Managing the trade-off between customization and standardization in new service design
the development of a modular service model

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Managing the trade-off between customization and standardization in new service design:
The development of a modular service model

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Abstract
This report describes a way to deal with the tradeoff between customization and standardization within Cofely Nederland NV. A modular service architecture should help them to stay competitive and therefore a roadmap for the development of such an architecture is created. The basis of the roadmap is derived from a literature review by combining the limited literature on service modularity. An analysis within Cofely Nederland NV showed that the current body of knowledge doesn’t cover a situation in which organizations want to include existing services in their service model. To fit the situation of the organization, the roadmap according to literature is redesigned. The redesigned roadmap, including the standardization of custom services, is applied in practice. By combining and applying the current unstructured and limited knowledge on service modularity, this study has value for both theory and practice.
Preface

This document presents the result of my graduation project for the master program Innovation Management at the Eindhoven University of Technology, which I performed at Cofely Nederland NV. The master thesis was a great opportunity for me to apply the knowledge gained in my studies within practice. The period has been very valuable to my own development as well as it provided me with lots of new insights and great experiences. This report could not have been created without the support of many people I would like to thank.

First I would like to thank my supervisor Joost Wouters. His critical view and the discussions we had were of great value for the successful completion of this project. Furthermore I would like to thank my second supervisor Jimme Keizer for his useful comments on my work.

I would also like to use this opportunity to express my gratitude to my supervisors of Cofely Nederland NV, Ruud Poppelaars and Maurice Baart. It was a pleasure to work with them during this project and I’m very grateful for all the opportunities they gave me. Their enthusiasm during our conversations has been an inspiration. I’m truly impressed by their involvement; by critical reflecting on my work they guided me in developing new insights.

A special note of thanks goes to my parents and my brother Kenny. Without their continuous support and love, I wonder if I even reached the opportunity to achieve my Master degree at Eindhoven University of Technology. It was a long way, but I hope that they are just as proud as me with the obtained result.

Thanks also to all my friends who have made six years of studying at the university so enjoyable.

Finally, I would like to conclude with the comparison between the process of doing a Master thesis project and my favorite sport tennis. Both disciplines do need a good endurance, physically and mentally. But, if you are well prepared and well supported during your journey, you can do great things and achieve unexpected great heights.

Kevin de Rooij, August 2013
Management summary
This master thesis report is the result of my graduation project conducted at Cofely Nederland NV (Cofely).

Introduction
Cofely is facing the tradeoff between customization and standardization. The key to reduce cost, achieving reliability, and improving productivity is to standardize the service process, whereas the key to ensure that customer needs are met is to customize the service offering (Wang et al, 2010). A modular service architecture can serve as a solution because it tries to combine the advantages of standardization with those of customization.

Cofely created Sustainable Asset Management (SAM), a service model that should help them to find a way to deal with the tradeoff. The problem is that Cofely has no idea which steps have to be taken in order to develop SAM in a scientifically grounded and modular way. Therefore the aim of this research is to design a roadmap for the development of a modular service model that fits the situation of Cofely.

Research questions
In order to fulfill the aim of the research, multiple research questions are formulated:

1. Which methods, models and tools to develop a roadmap for a modular service architecture are state of the art in literature?
2. Which requirements of the modular service architecture currently prevail within Cofely and what are the associated bottlenecks compared with the methods, models and tools of literature?
3. How to develop a modular service architecture that fits the situation of Cofely?
4. How to develop a revenue model that fits the modular service architecture of Cofely?

Methodology
An answer on the first research question is derived by performing a literature review. The search is carried out using search engines recommended by the TU Eindhoven: ABI/Inform, Web of Science, Science Direct, Emerald and Jstor. Furthermore the journal quality list 2012 of professor Harzing is used to assess the quality of the papers. From that point, an iterative improvement process results in an answer on the other research questions. The second research question is addressed by conducting meetings and semi-structured interviews, combined with informal conversions and SAM related documents.

By comparing the outcome of the literature review (question 1) with the requirements within Cofely (question 2) an answer on the third research question is derived. Interviews with responsible employees and participative observations result in a clear view on the way of working with respect to revenue models. This information is compared with the modular service architecture that fits the situation of Cofely to get an answer on research question 4.
Findings

The roadmap according to literature is constructed as follows:

It was not possible to apply all those steps in practice, because Cofely wants to include existing services within their model. The current body of knowledge doesn’t cover this situation and therefore a new roadmap to fit the situation of Cofely is developed:

The new roadmap still provides a way to deal with customization and standardization, because
- The model gets a standardized position within the general service process. Each service is standardized individually. Therefore the modular service model of Cofely can benefit from advantages of standardization.
- On the other hand, due to the connection between the service concept and the standardized services, it remains possible to customize the service. A customer can compose the service that fits their situation and Cofely can benefit from advantages of customization.

The roadmap is applied at Cofely. One of the steps is the standardization of custom services. Services are standardized according to three different steps:
- Link to SAM
- Standardize processes
- Standardize functional and nonfunctional properties

The revenue model is the most important (nonfunctional)property for Cofely. A revenue model per standard service is needed to fit the modular service architecture of Cofely. One of the services is provided with a revenue model using value based pricing.

Conclusion

This research project is of value for both theory and practice. As the current literature lacks a roadmap for the development of a modular service architecture and management of an organization is provided with a way to deal with the tradeoff between customization and standardization.
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1. Introduction
This introductory chapter will start with a description of Cofely Nederland NV, the organization in which this research is based. After the organizational description, the problem that the organization faces is described in section 1.2. Followed by a determination of the aim of this research in section 1.3. Multiple research questions and the associated methodology are described in section 1.4. This chapter concludes with section 1.5 in which a thesis outline is presented.

1.1 Description of the organization
Cofely Nederland NV (in the continuing of this paper referred to as Cofely) is part of GDF SUEZ Energy Services (Figure 1), the European market leader in sustainable energy and environmental solutions. With 77,000 employees, GDF SUEZ Energy Services achieved a turnover of over 14 billion euros in 2011. GDF SUEZ Energy Services is a business unit of GDF SUEZ, one of the largest energy suppliers in the world.

![Figure 1: Organization chart GDF SUEZ](image)

Cofely is a service provider and their headquarter is based in Bunnik. They support their clients with innovative, state-of-the-art solutions in Energy Efficiency, Human Comfort and Asset Efficiency for industry, infrastructure and the building services market. Cofely makes a sustainable contribution to the more efficient use of resources, a comfortable and energy-saving indoor climate and an optimum use of technical installations.

Most of the research is based within Cofely South Netherlands BV (Figure 2). This part of the organization counts 1600 employees and has a turnover of 300 million euro’s per year.
1.2 Problem Description

Cofely is facing a lot of competition in their utility market in which they mainly work with ‘activity-based’ contracts. During the execution of those contracts, there is no value added on the customer process. Just like their competitors, they are focusing on their own internal processes and using the strategy of ‘Operational Excellence’. Operational Excellence includes conducting business in a way that improves quality, obtains higher yields, faster throughput, and less waste. The market is deteriorating and Cofely is almost forced to work in a different way. Therefore they have to focus more on the processes of their customers and use a long term strategy named ‘Customer Intimacy’. This means being more accepted and known as the regular partner of the customer. Cofely experiences that customers are looking for partnership and thus a ‘Customer Intimacy’ approach.

The goal is to create a virtuous circle: the better the supplier knows the customer company with its objectives and difficulties, the better able he is to provide an optimal solution. Instead of the ‘activity based’ maintenance contracts, Cofely wants to work with ‘performance based’ contracts and look forward towards a long term relationship with their customers. Because the ‘performance based’ contracts are output based and rewarded by the customer from its primary process, they have to take care of the vision, strategy and goals of their customers. To get the optimal balance between Energy Efficiency, Asset Efficiency and Human Comfort it is necessary to manage the physical assets in a sustainable way. Therefore Cofely created Sustainable Asset Management (SAM), as presented in Figure 3:
Cofely experiences that customers are looking for partnership and thus a ‘Customer Intimacy’ approach. SAM is a service model that should help Cofely being more accepted and known as the regular partner of a customer. When service businesses increasingly focus on the needs of a particular segment, one fundamental issue is how to deliver superior value to its customers in a cost-effective way (Wang et al, 2010). From a service delivery standpoint, the challenge is to manage service quality and service productivity simultaneously. The key to reduce cost, achieving reliability, and improving productivity is to standardize the service process and product, whereas the key to ensure that customer needs are met is to customize the service offering (Wang et al, 2010).

Thus, customers are demanding a ‘Customer Intimacy’ approach, but on the other hand Cofely wants to standardize their services. A modular service architecture can serve as a solution because it is positioned in the middle of the continuum between customization and standardization. Modularity tries to combine the advantages of standardization with those of customization. Langlois and Robertson (1992) make the point that a modular system can be seen as a service that customers can separate into sub-groups, which they can arrange into various combinations to suit their personal preferences.

The problem is that Cofely has no idea which steps have to be taken in order to develop their new service model (SAM) in a scientifically grounded and modular way. On the one hand they want to customize their service offerings as much as possible, but on the other they want to improve and standardize their internal service processes. The modular service model should find a balance between them:

*How should Cofely develop a modular service model in order to find the balance between customization and standardization?*
1.3 Aim of the research
The aim of this research is to design a roadmap for the development of a modular service model that fits the situation of Cofely.

1.4 Research questions and methodology
In order to fulfill the aim of the research, multiple research questions and their associated methodology are formulated:

Research question 1:
Which methods, models and tools to develop a roadmap for a modular service architecture are state of the art in literature?

A literature review is carried out using search engines recommended by the TU Eindhoven: ABI/Inform, Web of Science, Science Direct, Emerald and Jstor. The search was performed by entering the following base keywords: “customization”, “standardization”, “service modularization” and “modular service design”. Results are filtered, because only full articles published after 1998, scholarly articles and frequently cited papers are selected.

Furthermore the journal quality list 2012 of professor Harzing is used to assess the quality of the papers. The Journal Quality List is a collation of journal rankings from a variety of sources. It is published primarily to assist academics to target papers at journals of an appropriate standard. Journals that score a two or higher according to the ABS 2011 (Association of Business Schools Academic Journal Quality Guide) are seen as well regarded and therefore allowed to use in this literature review.

Research question 2:
Which requirements of the modular service architecture currently prevail within Cofely and what are the associated bottlenecks compared with the methods, models and tools of literature?

To get a view on the current situation, a qualitative analysis is performed. Meetings with responsible employees are arranged. Specific questions will be formulated based on the outcome of the literature study. This makes it possible to experience organizational processes from within and to reveal the requirements that currently prevail within Cofely. To reap the full value of observations, they are captured. Taking nodes of observations and recording meetings where needed is a good way to do this (van Aken et al., 2007).

Semi-structured interviews with employees responsible for the SAM model within Cofely, provide extra information. During the preparation of the interview a short analysis of the perspective of the informant is performed, in order to be sensitive for possible personal and positional bias in the answers (van Aken et al, 2007).
In addition, the available SAM related documents were analyzed. These documents help to gain a better understanding of the goals that Cofely want to reach with this model. If information remains unclear after the meetings and semi-structured interviews, informants are asked for additional information and clarification through informal conversations, phone calls and emails.

**Research question 3:**
*How to develop a modular service architecture that fits the situation of Cofely?*

To get an answer on this research question, the output of the literature review (research question 1) is compared with the current situation of Cofely regarding the development of the modular service model (research question 2). An iterative improvement process will result in a roadmap for the development of a modular service architecture that fits the situation of Cofely.

**Research question 4:**
*How to develop a revenue model that fits the modular service architecture of Cofely?*

There are many different types of revenue models. Actually, a lot of innovative companies invent their own unique revenue model that fits their situation. Therefore interviews with responsible employees and participative observations result in a clear view on the way of working with respect to revenue models. This information is compared with the modular service architecture that fits the situation of Cofely.

**1.5 Thesis outline**
This thesis sets off with the development of a theoretical framework in chapter 2. This chapter answers the first research question by describing the tradeoff between customization and standardization, followed by the concept of modularity. It concludes by presenting a roadmap for the development of a modular service architecture according to literature. From that point, an iterative improvement process results in answers on the other research questions.

The iterative improvement process starts with a validation of the theoretical roadmap within Cofely in chapter 3. Unexpected problems appeared during the execution in chapter 4. Chapter 4 describes the execution of the first three steps and gives an overview of the bottlenecks compared with the theoretical roadmap due to the requirements that prevail within Cofely (research question 2). Based on this information, a redesign of the theoretical model is presented in chapter 5. This is a roadmap that should fit the situation of Cofely (research question 3). In chapter 6, the redesigned roadmap is executed. The revenue model (research question 4) is part of this roadmap and also described in chapter 6.

Chapter 7 reflects on the redesigned roadmap and the conclusion of the report is presented in chapter 8. The conclusion contains recommendations for Cofely as well as an overview of the theoretical and managerial implications of the study.
2. Theoretical roadmap
The goal of this section is to create a roadmap for the development of a modular service architecture, using methods, models and tools that are state of the art in literature.

It starts with a comparison between customization and standardization (section 2.1), because modularity is presented as a way to deal with the tradeoff between them. The concept of modularity itself is described in more detail in section 2.2. Section 2.3 describes a scientifically grounded roadmap for the development a modular service architecture.

2.1 Customization versus Standardization
The key to reduce cost, achieving reliability, and improving productivity is to standardize the service process and product, whereas the key to ensure that customer needs are met is to customize the service offering (Wang et al, 2010). Looking at the literature on customization and standardization it can be concluded that standardization as well as customization has been discussed in the service literature. However, the discussions are conducted within different traditions and thus the relationship between standardization and customization has rarely been debated. The tendency towards customization has been emphasized within the service management and marketing approach (for example Lovelock(1984), Ostrom & Iacobucci (1995), Fornel et al., (1996), Anderson et al. (1997), Fixon (2006)). Standardization on the other hand is a core theme in service operations management (for example Blind (2002), Wang et al. (2010), Sundbo(2002), Sandoff (2005)).

Customization means the degree to which the firm’s offering is tailored to meet heterogeneous customers’ needs (Anderson et al., 1997) and it aims at satisfying as many needs as possible for each individual customer. The nature of the customer demand is shifting towards a greater variety, more features, and higher quality in products as well as in services. Therefore, many companies follow a customization strategy with the objective of establishing a competitive advantage (Huffman and Kahn, 1998). The rationale of the competitive advantage through service customization is grounded in the stronger customer-firm relationships as characterized not only by the increased customer loyalty, but also a higher relationship quality (Coelho & Henseler, 2012).

