the allocation in this research. These practical considerations were that interviewees were unable to give time estimations and that setting up the right time equations would be too time-consuming for this research.

2. Which processes and activities can be identified at TKF?

The basic process of TKF shows that sales, procurement, production, expedition and administration are involved. Several departments are supportive in nature, of which Research & Development (R&D)

and New Business Development (NBD) are the most important. This research is focused on indirect costs that are not processed in the product cost at TKF. Therefore, procurement and production are not analyzed. The relevant activities of sales, R&D, expedition, administration and NBD are discussed in chapter four and are shortly summarized below.

- Sales: the sales staff consists of account managers, inside commercial staff and inside administrative staff. Account managers primarily work outside TKF and perform the following two activities: customer acquisition & retention and bargaining with customers. Inside sales staff is focused on making offers, processing orders, monitoring & leading the continuation and after-sales service.
- R&D: this department is especially focused on development projects, which can be general and customer-specific. Next, R&D has to work on incoming R&D requests and application engineers have to visit customers for technical support. Finally, some general activities can be identified at R&D, such as material technology, measuring and packaging.
- Expedition: Expedition is mainly focused on products. A part of the expedition activities are directly related to production and are processed in the product cost. Therefore, the activities processing raw materials & goods in production and Telecom Products & Systems (TPS) are not analyzed in this research. Important expedition activities are processing end products, completing end products and transport to customers.
- Administration: at the administration department primarily supportive activities are performed, which have to do with bookkeeping and control. However, there are some customer-specific activities at administration. These are processing sales invoices, booking payments and debtor administration.
- New Business Development: Activities are most often not related to individual customers, but to customer groups or the market as a whole. NBD is also active in finding new target areas and interesting projects. The activities can be roughly divided in two parts: performing market research and concept & product development.

3. How can costs be categorized at TKF?

The most important categorization that is used at TKF is between product costs and indirect costs. In figure 60, the different components of the product cost is given. As can be seen, the product cost consists of material costs, production costs and production overhead.

Table 60: Composition of product costs at TKF

Material costs	A
Production costs (man & machine)	B
Production costs per unit	A + B
Production overhead	C
Product cost	A + B + C

Source: Van der Voort (2005)

When looking at the indirect costs at TKF, it can be concluded that the five departments that are discussed in this thesis are responsible for a large part of the costs. This can also be seen in figure 61. Important cost types of remaining overhead costs at TKF are direction, IT automating, reception and the HR department.

Table 61: Composition of indirect costs at TKF

Overhead; Sales, R&D, Exp., Adm. & NBD	87,47 %
Remaining overhead costs	12,53 %
Total indirect costs	100 %

For 2009, the share of indirect costs over the total product costs seem to be X percent. This does not conform to the X percent that was thought of by TKF. However, this can be due to variances in sales volume and changes in prices of copper and aluminium. In chapter five, the costs of each of the five departments are analyzed. In general, labor costs represent the largest part of the costs, especially for sales, R&D and new business development. The costs of transport are grouped under expedition costs and are considered in the cost allocation. Finally, selling expenses can represent a significant share of the costs, mainly for sales. Important selling expenses are the costs of car use and travelling. The costs that are described above are included in the cost allocation at TKF that is described in chapter 7.

4. How can customers and products be categorized at TKF?

As mentioned earlier, customer profitability is analyzed by allocating indirect costs. It is also indicated that some activities are related to customers whether other activities are related to products. Consequently, the final cost objects of the cost allocation process will be products as well as customers. TKF's products can be directed at the transmission of energy and the transmission of information. Products for the transmission of energy can be low, medium and high voltage cables. Products for the transmission of information can be fibre channel cables, telecom cables, co-axial cables and TPS. The most important categorization of products has to do with the following six product groups: energy, installation, instrumentation, telecom fiber, telecom cable and telecom trade. In chapter six, the revenues for these six groups are presented. As said, also customers are analyzed. TKF is doing business with individual customers as well as concerns. Next, contracts are made with technical wholesalers to which TKF delivers their products. A categorization of six customer groups is mostly used at TKF. This categorization is also used by administration. The following customer groups are recognized: energy, installation, industry, rail, MENO and broadband. Again, revenues of 2009 are presented for these six group. Finally, customers and products can also be presented together. This can be done in a product/market matrix, which is used by TKF's administration. This matrix consists of 36 combinations of customer groups and product groups. Revenues as well as costs can be presented in this matrix.