Concrete advantages of customization to a service firm are (Sundbo, 2002):
- Customer satisfaction, because they get customers individual wants satisfied.
- Ensures quality as perceived service quality. The customer feels he has been treated well.
- Easy to expand the sold man-hours, because the task is rarely defined and the customer could always be served better.
- Innovation can be customer-near, which means that innovation can take its point of departure in the customer’s needs, which is the greatest guarantee for success on the market (Sundbo, 1998).

The primary goal of standardization is to control the output activity and service quality through scientific management of service to minimize the risks associated with the human factor. The costs
are minimized and the efficiency is maximized, but also the process is under control. When the prices are lowered, the firm will have competitive advantages in the market and therefore will sell more. Maybe the profit from each service delivery will fall, but the total profit for the firm will increase because of increased turnover. A maximal reliability is perceived by the customers within a minimum amount of time and cost (Wang et al., 2010).

The concrete advantages of standardization to service firms are the following (Sundbo, 2002):

- **Innovation can be systematized.**
- **Innovation can be reproduced**, because a standardized innovation can be shared more easily within the organization. This will increase the return of innovation investments.
- **Customer satisfaction**, because they get the same cheap product every time. They get what they can expect.
- **Sense of security for employees**. Through effective implementation, the employees have more complete knowledge of what to deliver. They feel a sense of security, are confident and do not have to figure out solutions for specific customer problems (Sandoff, 2005).
- **Quality assurance as zero failure**.
- **Good possibilities to increase productivity**.

Both standardization and customization are approaches service firms can take to pursue service quality and customer satisfaction, and in general the expectation is that both standardization and customization contribute positively to satisfied services (Bardakci & Whitelock, 2004). Modularity tries to combine the advantages of both concepts and is described in the next section.

### 2.2 Modularity in services

It is possible to take a third and middle position on the continuum ranging from customization to standardization, namely a combination of the two logics. Modularity tries to combine the advantages of standardization with those of customization. It can be described as the degree to which the components of a system can be separated and recombined to create a variety of configurations without losing in functionality (Schilling & Steensma, 2001).

The main principle is creating standard modules, which are produced according to standard procedures (Sundbo, 2002). There are many products, which act as modules that can be combined individually for each customer. In this way, the enterprise controls costs while the customer feels that he is served individually. The aim that the customer feels that he receives individual attention, is a matter of his belief (Sundbo, 2002). One can consider this to be successful cheating, but a rational look at modularization shows that it is a compromise: it is a semi-customized service.

Sundbo (2002) concluded that modularity is the long term tendency for service firms, and it seems to be a promising approach in the service domain (Araujo and Spring, 2006). The firm will sell high-priced customized services and lower the costs through standardized production procedures.
The concrete aims of modularization are presented by Bottcher & Klingner (2011) and can be divided into the following five key aspects:

- **Reduction of efforts**: Efforts regarding pricing, allocation of resources and the management of monolithic services can be reduced by using modules.

- **Configuration**: The possibility for a structured configuration of individual services for customers should be provided through the use of service modules. A portfolio of standardized modules is given, by which the customer may compose a custom-tailored service. This is a viable trade-off between overall standardization and entirely individual offerings.

- **Improved transparency, reduced complexity**: Many service companies are constantly developing new service offerings, which causes extensive and hard-to-overlook service portfolios. Structuring this portfolio by the use of service modules will lead to a greater transparency. Beyond that, it may help the service providers to better communicate the customer value that their services can generate in the negotiation phase. This is relevant in the business services context, since it is difficult to demonstrate services to the customer in advance.

- **Enhancements and improvements**: It is more feasible to develop delimited and less complex modules further, since inter-dependencies within the service system are transparent through well-defined interfaces. Being able to focus actions on a module level, a very precise improvement approach is possible.

- **Reuse**: Planning, implementation and improvement of service offerings demand great investments. The reuse of service modules allows using economies of scale and reduces the efforts for service development and improvement. Once the design or optimization of a service module is finished, it can be used in many different service offerings.

Those aims are able to influence the performance of an organization on different perspectives. The key performance indicators (KPI’s) affected by modularization are presented in Table 1.

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<td><strong>Financial perspective</strong></td>
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<td>- <strong>Outsource ratio</strong>: outsourcing is eased, as the functionality of a module is well defined by its interfaces (Baldwin &amp; Clark, 1997).</td>
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<tr>
<td>- <strong>Cost reduction</strong>: the better controllability of the human aspects leads to cost reduction.</td>
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<tr>
<td><strong>Customer perspective</strong></td>
</tr>
<tr>
<td>- <strong>Competitive score</strong>: It is more easily to manage service modules with an accurately defined output. This results in a more homogenous quality and a higher reliability of the entire service offering (Shostack, 1987), which leads to a better service quality and higher competitive score.</td>
</tr>
<tr>
<td>- <strong>Customer satisfaction</strong>: A better service quality increases customer satisfaction.</td>
</tr>
<tr>
<td>- <strong>Variety of services</strong>: It is possible to react more rapidly on new market demands by offering new services composed of modules (Heiskala et al., 2005).</td>
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**Internal perspective**
- **Productivity**: due to the reusability of modules, an organization can benefit from economies of scale and reduce the efforts of implementing new and improving existent services.
- **Maintenance costs**: within the limited scope of a module, improvements and new developments are less error-prone.

**Learning perspective**
- **Faster development cycles**: due to reusability and the reduced complexity.
- **Rate of innovation**: The ability to analyze and optimize performance on module level increases the rate of innovation.

| Table 1: KPI’s affected by modularization (Bottcher & Klingner, 2011) |

### 2.3 Designing a modular service model

This part of chapter 2 describes how to apply the concept of modularity in practice. It shows how an organization should develop a modular service model, according to literature. The final roadmap is presented in Figure 4.

![Figure 4: Roadmap according to literature](image)

There are only a few articles that discuss the application of modularity in services and mainly those articles are used to establish a scientifically grounded roadmap. The platform approach of Pekkarinen & Ulkuniemi (2008) is used in combination with assumptions made by Verma et al. (1999), the method for composing modular B2B services of Bottcher & Klingner (2011) and the statements of Heiskala et al. (2005) about structuring service modules. Also information of Treacy & Wiersema (2007) about good partnership is used.

Pekkarinen & Ulkuniemi (2008) stated that the development of a modular service model should use four different dimensions: customer, service model, organization and process. The roadmap is established by applying those dimensions.

- Verma et al. (1999) stated that new service development should start with a definition of the target market (customer dimension), before the development of a service concept to address this market can start. Therefore the first step is defining the target market, followed by developing the service concept. The necessity for the development of a service concept is confirmed by Bottcher & Klingner (2011).
- Bottcher & Klingner (2011) provided in their article a method for composing modular services.
(service model dimension). This method is used in combination with statements of Heiskala et al. (2005) about structuring service modules and covers step 3 and 4.
- The link to the organization and processes is realized in the final step, using information of the platform approach provided by Pekkarinen & Ulkuniemi (2008).
- Bottcher & Klingner (2011) and Treacy & Wiersema (2007) stated that the evaluation of service modules is one of the most important issues in modularization. Therefore this is also part of the model.

The different steps of the roadmap are described in more detail in section 2.3.1 to section 2.3.6.

2.3.1 Define target market (Step 1)
When creating a modular service model a firm should, first, take a look at the markets and competitors and decide which markets, customer needs and segments offer the most promising growth opportunities. In terms of customer needs, the firm should carefully identify and determine the service modules providing the customer with the desired new services. As Verma et al. (1999) stated, the identification of the service provider’s customer needs includes identifying target market segments.

2.3.2 Develop service concept (Step 2)
The service concept should address the market’s needs. The final modular service will be combined from one or several services modules. Changes in the design of one module can be made separately from other modules. There is no overlap but only an interface between the modules. A challenge in the development stage is the fact that the modules and the interfaces between them should have as low coordination as possible.

According to Bottcher & Klingner (2011) an organization should develop a systematic representation of modules that allows checking the validity of the structure of service modules.

2.3.3 Describe modules and their interdependencies (Step 3)
Most advantages of service modularization directly correlate with the necessity of a structured and well-defined description of the service modules and their inter-dependencies. Without a structured description the challenges of service modularization cannot be tackled, and the expected benefits will not be achieved (Heiskala et al., 2005). Service modules need to be described very precisely. Such descriptions are necessary to find the right modules for individual service offerings regarding cost efficiency, optimization and adequacy.

The question is how service modules should be described and structured so that reuse, customer-specific configuration and the creation of service catalogues are supported adequately. In order to do so, an unstructured set of service modules has to be structured by using a graph as shown in Figure 5.
Based on the logical rules, a customer can choose from the structured set of service modules. Finally, the service process chain is implemented on the basis of the temporal rules specified in the graph.

2.3.4 Define functional and non-functional properties per module (Step 4)
Except for the compositional structure that depicts how service modules can be combined, it is also necessary to precisely describe the singular service modules with functional and nonfunctional properties (O’Sullivan et al., 2002). Functional properties cover all aspects of the offered functionalities. This includes the customer and provider objectives, showing what customers and providers expect when using the functionality of a service module. It is important to describe the advantages looking at the customer perspective.

The non-functional properties act as restrictions on the functionality. The essential nonfunctional properties are as follows (O’Sullivan, 2006):
- temporal availability (“When can a service be used?”);
- locative availability (“Where can a service be used?”);
- temporal duration (“How long does the service take?”);
- price/revenue model (“How much is the service?”);
- payment (“How can a service be paid for – e.g. credit card?”);
- consequences (“What happens if violations of contracts occur?”);

If those non-functional properties are described in great detail, it would support IT-based searching, automatic generation of service catalogues, IT-based management of service modules as well as IT-based simulation and optimization (Bottcher & Klingner, 2011).

2.3.5 Link the service model to processes, organization and customer interface (Step 5)
The service is visible to the customer and is a combination of one or several service modules. In order to use modularity in service development, also three intra-organizational dimensions need to be considered:

- Modularity in processes: A process module is a standardized, indivisible process step. For example, an ordering process includes two process modules: sending and receiving of orders (Hoogeweegen et al, 1999). These can be performed manually but nowadays most of them are done automatically with...
operation management software. The standardization of IT processes should support the process modularity of an organization.

- **Modularity in organization:** A modular organization is an organizational structure that is formed by groups of weakly connected subsystems. The loosely coupled subsystems allow the organization to be flexibly recombined into a variety of configurations. A modular organizational form contains of standardized ways to organize service provider’s internal and external resources, so that the processes implemented and services offered are as efficient as possible (Pekkarinen & Ulkuniemi, 2008). A structure like that can be accomplished by various supplier network configurations and internal organizational structures (van Liere et al., 2004). The availability of standards, technological change and a competitive industry environment drive towards modular organizational forms, because they enable the recombination of heterogeneous inputs and the production of multiple services (Schilling, 2000).

- **Modularity in customer interface:** The customer interface also consists of modules, either organizational or process, through which the customer interface can be managed effectively.

“In order to use modularity in service development, each of these dimensions need to be considered” (Pekkarinen & Ulkuniemi, 2008). Modularity in processes, organization and customer interface are the means to create the modular services and are intra-organizational. Using the service model and those three dimensions, different customer service applications can be easily developed by re-integrating the service modules (Crawford et al., 2005). The link between the modular service model, modular organization an modular processes is shown in Figure 6.

![Figure 6: Link between service model, organization and processes](image)

One way to make it operational is to use the concept of a service platform, shown in Figure 7. A platform consists of independent subsystems and interfaces between them (Asan et al., 2004). Platform thinking can be used to identify and use the shared structure, logic of activities and
customer offerings in service production.

Figure 7: Service platform (Pekkarinen & Ulkuniemi, 2008)

Platform thinking has been argued to increase a firm’s flexibility and responsiveness and assist in gaining market share from the competitors (Sawhney, 1998). The most difficult challenge in the development stage of modular platform is coordination, because the modules and the interfaces between them, as well as the interfaces within each module, should have as low coordination needs as possible. However, the common core knowledge and competencies within a service provider, as well as technology, should be shared with all service offerings and market segments, which require well-organized and standardized coordination methods, for example organizational modules (Pekkarinen & Ulkuniemi, 2008).

2.3.6 Other issues: evaluation and continuous improvement

According to Bottcher & Klingner (2011) evaluation of the service modules is one of the most important issues in modularization. It is necessary to develop adequate methods to analyze the performance and quality of those modules and derive realizable modification strategies for service modules (Bottcher & Klingner, 2011).

Therefore the PDCA cycle is established. It is a well-established framework for process improvement where it focuses on continuous learning and knowledge creation, which is the key in the success of any quality improvement initiative (IAM/BSI, 2004):

- **Plan**: Establish the objectives and processes necessary to deliver results in accordance with the expected output. By establishing output expectations, the completeness and accuracy of the specification is also a part of the targeted improvement.
- **Do**: Implement the plan, execute the process, and provide the service. Collect data for charting and
analysis in the following "Check" and "Act" steps.

- **Check**: Study the actual results and compare against the expected results to ascertain any differences. Also look for the appropriateness and completeness of the plan to enable the execution.

- **Act**: Request corrective actions on significant differences between actual and planned results.

When a pass through these four steps does not result in the need to improve, the scope to which PDCA is applied may be refined to plan and improve with more detail in the next iteration of the cycle.
3. Validation of theoretical roadmap within Cofely

The goal of this chapter is to describe the validation of the theoretical roadmap of Figure 4 within Cofely before any step is executed.

Section 3.1 describes the process by which this is done and section 3.2 describes the conclusions of the validation.

3.1 Validation process

The theoretical roadmap of Figure 4 is validated within Cofely, by presenting it first of all to the employees that are responsible for the progress of the modular service model (SAM):
- 4 Business Consultants, working within the different regions of Cofely South Netherlands.
- 1 Member of the Management team of the Southwest region.

To get the best results out of the meeting, it was conducted according to the Golden Circle of Sinek (2009). Therefore the presentation starts with explaining ‘why’ the roadmap should be developed before the ‘how’ and ‘what’ is explained. The Golden Circle of Sinek (2009) is described in more detail in Appendix A.

After the theoretical roadmap was presented in more detail, the following questions were asked:
- Is it possible to develop a modular service architecture at Cofely in this way?
- Where do you expect problems during the execution of the roadmap and how to improve it?
- Are there other requirements that need to be considered?

Furthermore the same presentation was given to a group of 18 employees that consist of:
- Contract managers of the TOP-15 customers, to detect if they think that it is useful for the TOP-15 customers.
- Business consultants.
- Members of the Lean Six Sigma department, because they are experienced in process improvements.
- Members of the development department of Cofely, because they are experienced in developing new business models.