5. How can costs from relevant cost centres be allocated at TKF?

For the allocation of indirect costs, two separate methods have been chosen. The first one is a general cost allocation that allocates costs to the product/market matrix of TKF. The intention of this method is to get a quick scan of how groups are performing and subsequently the individual products and customers that belong to these groups. The second method is a detailed cost allocation that allocates costs to on the one hand a schedule for offers and on the other hand a matrix of remains. In the schedule, nine activities are processed that are related to individual customers and offers. Considering indirect costs in making offers should lead to a more accurate indication of whether an offer will eventually be profitable for TKF or not and subsequently what actions can be taken to improve profitability. It should also make sales staff more aware of activities that cause overhead costs and that profitability is not only about revenues and about product costs. Overhead that cannot be processed in the schedule is processed in a product/market matrix of remains. The detailed cost allocation should give a more specific indication of how profitable customers are. So instead of a quick scan that is provided by the general allocation, now a deeper analysis is made of customer profitability. There is no real connection between the general cost allocation and the detailed cost allocation, since other data is required for analyzing and allocating costs for specific offers. In most cases, for allocating costs to offers additional data is required that needs to be recorded in the system. Beside this, the detailed allocation only looks at revenues and costs that are the result of offers, whereas the general allocation also takes orders into account that are received by other means than by offers. In table 62, the division of indirect costs in the general cost allocation is presented. In table 63, the division of indirect costs in the detailed cost allocation is presented. Both tables show that 63% of the indirect costs can be allocated and that 37% of the costs is too general to be allocated.

Table 62: Indirect costs in general cost allocation

Overhead TKF	Costs	Percentage
- Sales	X	24,78%
- R&D	X	7,69%
- Expedition	X	28,22%
- Administration	X	0,81%
- New business development	X	1,50%
Total overhead costs allocated	X	63,00%
Remaining overhead (not allocated)	X	37,00%
Total overhead costs 2009	X	100%

Table 63: Indirect costs in detailed cost allocation

Overhead TKF	Costs	Percentage
Schedule for offers	X	44,63%
Matrix of remains	X	18,38%
Total overhead costs allocated	X	63,00%
Remaining overhead (not allocated)	X	37,00%
Total overhead costs 2009	X	100%

In the general cost allocation, each activity is split into two parts. First, the computation of activity costs is described. Activity costs were always based on the time consumption of employees, as usual for activity-based costing. This time consumption can be a percentage given to each activity but can also be a division of the total FTE over the relevant activities. Second, the selection of the right cost driver for the allocation is discussed for each activity. This is always done by analyzing the relation between activity and cost object. Each time a driver is chosen that best explains this relation, also considering the availability of data. This data availability was an important restriction. At for example sales, no information can be used with respect to the visits that are made by account managers. Next, at the R&D department some useful information is recorded but is not used by the other departments. This has mainly to do with the hours that are spent by R&D employees. This made it necessary to use estimation that are made by the R&D manager. Also at expedition, limited information was available, especially with respect to cutting and rewinding cables. In these cases, deeper analysis of the relation between activities and cost objects was needed. The best cost drivers were then selected and assumptions were needed to determine the cost driver rates.

After the cost allocation, the total costs are known for the six customer groups and the six product groups. These costs are divided over the 36 pieces of the product/market matrix by using product costs of each combination. Concluding, product costs are used instead of revenues, since customers or offers with high profit margins should not necessarily demand more indirect costs. Beside this, using product costs conforms to the old way of handling indirect costs that is based on product costs. For the detailed cost allocation, an excel sheet is used that represents the schedule for offers. In this sheet, information about customers, products and offers can be derived from Navision. This can subsequently be combined with the driver rates that have been calculated in chapter seven. This results in an amount of indirect costs for a specific offer that can be taken into account in analyzing profitability.

6. How can a system of customer profitability be developed at TKF?

Similar to the cost allocation process, also profitability is analyzed in a general and a detailed way. First, a basic scheme of the product/market matrix is presented in chapter 9, which includes revenues, gross profit margins (%) and value added (%). This scheme is currently used by TKF to analyze group-profitability. Also in the new situation general profitability is analyzed by using the

matrix. In chapter 9, general profitability is analyzed by comparing the old way of dealing with indirect costs to the new method. In this case, the old method is an add-on of X % above the product costs. The new method is the ABC allocation that is described in this thesis and that is assumed to be more accurate. For both methods revenues, gross profit margins (%) and net profit margins (%) are presented. Net profit margins are computed as revenues less product costs and indirect costs, as a percentage of the revenues. These net margins of both methods can be compared to each other. In this way, it can be identified for which product/market combinations profitability is higher for the ABC method. Consequently, it can also be seen which groups are responsible for more or less indirect costs compared to the old 'add-on method'. This comparison is valuable to TKF since it shows which combinations require more indirect efforts and which combinations require less indirect efforts.

As said, detailed profitability is analyzed by using an excel sheet that serves as the schedule for offers. Information of specific offers can be derived from Navision and processed in the excel sheet. Beside this, sales staff can fill in some additional information. This information can be combined with the cost driver rates and subsequently indirect costs can be presented in the sheet. The schedule is applied to three offers to analyze profitability. These offers are varied since they have different customer groups, product groups and consist of different number of products. Next, these offers have a value above € 100.000, since this was the condition for using the schedule. In this detailed profitability analysis, again a comparison to the old method is made. After applying the schedule it can be seen that in some cases a substantial difference in net profit margin arises in the new method. In other cases, the margin of the old method seemed to be reasonably similar to the new method.

Answering the research question

Above, all sub questions of this research are answered. Finally, the overall research question can be answered from the above conclusions.

Overall research question: ***How should overhead costs be allocated at TKF to identify the profitability of each of their customers/customer groups?***

In allocating indirect costs an accurate approach should be chosen that identifies which customers eventually are responsible for efforts that are made by TKF. So there is a connection between efforts, indirect costs and profitability. Therefore, more accurate approaches such as Activity-Based Costing (ABC) and Time-Driven Activity-Based Costing (TDABC) are the preferred methods. Applying TDABC would however be difficult, because interviewees mostly indicated they were unable to give time estimations and because setting up time equations would also be too time-consuming. Consequently, ABC is chosen in this research. This method requires an analysis of activities, costs and cost objects before costs can be allocated. This is done in respectively chapter 4, 5 and 6. With respect to the cost allocation process, two separate approaches have been chosen: a general cost allocation and a detailed cost allocation. The first one is based on group-level, whereas the second one is focused on offers. By assigning indirect costs to offers, the expected profitability of these offers can be calculated more accurately. In this phase, changes can be made to offers that can enhance profitability. Next, it can be possible to see what profitability of offers has been after completion of these offers.

For the general cost allocation a product/market matrix has been used. This matrix consists of the combination of six customer groups and six product groups. Consequently, the matrix has 36 pieces. This matrix is an appropriate format in this research since some activities are related to customers whereas others are related to products. Drivers should be selected that best explain the relationship between activities and customers/products. Next, data of these drivers should be available. The drivers that are selected in chapter 7 of this thesis will lead to an accurate allocation of the indirect

costs. As mentioned earlier, the availability of data created important restrictions for selecting the right drivers. After selecting drivers and calculating cost driver rates, the total indirect costs are known. These costs are presented in the product/market matrix by using product costs. Finally, this information can be combined with information about revenues and gross profit margins. In this way, net profit margins can be computed which shows the returns that are made on these groups. In chapter 8, these margins are compared to the margins that would have been the result of the old method of handling indirect costs. In this case, the old way of handling indirect costs is an add-on of X % above the product costs. Comparing profitability of the two methods showed that in many cases groups have different profit margins. Consequently, the amount of indirect costs varies strongly between the old and new method of allocating costs.