The employees have diverse functions within the organization. This is important because in this way the opinions of different organizational levels and regions are captured. When all those employees evaluate the roadmap, a lot of different insights are taken into account. Therefore it is possible to validate the roadmap in a reliable way.
3.2 Validation results
The conclusion of the meetings around the validation of the theoretical roadmap was that it is possible to develop a modular service architecture at Cofely in this way. Although some specific conditions were determined:

- It will be difficult to make decisions during every step of the roadmap, because a lot of employees with different opinions are involved. For example the description of the modules (step 3): definitions are very sensitive and used during the whole lifetime of the modular service model. One or two words can make a difference and when everyone proposes his or her definition, it is impossible to reach consensus.

Therefore it is important to make a proposal before every meeting. Presenting a proposal ensures that discussions are more focused.

- An evaluation point after every step is needed, in order to ensure that Cofely stays on the right track while they execute the proposed roadmap.

- The contract managers of the TOP-15 customers were positive about the idea of a modular service model. Therefore they want their customers to be part of the target market and they want to approve the service concept (step 2) before the next step of the roadmap starts (step 3). This ensures that the service concept consists of modules that are required by the TOP-15 customers.

- The Lean Six Sigma department has to be involved during step 5 of the roadmap (the link to the processes), because the strategic plans of Cofely mention that they want to improve their processes using the Lean Six Sigma department.

- The management teams of different regions want to be informed about the results of every step of the roadmap.

The most important conclusion was that it is possible to use the roadmap according to literature at Cofely. Therefore the next chapter starts with the execution of the roadmap, while the above mentioned conditions are kept in mind.
4. Execution step 1, 2 and 3 of theoretical roadmap

*During this chapter the validated theoretical roadmap are executed. Unexpected problems appeared in step 3.*

The execution of the first two steps is presented in section 4.1 and 4.2. In section 4.3 the third step of the theoretical roadmap is addressed. Problems associated with this step are presented in section 4.3.1 and section 4.3.2 presents the requirements of Cofely and bottlenecks compared to the roadmap according to literature. Section 4.4 reflects on the execution of the theoretical roadmap.

4.1 Define target market (step 1)

*Process*

The first step of the roadmap according to literature is defining the target market. Therefore a meeting was planned with the following employees:

- 4 Business Consultants, working within different regions of Cofely.
- 1 Member of the management team of Cofely Southwest.

Those employees have diverse functions within the organization and therefore opinions of different organizational levels and regions are captured. To get the best result out of the meeting, it is conducted according to the Golden Circle of Sinek (2009). This concept is explained in Appendix A.

The meeting was structured as follows:

- Presenting the theoretical roadmap.
- Explaining ‘why’ it is important to define the target market.
- Asking which customers Cofely wants to reach with the ‘SAM-model’.

A more detailed description of the meeting is presented in Appendix B1.

*Results*

The conclusion of the meeting around the target markets was, that Cofely wants their biggest customers (The TOP-15, for example: ASML, DOW, Achmea, AAFM, Lievensberg Hospital) to be the first users of the modular service model. After getting them excited about the possibilities they want to offer it to ‘existing customers with the opportunity to grow’ and also possible new clients. The existing big customers (TOP-15) should serve as best practices for all the other ones, because Cofely experienced that they are interested in this kind of model. A closer look at the TOP-15 customers shows that they account for 41,85% of the budgeted turnover of Cofely South Netherlands BV in 2013.

When the target market is defined, it is possible to develop the service concept to address the target market needs in step 2.
4.2 Develop service concept (Step 2)

Process
The second step of the roadmap according to literature, is developing the service concept. Therefore a meeting was planned with the following employees:

- 4 Business Consultants, working within different regions of Cofely
- 1 member of the management team of Cofely Southwest.
- 3 Contract managers of TOP-15 customers.

The contract managers are involved during this meeting in order to ensure that the service concept addresses what the TOP-15 customers want. Again the Golden Cirly of Sinek(2009) is used.

The meeting was structured as follows:
- Presenting the target market (step 1) and explaining the position of the step in the roadmap.
- Explaining ‘why’ it is important to develop the service concept.
- Asking which service concept addresses the target market needs?
- Asking which service modules have to be included within this service concept?

Results
Cofely is a service provider and wants to focus their modular service model on the management of the assets of their customers. Assets, and value realized from them, are the basis for any organization. Good asset management maximizes value-for-money and satisfies expectations of stakeholders. There is an international reference standard that is applicable to any organization where physical assets are a key or a critical factor in achieving its business goals:

*PAS 55(2008) is the international reference standard for the optimal management of physical assets, providing the definition of good practice in the whole-life management of assets. “Being able to demonstrate that the requirements specified in PAS 55(2008) are met, provides tangible evidence of a systematic, cross-disciplinary and optimized approach to asset management, that correctly blends responses to short term requirements with sustainable delivery of long term goals” (IAM/BSI, 2004).*

Because it provides assurance to customers, owners, employees, regulators and other stakeholders that the business is in good hands, it is important for Cofely that the SAM model has a connection with this standard. “Organizations have found that carrying out a ‘gap analysis’ against the requirements set out in PAS 55 has enabled them to identify improvement opportunities and build these into a prioritized improvement plan. This leads to real improvement in the bottom line and can often enable business deliverables to be achieved more efficiently and effectively with fewer resources” (IAM/BSI, 2004). Cofely should be able to execute possible improvements.
The PAS 55(2008) is not concrete about how to perform, but states that an organization ‘should do something with’: legal requirements management, functional management, risk management, condition management, energy management, maintenance program management, life cycle management, spare parts management, subcontract management, document management, IT management, financial management. Cofely is able to perform services in all those areas and therefore the modular service model should contain all the services.

According to Bottcher & Klingner (2011) the development of the service concept should contain a systematic representation of modules that allows checking the validity of the structure of service modules. This representation is shown in Figure 8:

![Figure 8: Service concept SAM](image)

4.3 Describe modules and their interdependencies (step 3)

4.3.1 Problems with interdependencies

**Process**

In order to describe the modules and define the interdependencies, a meeting with the following employees was conducted:

- 4 Business Consultants, working within different regions of Cofely.
- 12 Employees, working within the service environment of the organization and experienced in activities related to modules of the service concept.

Those employees represent all the organizational levels and regions. The meeting was structured as follows:

- Presenting the target market and service concept (step 1 and 2).
- Explaining the ‘why’ of the interdependencies.
- Asking: What are the interdependencies between the different service modules of SAM?

A detailed report of the meeting is presented in Appendix B3.
Results
It was impossible to define the interdependencies, because there was no agreement on the position of SAM within the customer environment. There was no clear answer on the following questions:

* Provide services on strategic and tactical level, or also on operational level of the customer?
There are three management levels in an organization. Strategic management, tactical management and operational management (Schmidt & Wilhelm, 2000):

- Strategic management is the higher management level in an organization. It provides the overall direction to the enterprise.
- Tactical management is intended to gain a specific objective in the context of an overall plan.
- Operational management serves to regulate the day-to-day output relative to schedules, specifications, and costs (Schmidt & Wilhelm, 2000).

In the current situation of Cofely, the different levels require different interdependencies. Services on strategic level require different input than the same kind of service on an operational level.

* Use existing services or develop completely new modules?
Some responsible employees stated that SAM should use their existing services in their service model instead of developing new service modules. Their argument was that Cofely already possess the services and customers are willing to pay for them. Because there was no agreement on it, it was impossible to define the interdependencies.

In section 4.3.2 a proof of concept is organized to get an agreement on the different management levels of the customer as well as on the existing services.

4.3.2 Current requirements of Cofely and bottlenecks compared to theoretical roadmap

Process
To detect the requirements of the modular service model that currently prevail within Cofely, a proof of concept was organized. The proof of concept was attended by:

- 4 Business Consultants, working within different regions of Cofely.
- 12 Employees, working within the service environment of the organization and experienced in activities related to modules of the service concept.

Those employees have diverse functions within the organization and therefore opinions of different organizational levels and regions are captured.
The goal was to detect what the current requirements of Cofely and bottlenecks compared to the theoretical roadmap are. Therefore, one of the modules of the service concept was chosen (functional management) and the following question was asked:

- Which services do we want to sell within functional management?

A small report of the proof of concept is presented in Appendix B4.

**Results**

Thus far, SAM consists of modules that are different and separated services. The final goal was to link every module to certain process modules and organizational modules, as shown in the service platform in Figure 7. The conclusion of the proof of concept was that the roadmap according to literature is not valid in the situation of Cofely. It is not possible to sell and standardize the different building blocks of modular service model apart. During the proof of concept it was concluded that this way of thinking is only valid when an organization wants to develop completely new services or modules.

Cofely wants to include existing services within the modular service model, because they know that customers are willing to pay for them. The problem is that the existing services are combinations of different modules of SAM.

**Example:**

A functional risk analysis is a combination of functional management and risk management and some customers already paid for and are using the service.

Cofely asked for further investigation within literature, to discover if it is valuable to include services on management as well as on operational or not. They want to be a better partner of their customers and the SAM model should help them to reach this goal. According to Narver et al. (2004), market orientation can be reactive or proactive. Reactive involves a company discovering, understanding, and satisfying the expressed needs of customers, whereas proactive involves discovering, understanding, and satisfying the latent needs of customers.

Of the two, reactive market orientation has without doubt received most attention from researchers and managers, and is generally easier to implement (Narver et al., 2004). The challenge for businesses lies in identifying and satisfying the latent needs of customers and that is something what SAM should do. Treacy & Wiersema (2007) pointed out that a proactive attitude is very important to become a successful partner and satisfying the latent needs of a customer. A good partner looks further than only the standard solution. The customer is leveled and so are their needs.
Therefore Cofely should have a proactive attitude and to satisfy all the possible latent needs, the modular service model of Cofely should be able to provide solutions on three different levels of a customer (Figure 9):

- Strategic (Strategic plan)
- Tactical (Project and maintenance management)
- Operational (Operations)

Figure 9: Different levels of SAM

4.4 Reflect on execution of theoretical roadmap

Figure 4 presents a roadmap for the development of a modular service model according to literature. Although it was validated in chapter 3, unexpected problems made it impossible to execute the whole roadmap. During the practical application at Cofely, it was not possible to execute ‘Step 3: Describe modules and their interdependencies’ because of the following reasons:

- Cofely decided not to develop the modules, but includes existing services within the service model.
- The existing services are combinations of different modules of the service concept.
- The existing services are executed on strategic, tactical and operational level.

Therefore the theoretical roadmap is redesigned in the next chapter.
5. Redesign theoretical roadmap

The goal of this chapter is to describe a roadmap that fits the situation of Cofely. This is a roadmap that is compliant with the requirements for the modular service architecture that currently prevail within Cofely and solves the associated bottlenecks compared with the roadmap of literature.

In addition, section 5.2 provides some extra explanation of step 8: ‘standardize services’.

5.1 The ‘Cofely roadmap’

Because Cofely wants to include existing services within their service model, it is important to take other steps than literature suggested. Therefore the theoretical roadmap needs to be redesigned. The redesigned roadmap is presented in Figure 10:

![Figure 10: New roadmap, development modular service model (Situation Cofely)](image)

The redesigned roadmap (Figure 10) starts the same as the roadmap according to literature, because there were no problems until the determination of the interdependencies. Being aware of the fact that existing services are executed on three different levels, makes it possible to determine the interdependencies when the modules are described (step 3 and 4). From that point, the roadmap is different as the one according to literature in order to fit the situation of Cofely.

Compared to the theoretical roadmap, the roadmap of Figure 10 makes it possible to include existing services within the modular service architecture. The connection with the existing services is provided during step 5 until step 8:

- The existing services that should be part of the service model are investigated (step 5).
- Those services are linked to the service concept (step 6).
- The modular service model gets a standardized position within the general service process of Cofely (step 7).
- Each individual service is standardized (step 8). Extra explanation about the standardization of services is provided in section 5.2.

The idea is presented in Figure 11.
Looking back at the basic idea of a modular service model, it is positioned in the middle of the continuum between customization and standardization. The advantages of standardization are achieved through the standardized service modules and through a combination of different service modules it is possible to provide a customized service. The new roadmap still covers those aspects:

- The model gets a standardized position within the general service process. Each service is standardized individually. Therefore the modular service model of Cofely can benefit from advantages of standardization.

- On the other hand, due to the connection between the service concept and the standardized services, it remains possible to customize the service. A customer can compose the service that fits their situation and Cofely can benefit from advantages of customization.

5.2 Standardization of services

Process

While constructing a way to standardize the existing services of Cofely, there was some resistance because of the following reasons:

- It takes time and thus money to standardize a certain service.
- Results are not directly visible.
- The number of its offerings may be reduced, but in initial stages a better reliability and lower service cost may not have been realized. Additional investment in service design, employee training and capital equipment may increase the cost of the service.
- A steep learning curve for the company as well as for the employees.
Nevertheless there are a lot of key performance indicators (KPI’s) that are influenced positively by applying the modular service model at Cofely. Those are mentioned in Table 1. Furthermore the standardization is strategically embedded. In their strategic plans from 2013-2015, Cofely mentioned that they strive for continuous improvement in all areas with an integral approach. They want to improve their processes with the methodology of Lean Six Sigma.

Therefore meetings with employees of the Lean Six Sigma department were planned. The central question was:

- **How to standardize the custom services of Cofely?**

Those meetings are summarized in Appendix B7.

**Results**

Combining the current body of knowledge with requirements from the Lean Six Sigma department, the standardization of the existing services contains three parts:

1. **Link to service concept (SAM)**
   
   When standardizing the services, the link to SAM should be clear:
   - Which modules are influenced by the service?
   - There should be a standard functional block diagram and risk matrix for each service.

2. **Standardize processes of services**
   
   The Lean Six Sigma department is compliant with the PDCA-cycle for process improvement. The standardization is part of the ‘Plan’-step of this cycle:
   - Make a high level process of each service of approximately 7 high level steps.
   - Construct a SIPOC-Diagram. SIPOC stands for Supplier, Input, Process, Output and Customers. Using the SIPOC methodology provides insight in the different process steps and standardized roles within the organization.
   - Develop a cross-functional diagram to discover which standard organizational functions are going to execute the different process steps.

3. **Standardize functional and nonfunctional properties**
   
   The revenue model is the most important (nonfunctional) property for Cofely.

   This way of working is based on the platform approach of Pekkarinen & Ulkuniemi (2008). An overview is presented in Figure 12.
According to Pekkarinen & Ulkuniemi (2008) the different modules of the service concept have to be linked to standardized parts of the organization and to standardized processes (Figure 7). In the situation of Cofely, the services (and not the modules) are linked to standardized organizational roles by a SIPOC and cross-functional diagram. The link to the processes is provided by a standardized high-level process. The services have standardized functional and nonfunctional properties and are linked to the service concept (Figure 12).

The way to standardize is therefore based on the current body of knowledge and fits the requirements of the Lean Six Sigma department by working with a SIPOC and cross-functional diagram.
The goal of this chapter is to walk through the redesigned roadmap that fits the situation of Cofely. This is done within the sections 6.1 until 6.6 assuming that the target market is already defined (step 1) and the service concept is already developed (step 2).

6.1 Define target market, develop service concept (step 1 and 2)
During the execution of the theoretical roadmap, the target market was already defined and the service concept was already developed. Because Cofely didn’t change their mind, it was assumed that the outcome of those steps is still the same. The next step of the redesigned roadmap is the description of the modules, presented in section 6.2.

6.2 Describe modules (step 3)
Process
In order to describe the modules, a meeting was planned with the following employees:
- 4 Business Consultants, working in different regions within Cofely.
- 1 Member of the management team of Cofely Southwest.
- 12 employees who are working in the service environment of Cofely.

The meeting was structured as follows:
- Presentation of target market and service concept (step 1 and 2)
- The ‘why’ of step 3 according to the Golden Circle of Sinek (2009), presented in Appendix A.
- Attendees were divided into different groups. Every group was responsible for a few definitions. Those definitions are submitted within 1 week.

A small report of this meeting is presented in Appendix B2.1. The submitted definitions were improved and the improvement points per definition were discussed with the same group during a new meeting. A small report of this meeting is presented in Appendix B2.2.

Results
Appendix C1 presents an overview of all the definitions that were submitted by the stakeholders. After studying those definitions individual and in the context of the whole, the following conclusions were drawn:

- The definitions were written in a different style. Some definitions were written from an internal point of view, others from an external point of view. Because it should be possible for both customers and users internal to the organization to understand the definitions, they have to be rewritten in a general style.
- Some definitions contained detailed examples. The examples do not cover all aspects of the module and could cause ambiguity.
- Some definitions described also the goal of the module. Both the goal and the definitions should
result in a structured and well-defined description of the service modules. Therefore the goal of the module has to be separated from the definition itself.

- **The content of some definitions needed some improvement**, keeping in mind that there should be no overlap but only an interface between the modules (Pekkarinen & Ulkuniemi, 2008). A challenge is this development stage is the fact that the modules and the interfaces between them should have as low coordination as possible.

The new and final definitions are presented in Appendix C2.

The next step is to determine the interdependencies, described in section 6.3.

**6.3 Determine interdependencies (step 4)**

**Process**

Cooperating with a business consultant and a financial director, while they are developing a new service, provided important information with respect to the interdependencies:

*A functional block diagram (FBD) and a risk matrix could operate as the basis for all other services.*

A functional block diagram is a model which consists of classified facilities on the one hand and assembled components of an installation on the other, both characterized by their location (Figure 13). Through the relationships is determined in which way the facilities are provided by the components of an installation. It also shows also how the installations are working together. The risk matrix presents the risks associated with them.

![Diagram of FBD and Risk Matrix](image)

**Figure 13: The idea of a FBD**

The idea behind the functional block diagram (in combination with risk matrix (RM)) as the basis for all services of the modular service model is that it is a model in which a customer can be taken into his own buildings and installations. A customer can indicate his expectations regarding the services to be delivered, using the FBD and RM during conversations with Cofely. When the FBD and RM uncover more possibilities for SAM, Cofely can be a better partner and provide more services to their customers. Therefore the functional block diagram should contain useful indicators. Those indicators per module are presented in Appendix D and should be added to the FBD of an organization.
A meeting with the following employees was planned:
- 4 Business Consultants, working within different regions of Cofely.
- 10 Employees, working within the service environment of the organization.

The meeting was structured as follows:
- The results of step 1, 2 and 3 are presented.
- The concept of the FBD and RM was presented according the Golden Circle of Sinek(2009)
- A discussion with the attendees on the topic.
A report of this meeting is presented in Appendix B5.

**Results**

It was concluded that the functional block diagram, in combination with risk matrix, indeed could serve as the basis for all services. Representatives of Cofely should take those two documents with them to discuss it with the customer and uncover potential. The FBD is functional management on an operational level and the RM is risk management on an operational level.

Another conclusion was that every service module contains services on an operational as well as on a strategic and tactical level. Every service on a strategic or tactical level, needs input from the service executed on the operational level. The way to present the interdependencies is shown in Figure 14.

![Image](image.png)

**Figure 14: Graph based structure of interdependencies (Bottcher & Klinger, 2011)**

A well-defined, but unstructured set of modules has to be structured using a graph-based structure before a customer can choose one of the modules. This structure of SAM is shown in Figure 15 and validated by different employees within Cofely. The blue boxes are services on strategic and tactical level, the white boxes are the services on operational level.
6.4 Define services and link services to service concept (step 5 and 6)

**Process**

The next step was to investigate which services should be included within the service model and link them to the different modules of the service model. During the identification of the target market, it was concluded that the biggest customers (TOP-15) should function as best practices for all other customers of the model in the future. Therefore meetings with employees, responsible for the top-15 customers of Cofely are planned. Those employees can uncover which services are interesting for SAM.

Three meetings with contract managers of the regions Southwest, East and South were conducted. A small report of those meetings is presented in Appendix B6.

Services were assigned to a certain module according to their focus. CoAssist for example is a combination of functional management, risk management (operational level) and legal requirements management (tactical level). The focus of CoAssist lies within the legal requirements module and therefore it is assigned to that module.
**Results**  
It resulted in an overview of the services and a link to different modules. The overview is presented in Appendix E. It could be concluded that those services are provided mainly by customized processes. The next step is to determine the position of SAM within the service process.

**6.5 Determine position within service process (step 7)**

**Process**  
For internal purposes it is important to know where in the general service process of Cofely SAM has its influence. First of all it is important to construct the process steps of the modular service architecture itself (Figure 16).

![Figure 16: Process SAM](image)

The process of the modular service architecture starts with a commercial acquisition phase, where the customer needs to be convinced of the additional value of Cofely and SAM. After the contract is constructed the agreed services are executed. During this execution phase the (latent) needs of a customer have to be managed. Cofely has to control the situation and has to search for potential services that could help their customer. As Treacy & Wiersema (2007) mention, a good partner looks further than only the standard solution. To satisfy all the possible latent needs, Cofely should have a proactive attitude. This proactive attitude is shown in the iterative process from execution to manage or control in Figure 16. When Cofely uncovers a possibility for a customer, the process from commercial acquisition to execution starts again.

A meeting with two business consultants was planned to validate the process of Figure 16. During this meeting, also the standardized position of SAM within the general service process of Cofely was defined. The general process without SAM is presented in Appendix F1.

**Results**  
In order to define the position of SAM it is necessary to zoom in on the different process steps of Figure 16 and link them to this general process.

SAM influences the general service process of Cofely in the following way:

- The concept of SAM is mentioned for the first time during the first serious appointment with the
When a tender team is composed, every team member is aware of SAM. This tender team should use a general action plan of SAM as well as the standard basic asset list for SAM. This is a list with all the installations and their different features. Physical assets are the basis for every service. Therefore the standard basic asset list of Cofely should always be part of the process.

- During the contract design process, the customer goals and needs have to be mapped using a functional block diagram and risk matrix.
- The services of SAM have to be linked to a SAP-code, making it easier for the calculation department to construct the contract.
- When the contract is constructed, the services are executed and the iterative process of SAM starts on different levels.

The new maintenance process of Cofely based on SAM is shown in Appendix F2.

### 6.6 Standardization of services (step 8)

This chapter validates the proposed way to standardize a service by applying the three stages on CoAssist (section 6.6.1) and also stage two (standardization of the process) of the “Meerjaren onderhoudsbegroting” (MJOB) in section 6.6.2.

#### 6.6.1 Standardization of CoAssist

**Process**

<table>
<thead>
<tr>
<th>Stage 1: Define process</th>
<th>Stage 2: Standardize process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the service</td>
<td>Identify the service</td>
</tr>
<tr>
<td>Map the service</td>
<td>Map the service</td>
</tr>
<tr>
<td>Establish the process</td>
<td>Establish the process</td>
</tr>
</tbody>
</table>

The standardization stages according to section 6.6.1 are executed by conducting meetings with the following employees:

- 2 Employees responsible for the development of CoAssist.
- 1 Employee of the Lean Six Sigma department, in order to ensure that the standardization is compliant with the requirements of this department.

**Results**

1. **Link to service concept (SAM)**

   CoAssist is a combination of the following modules of SAM:

   - Functional management on operational level
- Risk management on operational level
- Legal requirements management on operational, as well as on tactical level.

Functional and risk management on operational level are the FBD and RM. Therefore a standard FBD and a standard risk matrix for hospitals is developed together with one of the employees that is responsible for CoAssist. The FBD and Risk Matrix are shown in respectively Appendix G1 and Appendix G2.

The FBD consists of the indicators presented in Appendix D to uncover more potential for SAM.

2. Standardize process
- The high level process of Cofely is presented in Appendix G3.
- The SIPOC is presented in Appendix G4.
- The Cross-Functional diagram is presented in Appendix G5.

3. Standardize revenue model
The revenue model of CoAssist uses value-based pricing. This kind of revenue model focusses on the value that a certain service provides to their customers. Therefore the costs of a hospital when doing it by themselves are estimated. CoAssist is based on a percentage of the current budget of hospitals.

*Estimated costs for hospital when doing it by themselves: € per year.*

There are three different versions of CoAssist: Silver, Gold and Platinum. Platinum provides the most complete service of CoAssist. The price of the different versions is based on a percentage of the current budget of hospitals (Table 2).

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 2: Revenue model CoAssist*
6.6.2 Standardization of MJOB

Process
The MJOB is a service of Cofely that focusses on the required maintenance budget of a customer the coming years. Cofely estimates as good as possible the maintenance costs per timeslot. The process of the MJOB is by conducting meetings with the following employees:
- 1 Business consultant that is experienced in executing the MJOB.
- 1 Employee of the Lean Six Sigma department, in order to ensure that the process is compliant with the requirements of this department.

Results

Standardize process

- The high level is presented in Appendix H1.
- The SIPOC diagram is presented in Appendix H2.
- The cross-functional diagram is presented in Appendix H3
7. Reflection on redesigned roadmap

The goal of this chapter is to reflect on the redesigned roadmap. It presents an overview of the organizational risks when developing a modular service architecture using the redesigned roadmap at Cofely. They are mapped in order to minimize the possibility of failure during further application.

Process

Reflecting on the redesigned roadmap, there are general organizational risks that can cause a disappointing result. Those risks need to be mapped in order to minimize the possibility of failure, during the application of the redesigned roadmap.

In order to capture valid risks, a meeting was planned with the following employees:
- 2 Operational employees, working within different regions.
- 2 Business Consultants, working within different regions and involved in SAM.
- 1 member of the management of the Southwest region.

Those employees have diverse functions within the organization. This is important because in this way the opinions of different organizational levels and regions are captured. During the meeting the redesigned roadmap and results so far are presented. The attendees discussed about risks during the development of such a modular service model. Results were captured by recording the meeting and by taking notes.

Every risk received a score ranging from 1 (minimum risk) until 3 (maximum risk). This score is based on a combination of the chance of occurrence and effect of the risk as shown in Table 3.

<table>
<thead>
<tr>
<th>Score</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>Chance</td>
<td>1   1 1 1 1 2</td>
</tr>
<tr>
<td></td>
<td>2   1 1 1 2 2</td>
</tr>
<tr>
<td></td>
<td>3   1 2 2 2 3</td>
</tr>
<tr>
<td></td>
<td>4   1 2 2 3 3</td>
</tr>
<tr>
<td></td>
<td>5   2 2 3 3 3</td>
</tr>
<tr>
<td></td>
<td>6   3 3 3 3 3</td>
</tr>
</tbody>
</table>

Table 3: Score Table
A more detailed explanation of the chance and effect levels is presented in Table 4.

<table>
<thead>
<tr>
<th>Chance</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Definition</td>
</tr>
<tr>
<td>6</td>
<td>Often</td>
</tr>
<tr>
<td>5</td>
<td>Regular</td>
</tr>
<tr>
<td>4</td>
<td>Incidental</td>
</tr>
<tr>
<td>3</td>
<td>Irregular</td>
</tr>
<tr>
<td>2</td>
<td>Rarely</td>
</tr>
<tr>
<td>1</td>
<td>Never</td>
</tr>
</tbody>
</table>

Table 4: Chance and Effect levels

The outcome of the meeting about the risks during the development, is complemented with additional information from informal conversations at Cofely.

**Results**

An overview of the risks and options to control them are presented in Table 5. The risks mainly belong to step 8 of the roadmap (standardize the existing services), because it is a lot of work to standardize all the custom services.

<table>
<thead>
<tr>
<th>Risks during development</th>
<th>Risk item</th>
<th>Cause</th>
<th>Consequence</th>
<th>Chance</th>
<th>Effect</th>
<th>Score</th>
<th>Control mechanism:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No foundation for the development within management</td>
<td>Management doesn’t recognize themselves in the roadmap</td>
<td>No support for this approach</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>Include management within process, clear procedures</td>
</tr>
<tr>
<td></td>
<td>No commitment of responsible employees</td>
<td>No trust and no unconditional support</td>
<td>Not able to execute different steps</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>Include responsible employees within process and continuously capture commitment</td>
</tr>
<tr>
<td></td>
<td>Organization is not ready for a transformation of services</td>
<td>They don’t believe in it, other priorities</td>
<td>Results are delayed or not achieved</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>Share successes, work with examples, create commitment</td>
</tr>
<tr>
<td></td>
<td>Organization not able to execute national developments</td>
<td>Improvements mainly on local level</td>
<td>Successes and approach are not shared within whole organization</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>Share successes, work with examples, create commitment</td>
</tr>
<tr>
<td>Culture of organization is cost-driven</td>
<td>Experiences in the past</td>
<td>No budget and no support</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>Share successes, create commitment, communication</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------------------</td>
<td>--------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>-----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Interpretation differences between different local levels</td>
<td>Ownership and decision making is executed local level</td>
<td>Unambiguous approach and sub optimization of process</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>Include stakeholders from different local levels, continuously capture commitment</td>
<td></td>
</tr>
<tr>
<td>No change management skills</td>
<td>Is something new for organization</td>
<td>Quality of result is not achieved</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>Determine necessary skills and establish them. Include in budget</td>
<td></td>
</tr>
<tr>
<td>No communication skills concerning this kind of developments</td>
<td>Is something new for organization</td>
<td>Quality of result is not achieved</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>Determine necessary skills and establish them. Include in budget</td>
<td></td>
</tr>
<tr>
<td>Expectations about results differ within organization</td>
<td>Personal interpretation</td>
<td>Different opinions</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>Develop clear plan of action with clear outputs. Provide insight in progress</td>
<td></td>
</tr>
<tr>
<td>No support of facilitating departments</td>
<td>Other priorities</td>
<td>Results are not achieved</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>Include stakeholders within project and continuously capture commitment</td>
<td></td>
</tr>
<tr>
<td>Costs exceed budget</td>
<td>Bad cost control</td>
<td>Problems with budget, results could not be achieved</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>Make a good estimation of budget and describe responsibilities</td>
<td></td>
</tr>
<tr>
<td>ICT is obstacle</td>
<td>Costs are not predicted</td>
<td>Results are not achieved</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>Develop overview requirements from ICT, develop plan of action, budgeting of plan and approving of plan</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5: Risks during development modular service architecture**

Risks with a score of 3 need to be controlled intensively, otherwise there is a high possibility of failure of the redesigned roadmap.
8. Conclusion
This section will look back onto the research project. First the research question will be discussed, followed by the implications of the research for theory and practice. Finally the limitations of this research project and directions for future research are presented.