For the detailed cost allocation, a schedule for offers is chosen which can be used by sales. Information that is needed for the schedule can have to do with customers, such as the relevant customer group, but can also have to do with products, such as the number of lengths of a certain type of cable. A large part of the necessary information can automatically be derived from Navision. Sales staff should fill in the remaining information. Beside this information, a matrix of remains is applied to the schedule for offers. This matrix is set up in the same way as the general product/market matrix. In the matrix of remains, less indirect costs are processed, since a large part of the indirect costs is processed directly in the schedule for offers. Eventually, in the schedule the profitability of the offer is indicated by calculating the net profit margin and the value added. In this case, the expected profitability is known more accurately before the offers are accepted. This expected profitability in many cases is different from the profitability when using an add-on of X % above the product costs. This can be seen in three examples that are elaborated in chapter 8. Concluding, applying the schedule for offers results in valuable information. Applying the schedule will not be too time-consuming, since filling in the information will cost no more than fifteen minutes. Beside this, the schedule will only be applied to offers that are valued above € 100.000.

9.2 Recommendations

The above answer on the research question shows how indirect costs are allocation at TKF and how customer profitability is analyzed. In this part, recommendations are given about cost allocation and customer profitability that can be used by TKF. These recommendations are divided into three parts. First, general recommendations are given. These are mostly related to the conclusions that are given above. They have to do with the practical use of the cost allocation process and the method of analyzing customer profitability. Second, recommendations are given about the use of data. As mentioned earlier, the availability of data created restrictions for the allocation. In this part, the future use of data is discussed in order to have fewer restrictions. Third, recommendations are given about allocating other costs at TKF. In this research, only indirect costs are analyzed that are not processed in the product costs. However, it may be interesting to TKF to consider also other costs in a customer profitability analysis. These three parts are separately discussed below.

9.2.1 General recommendations

For the purpose of assessing customer profitability more accurately, an activity-based cost allocation is needed. Performing a general allocation and a detailed allocation will lead to both a quick scan of profitability of groups and to a detailed analysis of returns made on offers. Therefore, using the general cost allocation and the detailed cost allocation is recommended for TKF in the future. The awareness of overhead costs can be increased and now more accurately can be dealt with costs and profitability.

However, the cost allocation and profitability analysis can only result in valuable information if the data is periodically reviewed. According to Noone & Griffin (*1999*), the frequency of updating the activity data will depend on how the activities change over time. Next, driver data that is not available at the moment of implementation will be updated in the system as it becomes available. This will also apply to TKF. Activities that are performed at TKF in 2009 will change the coming years. Especially the division of the number of FTE over the activities can change a lot. For 2010, already many changes have occurred with respect to the five departments that are analyzed. As an example, the organization of expedition has changed a lot because of closing the factory in Lochem and also moving expedition to Haaksbergen. Concluding, periodically updating the allocation is needed at TKF because of changes in activities. Next, the system should be updated to incorporate new driver data that was not available in 2009. According to Drury (*2008*), it is recommended that an activity-based database is maintained at estimated standard costs that are updated on an annual or semi-annual basis. After consulting with the controller of TKF, it is decided that the cost database should be updated annually. The reason for choosing annually instead of semi-annually, is that changing data during the year will lead to confusion at sales. Changing data will lead to different margins and for sales staff it will be unclear on what basis sales staff is assessed. Consequently, updating the system should be done annually at the beginning of the year.

This research is focused on setting up a process of cost allocation and customer profitability analysis. So the design of the allocation is made and it is identified how profitability should be presented. By applying the new ABC-method, more accurate returns are obtained than in the current situation. However, there are no conclusions given about these returns. The profitability figures that are presented in this thesis have to be analyzed by TKF. It can be said that TKF has to focus more on customers that are profitable and should get rid of unprofitable customers. However, it is not that simple. As said earlier, other factors than profit margins and value added should also be considered. Market circumstances, commercial issues and strategic issues should all be taken into account in assessing profitability and subsequently in making decisions. Other factors that need to be considered are payment conditions and costs that are charged out, since these factors can influence profitability of customers and offers. After analyzing all this information it is up to TKF to make

decisions about focusing more on certain product groups, customer groups or individual customers. Concluding, profit margins that are presented in this thesis and other company information should be considered by TKF before actions can be undertaken.