8.1 Conclusions on the research questions
This research aimed to answer four research questions:

1. Which methods, models and tools to develop a roadmap for a modular service architecture are state of the art in literature?
2. Which requirements of the modular service architecture currently prevail within Cofely and what are the associated bottlenecks compared with the methods, models and tools of literature?
3. How to develop a modular service architecture that fits the situation of Cofely?
4. How to develop a revenue model that fits the modular service architecture of Cofely?

In chapter 2, theoretical roadmap, the current literature on service modularity is described. Modularity is positioned in the middle of the continuum between customization and standardization and using the methods, models and tools of literature a roadmap for the development of a modular service architecture is created. This roadmap answers the first research question. From that point, an iterative improvement process results in answers on the other research questions.

The iterative improvement starts with a validation of the theoretical roadmap in chapter 3. Cofely expected no problems during the execution of the theoretical roadmap. Therefore it was executed in chapter 4. In order to answer the second research question: during the execution of the third step, the requirements of Cofely as well as the associated bottlenecks compared with the methods, models and tools of literature appeared. The main bottleneck was that literature only covers the situation in which an organization wants to develop completely new modules or new services. Cofely wanted to include existing services within their service model.

The next step of the iterative improvement is to redesign the theoretical roadmap in order to fit the situation of Cofely in chapter 5. This chapter answers the third research question. The roadmap is redesigned by allowing existing services within the architecture. One of the steps is the standardization of custom services. A revenue model per standard service is needed to fit the modular service architecture of Cofely.

The redesigned roadmap is executed in chapter 6. A revenue model is developed for CoAssist (research question 4) and value based pricing is used. Chapter 7 reflects on the redesigned roadmap by describing the associated organizational risks. This is done in order to minimize the possibility of failure during the further application.
It can be concluded that this approach to develop a modular service model with existing services, is successful when:
- Cofely standardizes all the services in the proposed way. In that situation the organization should be able to reduce cost, achieving reliability, and improving productivity.
- The organization is able to be a better partner. Customers are demanding a ‘Customer Intimacy’ approach of their service provider. Cofely is able to be a better partner of their customers because the services are linked to the service concept. The service concept addresses the target market needs.

In addition, they have to control for the risks presented in Table 5.

8.2 Theoretical implications
Standardization as well as customization has been discussed in the service literature. Discussions have been within different traditions and thus the relationship between standardization and customization has rarely been debated. Therefore there is only a limited number of articles that discuss the topic of modularization in new service development. Logically, the current body of knowledge lacks a roadmap for the development of a modular service architecture. This explorative research could be regarded as a first effort to close this gap of knowledge.

- The development of a roadmap for a modular service architecture: When coping with the idea of service modularization, a structured roadmap for the development of a good service model is one of the most useful aspects. This research contributes to the current literature by developing a roadmap utilizing the knowledge on standard new service design and the little work that has been done within the application of service modularity.

- The development and application of a modified roadmap: Another contribution is the validation of the roadmap according to literature in practice. It was concluded that literature only covers the situation in which an organization wants to develop completely new modules or new services. The current body of knowledge doesn’t account for organizations who want to include existing services within their service model. One of the reasons for an organization to include existing services is the fact that they already know that customers are willing to pay for them. Therefore this research also contributes to literature by presenting and applying a roadmap for the development of a modular service architecture, focusing on organizations who want to include existing services within their model.

- Service standardization: Part of this roadmap is the standardization of custom services. Standardization is an important part of modularization, but there is no or limited literature available on the process of standardizing a custom service. This research contributes also to the current body of knowledge by presenting a way to this and applying it in practice.
8.3 Managerial implications
From a managerial point of view the findings of this research project will be useful for the management of organizations who are facing the tradeoff between customization and standardization in new service development. Modularity is presented as a solution and the roadmap to develop a modular service architecture could serve as a guideline. Without this research, management had to search within the literature of customization and standardization or within the limited and unstructured body of knowledge on service modularity.

Management of organizations that want to develop completely new modules and new services to address their target market needs, can walk through the roadmap according to literature. On the other hand, there are plenty of reasons to use existing services within a new service model. Therefore, the roadmap that fits the situation of Cofely is useful for managers of organizations facing that challenge.

As mentioned earlier, the standardization of custom services is an important part of the modified roadmap. Management of organizations that want to profit more from the advantages of standardization, can use the proposed way to standardize their services.

8.4 Limitations and future research
Looking at the literature on customization and standardization it can be concluded that standardization as well as customization has been discussed in the service literature. However, the discussions are conducted within different traditions and thus the relationship between standardization and customization has rarely been debated. The roadmap developed during this research is therefore based on a small number of articles about the application of modularity in the service context. Because the way of working during steps of the roadmap is not confirmed by other available literature, reliability is limited.

Although the developed roadmap is applicable for organizations that want to develop a modular service architecture with existing service, the data and research context are specific to Cofely and generalizability could be a subject of discussion.

Even though the roadmap presented is a very structured and clear approach, it can only live up to its expectations when all the services are standardized in the proposed way. This report presents the complete standardization of one of the services and part of the second. The next step is to implement the standardization in practice and this is not covered during this research. Every employee has work according to this new standardized way and this seems to be a complex process. According to van Aken(2004), the outcomes of the study need to be compared to the future situation after they walked completely through the roadmap to be able to draw conclusions. These steps could confirm or contradict the applied theories but as they are not completely implemented yet, the
research findings are not assessed yet. So validity of the proposed roadmap is also subject of discussion.

Focusing on future research, the concept of modularity has to be investigated within the service context in more depth. It has not been tested on many occasions but may provide a new value way of working for service organizations. Second, the roadmap was only developed and applied within Cofely. Further research should thus be conducted to investigate the roadmap within other organizations. Third, further research should investigate whether the expected benefits of the roadmap can be confirmed.

Fourth, an important area for future research of modularity in service development is the co-creation aspect. In modular service offerings, the role of the customer may become more important in the value co-production if certain actions are transferred to the customer. For example self-service regarding the information about the offerings as also used within CoAssist. In this case, the customers’ understanding of the available solutions and their own needs becomes essential in modular services. However, in case of business services, the co-creation aspect may be difficult to the customers and the service provider’s expertise may be needed to solve the problem.
9. Recommendations Cofely

This chapter presents an overview of the recommendations for Cofely, focusing on the development of SAM within the organization:

- **Construct achievable long term plan and uncover latent needs**: In order to be a successful partner, Cofely should construct an achievable long term plan with his customer (Treacy & Wiersema, 2007). To uncover the latent needs, a decentralized organization is important. Employees have to keep their eyes open during the contact with the customer and therefore they should be conform to a certain profile:
  - Skilled in implementing changes in the organization of a customer.
  - Know that everything is possible to serve the customer.
  - Flexible

- **Continue standardizing the services**: In order to tap the full potentials of service modularization, all the custom services that will be part of SAM have to be standardized and implemented within the whole organization.

- **Standardize functions**: During the standardization of the existing custom services, standard functions are related to standard activities. If SAM is introduced in the Netherlands, it is important that the standardized functions are the same across different areas. This research revealed that this is not done yet and therefore it is important to zoom in on the organizational structure.

- **Standardize forms**: The SIPOC of for example CoAssist describes a number of standardized forms that are needed as input for certain process steps. Those standardized forms have to be developed in order to tap the full potentials of service modularization.

- **Develop project management**: Employees responsible for the development of SAM have also operational responsibilities. Those employees are assessed mainly on the operational activities and not on developing activities. Therefore there are times that it is difficult to make progress, especially when different milestones of SAM are not clear. Project management is a methodical approach to planning and guiding project processes from start to finish. This ensures that it is clear what has to be done within each timeframe and describes who is responsible for what. Project management for SAM will help Cofely to achieve their goals.

- **Keep an eye on the organizational risks**: Section 4.2 describes the organizational risks during the execution of the roadmap. In order to minimize the possibility of failure during the further development of SAM, it is recommended to take those risks into account.

- **Map the current situation of existing customers**: The modular service architecture of Cofely
consists of existing services that are already executed at different customers. The goal of SAM is to provide more services at each customer and to be a better partner of them. Therefore it is necessary to make an overview of the current situation. Which services associated with which modules of SAM are already provided by Cofely? This overview will uncover potential within the different building blocks of SAM. The overview of the services and customers in Appendix E could serve as input.

- **Link the different services of SAM to a certain SPC code**: The calculation department of Cofely develops the calculation of a certain service using SPC codes. Therefore the different services that will be included within SAM have to be linked to a certain SPC code in order to facilitate the calculation department.

- **Map the connection between the development department and SAM**: Cofely has a development department that is busy with developing new additional services for the organization. Those new services have to be matched with SAM and therefore it is important to map how the development department will be connected to SAM.
References


Appendix A- Golden Circle Sinek (2009)

Sinek(2009) states that leaders and organization achieve a disproportionate degree of influence by following the principles of the ‘Golden Circle’. The circle comprises three concentric rings with ‘WHY’ in the core, followed by ‘HOW’ and finally ‘WHAT’. This is represented in Figure 17.

By beginning with the ‘WHY’, leaders and organization can leverage on beliefs and aspirations of their employees and their customers. “This allows them to tap onto a deeper vein of trust, belief and passion which transcends the common attributes of competitiveness such as quality, features, benefits, service and price (Sinek, 2009)”.

Therefore meetings and presentations around the development of the modular service model utilize the Golden Circle of Sinek (2009). Starting with ‘WHY’ something is important to know, then ‘HOW’ it should be done and finally by stating ‘WHAT’ actually has to be done.
Appendix B – Meetings at Cofely

Appendix B1: Target Markets

Date: 15- January 2013

Attendees: - 4 Business Consultants, working within different regions of Cofely
- 1 Member of the management team of Cofely Southwest.

Topic: Target market SAM

According to Verma et al. (1999) it is important to decide which customers an organization wants to reach before the development of the model continues. Therefore meeting was planned with four business consultants of different regions within Cofely. First of all this ‘WHY’ was made clear. The meeting was prepared by dividing the service market of Cofely in 3 segments: Industry, Utility and Water (Figure 18). The TOP 15 customers of Cofely were positioned in those segments (In the same way as Pekkarinen & Ulkuniemi (2008)) and the question was:

*Which of those customers Cofely wants to reach with the ‘SAM-model’?*

![Figure 18: Target market Cofely](image)

Conclusion was that there were 3 kinds of possible customers for the modular service model. This were the existing big customers (TOP-15), existing customers with potential to become bigger customers and possible new customers. The existing big customers (TOP-15) should serve as best practices for all the other ones, because Cofely knows (experience) that they are interested in this kind of model. Therefore the service model will be introduced in this target market first.
Appendix B2: Definitions

The meetings around the definitions are conducted according to the Golden Circle presented in Appendix A.

Appendix B2.1 – Why definitions?

Date: 22 February 2013

Attendees:
- 4 Business Consultants, working in different regions within Cofely.
- 1 Member of the management team of Cofely Southwest.
- 12 employees who are working in the service environment of Cofely.

Topic: Definitions modules

19 stakeholders of Cofely came together to discuss the next step of the development of SAM. Because it is important for the stakeholders to know why they are doing something, a part of the literature review was presented. It was explained ‘why’ the next step in the development phase of a good modular service model is to set the definitions.

Service modules need to be described very precisely to tap the full potentials of service modularization. Such descriptions are necessary to find the right modules for individual service offerings regarding cost efficiency, optimization and adequacy. Heiskala et al. (2005) describe that most advantages of service modularization directly correlate with the necessity of a structured and well-defined description of the service modules and their inter-dependencies. Without a structured description, the challenges of service modularization cannot be tackled and the expected benefits will not be achieved (Heiskala et al., 2005). Therefore clear definitions and goals of the service modules have to be made first.

At the end of the meeting the stakeholders were divided into different groups. Every group was responsible for a few definitions, which were handed in within 2 weeks.

Appendix B2.2 – Discuss submitted forms

Date: 8 March 2013

Attendees:
- 4 Business Consultants, working in different regions within Cofely.
- 1 Member of the management team of Cofely Southwest.
- 12 employees who are working in the service environment of Cofely.

Topic: Definitions modules

After studying the definitions that were handed in, the following conclusions were drawn:

- The definitions were written in a different style. Some definitions were written from an internal point of view, others from an external point of view. Because it should be possible for both customers and users internal to the organization to understand the definitions, they have to be rewritten in a general style.
- Some definitions contained detailed examples. The examples do not cover all aspects of the module and could cause ambiguity.
- Some definitions described also the goal of the module. Both the goal and the definitions should result in a structured and well-defined description of the service modules. Therefore the goal of the module has to be separated from the definition itself.
- The content of some definitions needed some improvement, keeping in mind that there should be no overlap but only an interface between the modules (Pekkarinen & Ulkuniemi, 2008). A challenge is this development stage is the fact that the modules and the interfaces between them should have as low coordination as possible.

The improvement points per definition were presented during this meeting. Because it was not possible to discuss an hour about every definition, ‘yes or no’ propositions were used to draw conclusions quickly.
Appendix B3: First attempt, graph based structure of modules

Date: 25 March 2013

Attendees:  
- 4 Business Consultants, working within different regions of Cofely.  
- 12 Employees, working within the service environment of the organization and experienced in activities related to modules of the service concept.

Topic: Interdependencies modules

After setting the definitions, there was an unstructured set of modules. Those modules should be structured according to the graph-based structure presented by Bottcher & Klingner (2011) presented in Figure 19.

Figure 19: From unstructured to structured modules

The goal of this meeting was to get an answer on the following question:

*What are the interdependencies between the different service modules of SAM?*

The golden circle presented in Appendix A was used again. During this meeting it was impossible to set the structure. The problem was that some stakeholders concluded that Cofely shouldn’t develop the new service modules as mentioned in the service concept in figure ? Their opinion was that Cofely should use existing services, because they already have them and customers are willing to pay for them. Those services should be used within the concept of SAM. A lot of discussions followed.

Furthermore it could be concluded that there was no agreement on the position of SAM within the customer environment. Should SAM focus only the management level or also on the operational level of the customer? Those different levels require other interdependencies.

*Example that was mentioned a few times:*

“Recording the meter readings of a customer, doesn’t need any other service module. Another activity with the focus on Energy management, for example an energy improvement proposal, needs a functional block diagram (Functional Management?). Both recording the meter readings and the energy improvement proposal should be part of the SAM model. Or should we develop a whole new service called Energy Management?”

It is important to decide if SAM should use existing service or not. Also there has to be agreement on the position of SAM within the customer environment.
Appendix B4: Proof of concept SAM

Date: 5 April 2013

Attendees: 4 Business Consultants, working within different regions of Cofely.
- 12 Employees, working within the service environment of the organization and experienced in activities related to modules of the service concept.

Topic: Proof of Concept

There was no agreement on the position of SAM within the customer environment. Which services should be part of the service model and which not? And are we going to use existing services or establish new ones per module? Therefore a proof of concept was organized, also according to the Golden Circle presented in Appendix A. One of the modules, functional management, was chosen.

The goal of this proof of concept was to get an answer on the following questions:

**Which services do we want to sell within functional management?**

Everybody agreed on an existing service named functional block diagram. A functional block diagram shows the different installations of a customer and their interdependencies. Also other existing services were mentioned, but it could be concluded that those services have also interfaces with other modules. There was a discussion about a functional risk analysis. Is this part of functional management or risk management? Actually both, and there were more examples like this.

The next question was:

**Is a customer willing to pay for a functional block diagram and is that the service that is presented as functional management?**

The conclusion was that a customer is not willing to pay for a functional block diagram, although it has some additional value. A functional block diagram is part of SAM but is not the service presented as functional management.

Thus far, SAM consists of modules that are different and separated services. The goal was to link every module to certain process modules and organizational modules, as shown in the service platform in Figure 7. The conclusion of the proof of concept was that this way of thinking is not valid, because it is not possible (in the situation of Cofely) to sell and standardize the different building blocks of modular service model apart. Cofely wants to include existing within the modular service model because they know that a customer is willing to pay for it. Those existing services are combinations of different modules of SAM. A functional risk analysis for example is a combination of functional management and risk management and some customers already paid for this service.

Another conclusion was that it should be possible to include new developed services in the model. This service is probably again a combination of different building blocks of the SAM-model.

They asked for further investigation within literature, to discover if it is valuable to include services on management as well as on operational or not.
Appendix B5: Second attempt, graph based structure of modules

Date: 12 April 2013
Attendees: - 4 Business Consultants, working within different regions of Cofely.  
- 10 Employees, working within the service environment of the organization.  

Topic: Interdependencies SAM

During first attempt to make the graph based structure of the service modules (Appendix B3), there was no agreement on the position of SAM within the customer environment. The proof of concept clarified the situation, but there is still no graph based structure of the model. This meeting was constructed according to the Golden Circle presented in Appendix A and again the central question of this meeting was:  

What are the interdependencies between the different service modules of SAM?

The literature of Narver et al. (2004) and Treacy & Wiersema (2007) about customer partnership that goes along with a proactive attitude was presented. The conclusion was that every service on a strategic or tactical level, needs input from the service executed on the operational level.

Another conclusion was that a functional block diagram and a risk matrix are the basis for all other services. A functional block diagram shows the different installations of a customer and their interdependencies, a risk matrix shows the risks associated with them. Insight in the installations and risk associated with them are needed to execute other services. That is at least the ideal situation that SAM wants to reach. They concluded that representatives of Cofely should show the FBD in combination with the risk matrix to the customer and discuss it to uncover potential. Therefore the FBD should contain indicators of the other service modules. The FBD is functional management on an operational level and the RM is risk management on an operational level.

Also other interdependencies are discussed and the graph based structure is shown in Figure 15. Life cycle management on strategic and tactical level is needed for Maintenance program management on strategic and tactical level. Subcontract, spare part and risk management on strategic and tactical level needs input from maintenance program management on that level before it can start.

Because of the importance of the risk matrix and functional block diagram within SAM and the importance of standardization within a modular service model, every service should contain a standard functional block diagram and a standard risk matrix.
Appendix B6: Services per module

Summary three meetings with employees of different regions

Date: April 2013

Attendees: Contract managers of the regions Southwest, East and South.

Topic: Services per module

There are four different regions within Cofely South-Netherlands: Southwest, Southeast, East and South. Three meetings with responsible employees of the regions Southwest, East and South were conducted. The following information was discussed:

During the meeting of the SAM-group it was concluded that an investigation of the services within the TOP-15 customers is needed. Every service provided to these customers should be linked to different service modules of SAM, but always have a focus on one module. The question is which services, interesting for SAM, we already provide to the TOP-15 customers? Where lays the focus of those services and who are the responsible employees within the regions? Is there already a process?

Using a table presented in Figure 20 we walk through the different modules.

It resulted in an overview of different services per module, presented in Appendix E. During the meetings it could be concluded that the processes of the different services are mainly customized.

Module: Functional management

<table>
<thead>
<tr>
<th>Submodule</th>
<th>Department (yes/one?)/no?</th>
<th>Customer</th>
<th>Responsible employee</th>
<th>Processes</th>
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</thead>
<tbody>
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</tbody>
</table>

Figure 20: Standard form, example Functional Management
Appendix B7: Standardize process with Lean Six Sigma

Summary meetings Lean Six Sigma

Date: May 2013
Attendees: Employees of the Lean Six Sigma department within Cofely
Topic: Standardization of services

First of all the employees of the lean six sigma department within Cofely explained something about the history of six sigma. It is a process improvement methodology with its genesis in the manufacturing arena, and has gained wide acceptance in companies in the United States. The methodology has been proving itself effective in nonmanufacturing applications as a customer-driven, data-based approach that provides an objective framework for improving essentially qualitative.

The results of the literature study were shown and the Lean Six Sigma department was compliant with the PDCA circle. The PDCA cycle, established by Deming is shown in figure 7. It is a well-established framework for process improvement where it focuses on continuous learning and knowledge creation, which is the key in the success of any quality improvement initiative (IAM/BSI, 2004). After explaining the goals of the modular service model they proposed to make a high level process of each service of approximately 7 high level steps (PLAN-step of the PDCA-cycle).

With the help of those steps, a so-called SIPOC diagram can be elaborated. SIPOC stands for Supplier, Input, Process, Output and Customers and it has to be made according to the following steps:
1. Begin with the Process.
2. Map it in approximately 7 high level steps.
3. Identify the Outputs of this Process.
4. Identify the Customers that will receive the Outputs of this Process.
5. Identify the Inputs required for the Process to function properly.
6. Identify the Suppliers of the Inputs that are required by the Process.

Using the SIPOC methodology provides insight in the different process steps and standardized roles within the organization. The standard template is shown in Figure 21.
Who is going to execute the process steps needs to be elaborated within a cross-functional diagram.

![Figure 21: SIPOC-diagram](image)

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Inputs</th>
<th>Process</th>
<th>Outputs</th>
<th>Clients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>Requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C – Definitions modules

Appendix C1 - First definitions of modules (submitted by stakeholders)

Overview definitions Sustainable Asset Model
Different stakeholders were asked to hand in the definition of one of the modules. This appendix presents an overview of all those definitions together:

Asset:
An asset is an assembly of components. Those components are a whole from a maintenance point of view and fulfill a specific function within business processes. This is the lowest level of decomposition on which technical and financial reporting takes place. An asset has economic value and is property of a person or legal entity (In Dutch: “Een asset is een samenstel van componenten die vanuit onderhoudsoogpunt één geheel vormen, en binnen bedrijfsproces een specifieke functie vervult. Het betreft het laagste decompositieniveau waarop technisch en financiële rapportage plaats vindt. Een asset heeft economische waarde en is eigendom van een persoon of een rechtspersoon”).

Reporting
Cofely provides periodic reports that should show visually what the results of the provided service are. For example periodic reports about costs, availability, energy consumption and the condition of the installation. All this in relation to the forecasts and agreements that are made before a certain service starts. The reports have to be discussed together with the client for the optimization of the execution process (In Dutch: “Cofely verzorgt periodieke rapportages waarmee visueel zichtbaar wordt wat voor resultaat de geleverde dienstverlening heeft opgeleverd. Onder andere worden de gemaakte kosten, beschikbaarheid, energieverbruik en de staat van de installatie periodiek gerapporteerd. Dit alles in relatie tot een vooraf gemaakte prognose en gemaakte afspraken. Deze rapportages dienen de leidraad te zijn om in overleg met u als klant acties te bespreken ter optimalisatie van het uitvoeringsproces”).

Financial management
The policy adopted by an organization and procedures for the collection, recording, processing, monitoring and reporting on financial transactions in order to ensure that risks are managed and the costs do not exceed the budget (In Dutch: “Het door een organisatie vastgestelde beleid en procedures voor het verzamelen, vastleggen, verwerken, controleren en rapporteren over financiële transacties teneinde te borgen dat risico’s worden beheerst en de kosten het budget niet overschrijden”).

Maintenance program management
Identifying and grouping activities and their frequencies in time, implementing, evaluating and adjusting maintenance activities, materials, equipment, hours, documents and information. Based on assessment of financial, economic and security risks. Good maintenance management leads to efficient execution of maintenance and an increase of risk control (In Dutch: “Vaststellen en samenvoegen van activiteiten en hun frequenties in de tijd, implementeren, evalueren en bijstellen van onderhoudsactiviteiten, materiaal, materieel, uren, documenten en informatie. Op basis inschatting van
financiële, bedrijfseconomische en veiligheidsrisico’s. Goed onderhoudsplanbeheer leidt tot efficiënte uitvoering van het onderhoud en een toename van de beheersing van risico’s”).

**Spare parts management**
With sustainable spare parts management, we strive to avoid unnecessary inventories in the short and long term (In Dutch: “Met duurzaam spare parts management streven we naar het vermijden van onnodige voorraden op korte én lange termijn”).

**IT Management**
The proper management of for example maintenance management systems, building management systems and IT systems, which provides you information about your installations and related costs. This leads to completion of the information needs and automation level that fits your goals and work processes. Examples of information is data like, messages of failures, operating hours, energy consumption, maintenance tasks that were carried out, planned maintenance tasks, planned costs, costs made, performance, converted to more functional areas such as availability, energy benchmark, maintenance progress, KPI’s about response times, recovery times and energy consumption (In Dutch: “Het juiste beheer van bijvoorbeeld onderhoudsbeheersystemen, gebouwbeheersystemen en ICT systemen, welke u voorzien in informatie over uw installaties en daaraan gerelateerde kosten. Dit leidt tot invulling van de informatiebehoefte en automatiseringsgraad die aansluit bij uw doelstellingen en werkprocessen. Voorbeelden van informatie is data zoals, o.a. stortingsmeldingen, draaiuren, energieverbruiken, uitgevoerde onderhoudstaken, geplande onderhoudstaken, geplande kosten, gemaakte kosten, prestaties, omgezet naar meer functionele aandachtgebieden zoals o.a. beschikbaarheid, energiebenchmark, onderhoudsvoortgang, KPI’s over responsetijden, hersteltijden, energieverbruik”).

**Functional Management**
As functional manager, Cofely is the link between user needs and technical installations. Functional management activities are summarized by us in an advice. An advice which describes and visualizes what changes are needed to provide the facilities that are desired by the customer. Recommendations may relate to: Configuration of technical installations, Maintenance planning, stock of spare parts, long term budgets, operating instructions (In Dutch: “Als Functioneel Beheerder is Cofely de schakel tussen de gebruikersbehoefte en de technische installaties. Functionele beheersactiviteiten vatten wij samen in een advies. Een advies waarin beschreven of gevisualiseerd is welke wijzigingen nodig zijn om de voorzieningen te kunnen (blijven) leveren die gewenst zijn door de klant. Geadviseerde wijzigingen kunnen betrekking hebben op: Configuratie van technische installaties, onderhoudsplan(ning), de voorraad van reserve onderdelen, meerjarenbegroting, bedieningsvoorschriften”).

**Subcontract management**
Responsibility for, on the basis of the agreed service, selection, contracting, supervising and assessing the performance of the to third parties outsourced preventive and corrective maintenance (In Dutch: “Verantwoordelijkheid voor, de op basis van de met de klant afgesproken dienstverlening, selecteren, contracteren, begeleiden en beoordelen uitvoering van het aan derden uit te besteden (mogelijk specialistisch ) preventief en correctief onderhoud” ).
**Legal requirements management**

The management of legal requirements is the set of once and periodic preventive maintenance actions and corresponding security of the process. The aim is to design, build and operate according to the legal requirements (In Dutch: “Het beheer van wettelijke eisen is het geheel aan preventieve éénmalige en periodieke onderhoudshandelingen en daarbij behorende procesborging dat als doel heeft assets te ontwerpen, bouwen en beheren conform de gestelde wettelijke eisen (bouwbesluit met alle onderliggende norm- wet- en regelgeving”).

**Risk management**

Risk management is identifying and assessing risks and determining the management of it. The management includes activities that reduce occurrence and impact of risks. The goal is to improve project performance through systematic identification, analysis and control of related risks (In Dutch: “Risicobeheer is het identificeren en beoordelen van risico’s en het vaststellen van beheersmaatregelen. Beheersmaatregelen zijn activiteiten die de kans van optreden van risico’s verkleinen of de gevolgen van risico’s beperken. Het doel van risicobeheersing is het verbeteren van projectprestaties door middel van systematische identificatie, analyse en de beheersing van de gerelateerde risico’s”).

**Condition management**

The management of condition (condition level) is the set of operations that aims to qualify the assets and classify them according to the predefined norm (usually according to NEN 2767). Based on the established qualification and classification, actions can be defined to take away deviations that caused a lower condition level as defined earlier (In Dutch: “Het beheer van Conditie (conditieniveau) is het geheel aan handelingen dat er op gericht is om assets te kwalificeren en classificeren op basis van de vooraf afgesproken norm (veelal volgens de NEN 2767). Op basis van de vastgestelde kwalificatie en classificatie kunnen acties uitgezet worden om afwijkingen, die geleid hebben tot een lagere conditieniveau als vooraf vastgelegd / afgesproken, weg te nemen”).