9.2.2 The use of data

In the current situation, business cases are set up for some large customer-specific projects. It is not known in what cases such business cases are required. However, the fact that business cases are made shows that TKF considers the efforts of sales and R&D as important to analyze before offers are approved. TKF has plans to focus more on complex projects that require collaboration between sales, R&D and production. This makes it even more important to analyze efforts of for example sales and R&D and also to record data into the system. In chapter 7, it is already indicated that the availability of data creates some important restrictions for the allocation of indirect costs. Recording additional data can lead to a more accurate allocation of costs to customers that are responsible for causing these costs. Subsequently, also profitability will then become more accurate. This is also mentioned by Smith & Dikolli (*1995*), who argue that detailed analysis of customers may be justified if the cost of obtaining and maintaining information is not excessive. It can also be justified if the information so generated is useful in the making of strategic decisions. For sales, R&D and expedition, recording and using the following data is recommended:

- Sales

Recording data at sales has mainly to do with activities performed by account managers. Here, practical considerations determine the level of data that can be used for the allocation. For example, using the length of visits would be more precise instead of a standard rate for each visit, but this requires more effort to record (*Van Raaij, 2005*). In the current situation, information of visits is recorded in visiting reports that are sent to sales management. However, this data is not available to other departments and cannot be used in the allocation. Consequently, no information is available about the number of visits and the efforts of each visit. This is an important restriction for allocating the costs of visits. If data of visits were recorded into the system instead of the visiting reports, it would be much easier to allocate the costs of visits to the customers that are responsible for the costs. Also the efforts of recording data would not increase, since data that is already recorded at the moment will then be recorded in another way. In any case, the number of visits should be recorded and if it is possible, also the hours that are spent at customers should be recorded. This will make the allocation more precise. With respect to the efforts of inside sales staff, recording additional data would not be necessary. Recording hours would be too time-consuming and the benefits would be too low. It will also be very complex to record this data, since inside sales staff is working on several offers, orders and projects simultaneously.

TKF is planning to use a Customer Relationship Management (CRM) system. It can be possible to record the number of visits and hours of account managers in this system. Subsequently, this data can be used in the allocation process. However, it is not exactly known what data will be included in the CRM-system. A separate dimension that can be improved is the data availability of complaints. The number of complaints are recorded in the system, but the efforts that are made on these complaints are unknown. If it is recorded how many hours are spent by sales, R&D, quality management and other departments, the costs can more precisely be allocated. However, it should be examined whether this would be too time-consuming for these departments or not. At the moment, it is better to consider handling complaints as order administration, which is done in this thesis.

- R&D

As mentioned in chapter seven, the availability of data about R&D efforts changes partly in 2010. Since July 2010, hours that are spent by R&D on R&D requests are recorded in Navision, which can

make the allocation of costs more accurate. However, for some other R&D activities still improvements can be made. First, recording data of customer-specific R&D projects will increase accuracy in allocating these costs. At the R&D department, a project administration is active that shows how many hours are budgeted for each project and what is already done. So the hours are registered by R&D employees, but cannot be used in the allocation. However, since it is useful to know how many efforts are made for a specific customer, making the recorded hours available to other departments is recommended. In Navision, it should then be possible to indicate the total amount of hours that are budgeted and subsequently the actual amount of hours that are spent. This would not be very complex and would also not be too time-consuming since hours are already registered. Also with respect to application engineering, the use of data can be improved. For the last couple of years, the hours that are spent by application engineers at customers are registered and sent to sales. However, this was done in separate files that cannot be used for allocating costs. Recording the number of visits and hours in a systematic way and using them in the schedule for offers would lead to a more accurate assessment of customer profitability.

- Expedition

The expedition department of TKF is planning to scan cable reels and other products at the moment they are received until they are transported to customers. This can make it possible to see how many hours are needed in processing end products and in cutting and rewinding. At the moment, there is not many information available for these activities. Consequently, the rates that have been calculated are somewhat ambiguous, especially for cutting and rewinding. It should be analysed whether scanning products at expedition would lead to valuable information for allocating costs. In addition, it should be analyzed whether the rates for transport export can be made more accurate. Information would then be needed from expedition about contracts with transporters. Then it may be possible to calculate rates for each type of package for each country of delivery. Considering the current availability of data, the rates that are used in this research are most accurate.