**Energy management**

Energy management is designed to identify potential savings in energy consumption and maintenance. Using the energy scan and energy monitoring, energy consumption figures of the buildings and building-related installations were collected and analyzed periodically (In Dutch: “Energiebeheer is er op gericht om potentiële besparingen op energieverbruik (CO2) en onderhoud te identificeren. Met behulp van de zogenaamde energie scan en energie monitoring worden in het gebouw en aan de gebouwgebonden installaties energieverbruikscijfers en stooklijnen van installaties periodiek verzameld en geanalyseerd”).

**Document management**

Document management is about the way an organization controls his document flow. It includes the effective management of finance, technology, sustainability and safety of documents in all operations of a company (In Dutch: “Document beheer is de manier waarop een organisatie haar documentstroom beheerst. Het omvat het effectief beheer van de financiën, technologie, duurzaamheid en veiligheid van (technische) documenten in alle handelingen van een bedrijf”).
Life cycle management
Managing the lifecycle of assets includes the set of actions and processes that have the goal of optimizing the usage of those assets during the economic or technical lifetime (In Dutch: “Het beheer van de levenscyclus van assets is het geheel aan handelingen en processen dat tot doel heeft om de betreffende assets gedurende de gehele economische dan wel technische levensduur optimaal te benutten)
Appendix C2 - Final definitions

Overview final definitions Sustainable Asset Model

Asset:
An asset is an assembly of components. Those components are a whole from a maintenance point of view and fulfill a specific function within business processes. This is the lowest level of decomposition on which technical and financial reporting takes place. (In Dutch: “Een asset is een samenstel van componenten die één geheel vormen en binnen het bedrijfsproces een specifieke functie vervult. Het betreft het laagste decompositieniveau waarop technisch en financiële rapportage plaats vindt”).

Reporting
Reporting includes the provision of reports that make visible which results the service has obtained. All this in relation to the previously made forecasts and arrangements. Goal: Provide guidelines to discuss possible actions to optimize the execution process. (In Dutch: “Rapportage omvat de verzorging van rapportages waarmee feitelijk zichtbaar wordt wat voor resultaat de geleverde dienstverlening heeft opgeleverd. Dit alles in relatie tot een vooraf gemaakte prognose en gemaakte afspraken. Doel: Leidraad vormen om acties te bespreken ter optimalisatie van het uitvoeringsproces”).

Financial management
Financial management includes the management and associated procedures of the financial policy adopted by an organization. Goal: Ensure that risks are managed and ensure that costs do not exceed the budget. (In Dutch: “Financieel beheer omvat de beheersing van het door een organisatie vastgestelde financiële beleid en de bijbehorende procedures”. Doel: risico’s beheersen en zorgen dat kosten het budget niet overschrijden”).

Maintenance program management

Spare parts management
Spare parts management includes the management of optimal stock levels of spare parts in the short and long term. Goal: Avoid unnecessary inventories in the short and long term (In Dutch: “Spare parts beheer omvat het beheersen van de optimale voorraadhoogte van spare parts op korte en lange termijn. Doel: Vermijden van onnodige voorraden van spare parts op korte én lange termijn).

IT Management
IT management includes identifying and managing ICT and automation systems, which provide information about the assets. Goal: Delivering the information requirements and level of automation
that fits the goals and processes of the customer. (In Dutch: “Systeem beheer omvat het vaststellen en beheren van ICT en automatiseringssystemen, welke voorzien in informatie over de assets. Doel: Invulling van de informatiebehoefte en automatiseringsgraad die aansluit bij de doelstellingen en werkprocessen van de klant”).

**Functional Management**

Functional management includes the translation from technology to functionality for the process of the customer and the management of this process. Goal: Secure the customer process. (In Dutch: “Functioneel beheer omvat de vertaling van techniek naar functionaliteit voor het klantproces en het beheer hiervan. Doel: Klantproces borgen”).

**Subcontract management**

Subcontract management includes the responsibility for all the proceedings that are aimed at the third parties outsourced services. Goal: Optimize the outsourced services. (In Dutch: “Functioneel beheer omvat de vertaling van techniek naar functionaliteit voor het klantproces en het beheer hiervan. Doel: Klantproces borgen”).

**Legal requirements management**

Legal requirements management includes all the operations that are required to comply to the law. Goal: Design, build and operate according to the legal requirements. (In Dutch: “Wettelijke eisen beheer omvat het geheel aan handelingen die nodig zijn om aan de wet te voldoen. Doel: Ontwerpen, bouwen en beheren conform de gestelde wettelijke eisen”).

**Risk management**

Risk management includes identifying and assessing risks but also determining the management of it. The management includes activities that reduce the occurrence and impact of risks. Goal: Improve project performance through systematic identification, analysis and control of related risks (In Dutch: “Risicobeheer omvat het identificeren en beoordelen van risico’s maar ook het vaststellen van beheersmaatregelen. Beheersmaatregelen zijn activiteiten die de kans van optreden van risico’s verkleinen of de gevolgen van risico’s beperken. Doel: Verbeteren van projectprestaties door middel van systematische identificatie, analyse en de beheersing van de gerelateerde risico’s”).

**Condition management**

Condition management includes all the operations that are focused on the qualification and classification of assets, based on the predetermined standard, but includes also maintaining the desired condition. Goal: Prevent, ascertain and take away deviations that caused a lower condition level as defined earlier (In Dutch: “Conditiebeheer omvat het geheel aan handelingen dat er op gericht is om de assets te kwalificeren en classificeren op basis van de vooraf afgesproken norm, maar ook op de gewenste conditie te behouden. Doel: Het voorkomen, constateren en wegnemen van afwijkingen aan assets, die (kunnen) leiden tot een lager dan gewenst conditieniveau”).
Energy management
Energy management includes the translations of the energy objectives to the identification of the energy strategy. But also monitoring, analyzing and evaluating energy requirements. Goal: Save on energy consumption. (In Dutch: “Energiebeheer omvat het vertalen van energiedoelstellingen naar het in kaart brengen van de energiestrategie, alsmede het monitoren, analyseren en evalueren van de energiebehoeften. Doel: Potentiele besparingen op energieverbruik”).

Document management

Life cycle management
Life cycle management includes all the operations and processes which ensure that assets are used optimal during the economic or technical lifetime. Goal: Optimal usage of the assets during their lifetime. (In Dutch: “Levenscyclus beheer omvat het geheel aan handelingen en processen die ervoor zorgen dat de assets gedurende de gehele economische dan wel technische levensduur optimaal benut worden. Doel: assets gedurende de levensduur optimaal in te zetten en te benutten, met als ultieme doel de totale kosten van eigenaarschap van installatie en achterliggend proces te minimaliseren”).
Appendix D- Indicators per service module

Different indicators were constructed per module. Those indicators were added to the FBD to uncover more possibilities for SAM.

Risk management

Functional management

Spare parts management

Financial management

Maintenance program management
Life cycle management

IT Management

IT

Energy management

Subcontract management

Document management
Appendix E – Overview services per module

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Module 2</th>
<th>Module 3</th>
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<tbody>
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<td>Service 101</td>
<td>Service 102</td>
</tr>
</tbody>
</table>
Appendix F- Place of SAM in maintenance process Cofely

Appendix F1- General maintenance process Cofely

** Process continues on next page **
Appendix F2- Maintenance process Cofely on the basis of SAM

** Process continues on next page**
Start implementatie-traject

Overdracht naar uitvoering

Inhoud controleren

Opportunity bijwerken en voortgangslijst en updaten

Contract aanmaken in SAP

Projectadministratie inlichten

Aanpassing IB en/of SAP-contract

Analyseren terugmelding

Invullen sjabloon contractbouw

Contractbouw

Raamcontract (SAP)

subcontractors

In SAP IB aanvullen/aanmaken + contract vullen met beurten en taken

Operationeel beheer door Beheertechnicus/serviceleider/WVB

Vrijgave serviceorder

Uitvoering Terugmelding

Uitvoer door Servicemonteur/Beheertechnicus

Uren, Component, Feiten, Stillstandtijd, uitbesteding, diversen.

Terugmelding verwerken en Terugmelding/Storing Oplossing afhandelen a.d. KPI's

Contractspecifieke zaken toevoegen

Facturatie + DATA

Einde contract?

Afhandelen contract einde (SAP/SOURCING/etc…)

Ja

SAM DECISION

OPERATIONAL LEVEL

STRATEGIC / TACTICAL LEVEL

Customer

Sustainable Asset Management

Mission

Vision

Strategy

Goals

 Energy Efficiency
 Asset Efficiency
 Human Comfort

 Costs
 Performance
 Consumption

 Energy Efficiency
 Asset Efficiency
 Human Comfort
Appendix G - Standardization CoAssist

Appendix G1 - Standard FBD Hospital
**Appendix G2- Standard Risk Matrix Hospital**

The risk matrix is constructed according to the following principle: Probability x Impact.

The probability is constructed according to the following matrix:

**Probability**

<table>
<thead>
<tr>
<th>Redundancy:</th>
<th>Number of failures</th>
<th>Condition</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active redundancy</strong></td>
<td>No</td>
<td>Goed</td>
<td>1 Small</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>1 Small</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Goed</td>
<td>1 Small</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>1 Small</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td>A lot</td>
<td>Good</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>2 Medium</td>
</tr>
<tr>
<td><strong>Passive redundancy</strong></td>
<td>No</td>
<td>Goed</td>
<td>1 Small</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>1 Small</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Goed</td>
<td>1 Small</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>3 Above average</td>
</tr>
<tr>
<td></td>
<td>A lot</td>
<td>Good</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>3 Above average</td>
</tr>
<tr>
<td><strong>No redundantie</strong></td>
<td>No</td>
<td>Goed</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>3 Above average</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Goed</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>2 Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>3 Above average</td>
</tr>
<tr>
<td></td>
<td>A lot</td>
<td>Good</td>
<td>3 Above average</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>3 Above average</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad</td>
<td>3 Above average</td>
</tr>
</tbody>
</table>
The impact is constructed according to the following matrix:

**Impact**

<table>
<thead>
<tr>
<th>How many users could suffer from it</th>
<th>Does production suffer from it</th>
<th>Are there problems regarding to Safety, Health or the environment</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25%</td>
<td>Yes</td>
<td>yes</td>
<td>3 Great</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>2 Reasonable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>yes</td>
<td>2 Reasonable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>1 Small</td>
</tr>
<tr>
<td>25-75%</td>
<td>Yes</td>
<td>yes</td>
<td>3 Great</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>2 Reasonable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>yes</td>
<td>3 Great</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>1 Small</td>
</tr>
<tr>
<td>&gt;75%</td>
<td>Yes</td>
<td>yes</td>
<td>3 Great</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>3 Great</td>
</tr>
<tr>
<td></td>
<td></td>
<td>yes</td>
<td>3 Great</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>2 Reasonable</td>
</tr>
</tbody>
</table>

The risk level is constructed according to probability x impact and is shown in the risk matrix by different colors and descriptions:

**Risk**

<table>
<thead>
<tr>
<th>Risk</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Green</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2</td>
<td>Green</td>
<td>Acceptable</td>
</tr>
<tr>
<td>3</td>
<td>Orange</td>
<td>Attention</td>
</tr>
<tr>
<td>4</td>
<td>Orange</td>
<td>Attention</td>
</tr>
<tr>
<td>5</td>
<td>Red</td>
<td>Risk</td>
</tr>
<tr>
<td>6</td>
<td>Red</td>
<td>Risk</td>
</tr>
<tr>
<td>7</td>
<td>Red</td>
<td>Risk</td>
</tr>
<tr>
<td>8</td>
<td>Red</td>
<td>Risk</td>
</tr>
<tr>
<td>9</td>
<td>Red</td>
<td>Risk</td>
</tr>
</tbody>
</table>
An example:

**Risk matrix**

<table>
<thead>
<tr>
<th>Bouwsteen</th>
<th>Actieve redundantie</th>
<th>Passive redundantie</th>
<th>Geen redundantie</th>
<th>Gebruikers</th>
<th>Productie</th>
<th>VGM</th>
<th>Kans:</th>
<th>Effect:</th>
<th>Risico:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risico bepaling**

<table>
<thead>
<tr>
<th>Bouwsteen</th>
<th>Actieve redundantie</th>
<th>Passive redundantie</th>
<th>Geen redundantie</th>
<th>Gebruikers</th>
<th>Productie</th>
<th>VGM</th>
<th>Kans:</th>
<th>Effect:</th>
<th>Risico:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Redundantie</th>
<th># storingen</th>
<th>Conditie</th>
<th>Gebruikers</th>
<th>Productie</th>
<th>VGM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kans:</th>
<th>25%</th>
<th>75%</th>
<th>Ja</th>
<th>Nee</th>
<th>Ja</th>
<th>Nee</th>
<th>Nee</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effect:</th>
<th>Risico:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VGM</th>
<th>Effect:</th>
<th>Risico:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- x: Indicate present
- x: Indicate absent

- 25%: Medium risk
- 75%: High risk
- Ja: Present
- Nee: Absent

---

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Appendix G3 - High level process CoAssist

Proces CoAssist

1. Customer wants to comply with legislation (Start)
2. Inform customer about CoAssist
3. Conversation with customer about his needs
4. Aftercare
5. Offer
6. Get the job
7. Execution
8. Evaluation
9. Stop

- Fill format Input Form
- Fill format Functional Block Diagram
- Fill format Risk Matrix
- Fill format Basic Asset Form

- Control for legislation within Cofely
- Reports
- Cost control Cofely
- Time to evaluate the process
### Appendix G4- SIPOC CoAssist

**Process:** CoAssist

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Inputs</th>
<th>Requirements</th>
<th>Process</th>
<th>Outputs</th>
<th>Requirements</th>
<th>Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teamleader, Commercial, Contract manager</td>
<td>Question of customer in SAP</td>
<td>Complete, as concrete as possible</td>
<td>Customer wants to comply with legislation</td>
<td>Opportunity</td>
<td>in SAP and with description</td>
<td>Commercial and Business Consultant</td>
</tr>
<tr>
<td>Marketing and Communication</td>
<td>Film/ Demo &amp; leaflet CoAssist</td>
<td>The three different levels need to be clear for the customer: Operational, Tactical and Strategic</td>
<td>Inform client about CoAssist</td>
<td>Information about our services in relation to his question</td>
<td>Customers has a clear view of all possibilities of CoAssist</td>
<td>Commercial and Business Consultant</td>
</tr>
<tr>
<td>Business Consultant</td>
<td>Standard Format Functional Block diagram hospitals</td>
<td>Standard format</td>
<td>Conversation with client about his needs</td>
<td>Filled Functional Block Diagram and matched with situation customer</td>
<td>Deviations from standard Functional Block Diagram are described</td>
<td>Business Consultant and Commercial department</td>
</tr>
<tr>
<td>Business Consultant</td>
<td>Standard Format Risk matrix hospitals</td>
<td>Standard format</td>
<td>Conversation with client about his needs</td>
<td>Filled Risk Matrix matched with situation customer</td>
<td>Deviations from standard Risk Matrix are described</td>
<td>Business Consultant and Commercial department</td>
</tr>
<tr>
<td>Business Consultant and Commercial Department</td>
<td>Standard input form functionalities CoAssist</td>
<td>Standard format</td>
<td>Aftercare</td>
<td>Filled Input form CoAssist</td>
<td>Everything is filled in</td>
<td>Calculation Department</td>
</tr>
<tr>
<td>Commercial Department and Maintenance Engineer</td>
<td>Standard Format Basic Asset Form CoAssist</td>
<td>Standard format for installations of hospital</td>
<td>Offer</td>
<td>Filled Basic Asset form</td>
<td>Everything is filled in</td>
<td>Calculation Department and Backoffice IMS</td>
</tr>
<tr>
<td>Calculation Department, Commercial Department, Business Consultant</td>
<td>Filled Functional Block Diagram, filled Risk Matrix, filled Basic Asset form, filled Input Form, Calculation</td>
<td>Filled in completely</td>
<td>Offer</td>
<td>Offer to customer</td>
<td>There needs to be a link with Functional Block Diagram, Risk Matrix, Basic Asset form and Input form CoAssist</td>
<td>Customer</td>
</tr>
<tr>
<td>Customer</td>
<td>Confirmation at customer</td>
<td>Customer budget</td>
<td>Get the job</td>
<td>Order confirmation</td>
<td>There need to be a reference with the offer to the customer</td>
<td>Commercial and Business Consultant</td>
</tr>
<tr>
<td>Commercial department, Calculation department, Operational department</td>
<td>Capacity planning, Competence need, Functional Block Diagram, Risk Matrix, Assets, Input form</td>
<td>Filled in completely</td>
<td>Kick-off form and time schedule</td>
<td>Filled in completely</td>
<td>Customer, Backoffice Cofely IMS</td>
<td></td>
</tr>
<tr>
<td>Calculation</td>
<td>Budget</td>
<td>Made in SAP</td>
<td>Contract in SAP</td>
<td>SAP template used</td>
<td>Execution team and Backoffice Cofely IMS</td>
<td></td>
</tr>
<tr>
<td>Backoffice IMS</td>
<td>Uploadsheet format</td>
<td>Standard format</td>
<td>Filled upload sheet</td>
<td>Complete with unique link to legislation</td>
<td>Backoffice Cofely IMS</td>
<td></td>
</tr>
<tr>
<td>Backoffice IMS</td>
<td>Filled Upload sheet</td>
<td>Filled in completely</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial department with Business Consultant</td>
<td>Functional specifications from Input Form</td>
<td>Needs to be complete</td>
<td>Link web services with ticket engine (customer/SAP Cofely/ FMIS klant) live</td>
<td>Meet specifications customer</td>
<td>Execution team</td>
<td></td>
</tr>
<tr>
<td>Backoffice IMS</td>
<td>Customer Environment + webservice</td>
<td>Be Live</td>
<td>Test system in Customer Environment, webservice( and Denovo)</td>
<td>Complete functionality, 0 errors, Complete CoAssist</td>
<td>Execution team</td>
<td></td>
</tr>
<tr>
<td>Backoffice IMS</td>
<td>Order tablets</td>
<td>According to the input form</td>
<td>Delivery tablets customer</td>
<td>Filled in in Input Form CoAssist</td>
<td>Execution team</td>
<td></td>
</tr>
<tr>
<td>Backoffice IMS + Execution team</td>
<td>Filled Upload sheet, customer environment and login accounts ready, link webservice with ticket engine live, test system in customer environment, webservice (and Denovo)</td>
<td>Complete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Consultant/ Maintenance Engineer</td>
<td>Testcopy of customer</td>
<td>Copy of service environment customer</td>
<td>Train users customer</td>
<td>Notes with filled Input form accounts (numbers, authorization)</td>
<td>Customer</td>
<td></td>
</tr>
<tr>
<td>CoAssist + Customer</td>
<td>Tasks executed, tasks that need to be executed</td>
<td>Complete</td>
<td>Reports</td>
<td>Tasks done are described</td>
<td>Customer</td>
<td></td>
</tr>
<tr>
<td>Branche+ publisher</td>
<td>&quot;Staatscourant&quot;</td>
<td>References need to be described</td>
<td>Up to date legislation</td>
<td>Norm is right, frequent check</td>
<td>Backoffice</td>
<td></td>
</tr>
<tr>
<td>Backoffice</td>
<td>Up to date legislation</td>
<td>Complete</td>
<td>CoAssist updated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsible employee Cofely</td>
<td>Impact analysis</td>
<td>Complete</td>
<td>Informed customer about new legislation</td>
<td>Defined what has been changed and impact for customer is clear</td>
<td>Responsible employee Cofely</td>
<td></td>
</tr>
<tr>
<td>Contractmanager</td>
<td>Sap Cost Control</td>
<td>Contract used</td>
<td>Financial management</td>
<td>SAP template used</td>
<td>Board Cofely</td>
<td></td>
</tr>
<tr>
<td>Lean Six Sigma</td>
<td>Evaluation Form</td>
<td>Standard format</td>
<td>Filled Evaluation form</td>
<td>Complete</td>
<td>Cofely</td>
<td></td>
</tr>
</tbody>
</table>
Appendix H - Standardization MJOB

Appendix H1 - High level process MJOB

Proces MJOB
## Suppliers

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Inputs</th>
<th>Requirements</th>
<th>Process</th>
<th>Outputs</th>
<th>Requirements</th>
<th>Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teamleader, Commerciant, Contract manager</td>
<td>Question of customer in SAP</td>
<td>Complete, as concrete as possible</td>
<td>Customer wants financial overview of Cofely on assets</td>
<td>Opportunity in SAP and with description</td>
<td>Commercial and Business Consultant</td>
<td></td>
</tr>
<tr>
<td>Marketing and Communication</td>
<td>Film/ Demo &amp; leaflet MJOB</td>
<td>Describes the Cofely Style</td>
<td>Inform client about MJOB</td>
<td>Informed customer about our services in relation to his question</td>
<td>Commercial and Business Consultant</td>
<td></td>
</tr>
<tr>
<td>Business Consultant</td>
<td>Standard Format Functional Block diagram</td>
<td>Standard format</td>
<td>Conversation with client about his needs</td>
<td>Deviations from standard Functional Block diagram are described</td>
<td>Business Consultant and Commercial department</td>
<td></td>
</tr>
<tr>
<td>Business Consultant</td>
<td>Standard Format Risk matrix</td>
<td>Standard format</td>
<td>Filled Risk Matrix matched with situation customer</td>
<td>Deviations from standard Risk Matrix are described</td>
<td>Business Consultant and Commercial department</td>
<td></td>
</tr>
<tr>
<td>Business Consultant and Commercial Department</td>
<td>Standard Input form MJOB</td>
<td>Standard format</td>
<td>Filled input form MJOB</td>
<td>Everything is filled in</td>
<td>Calculation Department</td>
<td></td>
</tr>
<tr>
<td>Commercial Department and Maintenance Engineer</td>
<td>Standard Format Basic Asset Form MJOB</td>
<td>Standard format for installations</td>
<td>Aftercare</td>
<td>Filled Basic Asset form</td>
<td>Everything is filled in</td>
<td>Calculation Department</td>
</tr>
<tr>
<td>Contract Manager or Customer</td>
<td>Asset performance/condition information</td>
<td>Net 2767 condition information and/or Asset performance, failure and maintenance history</td>
<td>Offer</td>
<td>Offer to customer</td>
<td>There need to be a link with Functional Block Diagram, Risk Matrix, Basic Asset form and Input form MJOB. Always plan an appointment with customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Calculation Department, Commercial Department, Business Consultant</td>
<td>Filled Functional Block Diagram, filled Risk Matrix, filled Basic Asset form, filled Input Form, Calculation</td>
<td>Filled in completely</td>
<td>Get the job</td>
<td>Order confirmation</td>
<td>There needs to be a reference with the offer to the customer</td>
<td>Commercial and Business Consultant</td>
</tr>
<tr>
<td>Customer</td>
<td>Confirmation at customer</td>
<td>Customer budget</td>
<td>Customer wants financial</td>
<td>Customer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial department, Calculation department, Operational department</td>
<td>Capacity planning, Competence need, Functional Block Diagram, Risk Matrix, Assets, Input form</td>
<td>Filled in completely</td>
<td>Commercial</td>
<td>Commercial</td>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Commercial department, Calculation department, Operational department</td>
<td>Standard Kick off form</td>
<td>Standard format</td>
<td>Commercial</td>
<td>Commercial</td>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Calculation</td>
<td>Budget</td>
<td>Made in SAP</td>
<td>Commercial</td>
<td>Commercial</td>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Calculation</td>
<td>Filled Basic Asset form, input form MJOB</td>
<td>Complete</td>
<td>Commercial</td>
<td>Commercial</td>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Execution team</td>
<td>Asset list converted to MJOB Format and Asset condition/performance information</td>
<td>Complete</td>
<td>Commercial</td>
<td>Commercial</td>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Execution team</td>
<td>MJOB, filled with assets and performance/condition information, Functional Block Diagram, Risk Matrix</td>
<td>Filled in completely</td>
<td>Commercial</td>
<td>Commercial</td>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Execution team</td>
<td>Prepared MJOB</td>
<td>Filled in completely, discussed in detail</td>
<td>Calculation</td>
<td>20% right, indication price index, transferred to MJOB</td>
<td>Execution team</td>
<td></td>
</tr>
<tr>
<td>Calculation</td>
<td>Filled MJOB with prices, Input Form</td>
<td>Prices and assumptions of calculation</td>
<td>Review on quality and preassumptions, frozen and complete</td>
<td>Customer</td>
<td>Execution team</td>
<td></td>
</tr>
<tr>
<td>Execution team</td>
<td>Reviewed MJOB</td>
<td>Frozen and complete</td>
<td>Agreed MJOB</td>
<td>Complete</td>
<td>Customer</td>
<td></td>
</tr>
<tr>
<td>Contract manager</td>
<td>SAP Cost Control</td>
<td>Contract used</td>
<td>Financial management</td>
<td>SAP template used</td>
<td>Board Cofely</td>
<td></td>
</tr>
<tr>
<td>Lean Six Sigma</td>
<td>Evaluation Form</td>
<td>Standard format</td>
<td>Evaluation</td>
<td>Filled Evaluation form</td>
<td>Cofely</td>
<td></td>
</tr>
</tbody>
</table>

---

### Appendix H2 - SIPOC MJOB

#### Suppliers
- **Teamleader, Commerciant, Contract manager**
  - Question of customer in SAP
  - Complete, as concrete as possible
  - Customer wants financial overview of Cofely on assets
  - Opportunity in SAP and with description
- **Marketing and Communication**
  - Film/ Demo & leaflet MJOB
  - Describes the Cofely Style
  - Inform client about MJOB
- **Business Consultant**
  - Standard Format Functional Block diagram
  - Standard format
  - Conversation with client about his needs
  - Deviations from standard Functional Block diagram are described
- **Business Consultant and Commercial Department**
  - Standard Input form MJOB
  - Standard format
  - Filled input form MJOB
  - Everything is filled in
- **Commercial Department and Maintenance Engineer**
  - Standard Format Basic Asset Form MJOB
  - Standard format for installations
- **Contract Manager or Customer**
  - Asset performance/condition information
  - Net 2767 condition information and/or Asset performance, failure and maintenance history
  - Offer
  - Offer to customer
  - There need to be a link with Functional Block Diagram, Risk Matrix, Basic Asset form and Input form MJOB. Always plan an appointment with customer
- **Calculation Department, Commercial Department, Business Consultant**
  - Filled Functional Block Diagram, filled Risk Matrix, filled Basic Asset form, filled Input Form, Calculation
  - Filled in completely
  - Get the job
  - Order confirmation
  - There needs to be a reference with the offer to the customer
  - Commercial and Business Consultant
- **Customer**
  - Confirmation at customer
  - Customer budget
- **Commercial department, Calculation department, Operational department**
  - Capacity planning, Competence need, Functional Block Diagram, Risk Matrix, Assets, Input form
  - Filled in completely
  - Commercial
  - Commercial
  - Commercial
- **Calculation**
  - Budget
  - Made in SAP
- **Calculation**
  - Filled Basic Asset form, input form MJOB
  - Complete
- **Execution team**
  - Asset list converted to MJOB Format and Asset condition/performance information
  - Complete
  - Commercial
  - Commercial
- **Execution team**
  - MJOB, filled with assets and performance/condition information, Functional Block Diagram, Risk Matrix
  - Filled in completely
  - Commercial
  - Commercial
  - Commercial
- **Execution team**
  - Prepared MJOB
  - Filled in completely, discussed in detail
  - Calculation
  - 20% right, indication price index, transferred to MJOB
  - Execution team
- **Calculation**
  - Filled MJOB with prices, Input Form
  - Prices and assumptions of calculation
- **Execution team**
  - Reviewed MJOB
  - Frozen and complete
  - Agreed MJOB
  - Complete
  - Customer
- **Contract manager**
  - SAP Cost Control
  - Contract used
- **Lean Six Sigma**
  - Evaluation Form
  - Standard format
  - Evaluation
  - Filled Evaluation form
  - Complete
  - Cofely
Appendix H3 - Cross-functional diagram MJOB

Cross-functional diagram MJOB

Customer Process Execution team Maintenance
Calculation Business Consultant

Receive opportunity
Customer wants financial overview of Copex on assets
Inform customer about MJOB
Conversation with customer about his needs
Fill standard FBD, RM and input form

Aftercare
Fill Basic Asset Form
Offer
Input MJOB, Asset performance information and Basic Asset Form
Place Offer

Cofely gets job?

Get the job
Stop

Transfer to project team

Contract in SAP
Convert Assetlist to MJOB format
Convert Asset performance information to MJOB format
Make kick off form and time schedule

Execution Analysis and preparation
Calculation
Review on quality and assumptions
Agreed MJOB
Evaluation MJOB
FBD and RM
Manage new potential SAM
Provide Asset condition/performance information