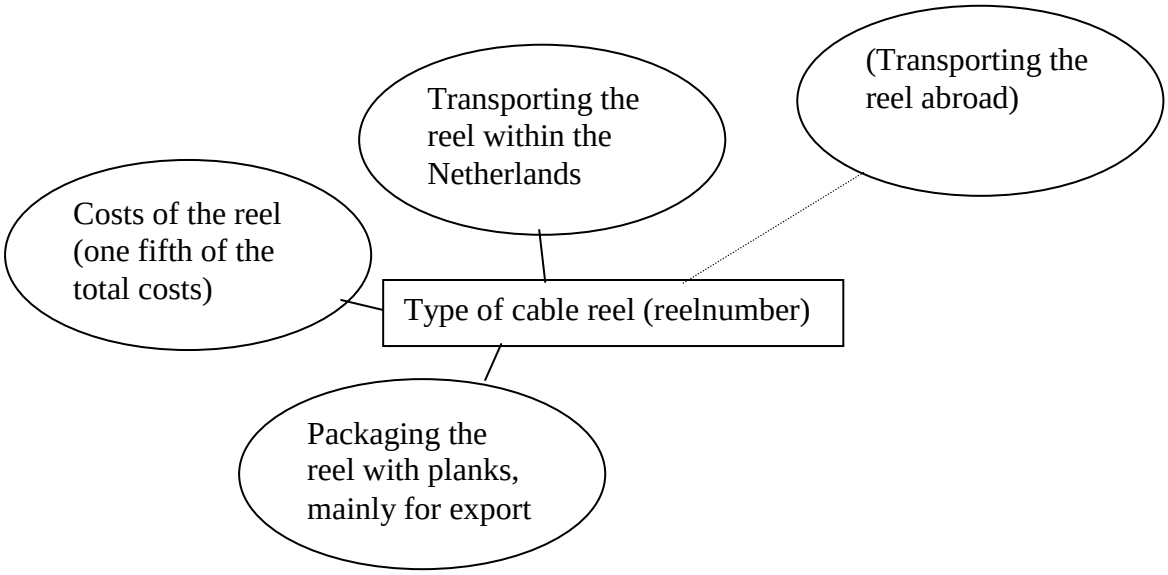
9.2.3 Future cost allocation at TKF

In this research, organisational overhead is analysed. Costs that are currently considered as product costs are therefore not taken into account. However, some of these product costs are very important in assessing whether customers are profitable or not. The two dimensions that can have an important influence on profitability are the costs of reels and packaging the reels with planks for transport. First, purchasing reels is very costly to TKF. In the current situation, these costs are processed on the balance sheet by using assets and depreciation. Consequently, the costs of the reel are not allocated to customers. According to the R&D employee that focuses on packaging, on average a reel can be used five times. This makes it possible to allocate the costs of each reel to the customers who use that reel. The rate would then be one fifth of the total costs of the reel, since the reel can be used five times on average. Different rates would then have to be used for different types of reels. This is also done for transport within the Netherlands. However, in this case sales staff has to know what type of reel will be used at the moment they are making the offer. Two options are available for indicating the specific type of reel. First, sales staff can estimate the type of reel by looking at the specific lengths of cable that is ordered and by experience of sales employees. Next, a program can be used called ‘maximum length for each type of reel’, that is available in Navision. This program selects the most appropriate reel when looking at the length of the cable and its diameter. Finally, the type of reel can be chosen, a rate can be given for the costs of that reel and the costs can then be allocated to customers.

Next to the costs of purchasing reels, also the costs of packaging these cable reels are part of the product costs of TKF. However, packaging is not done in all situations. This mainly concerns export products, which need some additional protection before they are sent. If the costs of packaging one reel is known, then the costs of this activity can be allocated to export customers to which that specific type of reel is sent. The efforts for packaging reels will vary for small reels and large reels.

Therefore, again the type of reel is an important variable. Since many activities appear to have a relationship to the type of reel, a model can be made that is presented in figure 45. In this model, also transporting the reel abroad is added, which indicates that it might be possible in the future to calculate rates for each type of reel for each land of delivery.

Figure 45: Allocating costs to the type of reel



So it seems to be beneficial to expand the current allocation with some dimensions that are currently processed in the product costs. However, some restrictions have to be examined. First, it should be analyzed whether it is possible to include product costs into profitability calculations according to IFRS guidelines. Second, it should be analyzed whether it is possible that sales staff determines the type of reel. Finally, it is also not sure if enough information is available to assign the costs of reels and packaging to a specific type of reel. Therefore, future research is needed to determine whether the model that is presented in figure 45 can be added to the allocation process at TKF.

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