

Service Oriented - Application Life cycle Management

A reference framework for ALM services



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TITLE PAGE

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SUMMARY

Motivation

The goal of this research project is to investigate the possibilities (advantages and disadvantages) of using a service oriented approach for application life cycle management (ALM). ALM is the set of processes and tools with which the application portfolio is kept up to date. In the current situation the IT processes which make this possible, are frequently entangled with each other and the business organisation. This entanglement makes it hard to break the IT organisation down into smaller pieces. As IT is often not a core activity of an organisation, it is a candidate for outsourcing. When parts of the IT organisation are outsourced they are detached from the rest of the IT organisation, so breaking the entanglement is necessary. The result of breaking the entanglement is that the information cannot flow as it normally does. New standards have to be applied on how information should flow when a process is outsourced. By (re-)defining the parts or services the of IT organisation, this problem can be resolved.

The assumption is that a service approach to ALM can deliver an important contribution to solving the outsourcing problems by reducing the entanglement of the IT processes.

Before the advantages of service oriented ALM (SO-ALM) can be tested, a framework has to be developed which consists of ALM organised around service: the SO-ALM framework.

Meta-model

The SO-ALM framework is composed of ALM services. These services are a wrapper around a collection of processes which act as a black box. How IT processes are organised is already known and the SO-ALM framework does not try to reinvent these, only to present them in another way. Existing process frameworks like ASL, ITIL and OpenUP are used as input for the processes. Each ALM service has a number of functions. The ALM service functions define the interaction; they are the interfaces of the ALM services: what asset is exchanged when. Functions are separated into four different function types for clarification:

- Contract functions - to make agreements about the usage of a service;
- Do functions - give an ALM service assignments to do something, initiate action;
- Deliver functions - retrieve products which are the result from actions initiated by do functions;
- Inform about functions - deliver management information / statistics about an ALM service. The goal is to measure the ALM service to verify it performs to the made agreements.

ALM service creation and documentation

The ALM services are created based upon criteria and knowledge of experts. A workshop and interviews have been used to get the knowledge of experts. A wiki is used to document the ALM services. The wiki implements the meta-model. The advantage of using a wiki opposed to a normal document is that, it always represents the latest version and allows everyone to make contributions in an easy way while creating an audit trail in case reverts are necessary. The wiki can be found online by the URL of: www.so-alm.nl/wiki/.

Results

The SO-ALM concept and the SO-ALM framework have been validated by using a workshop, interviews and an online survey. The results of this validation can be summarised as followed:

- The SO-ALM framework can lead to easier switching of suppliers;
- The SO-ALM framework will probably not lead to an increase in service quality;
- It is more likely that prices will drop due to competition, opposed to an increase in service quality;
- The SO-ALM framework might help to keep a better overview of the entire IT organisation by making the IT organisation more transparent;
- Moving towards a service organisation requires more than a framework with ALM services, do not forget the changes in IT governance;
- Maintaining the SO-ALM framework could be done best by an open source organisation. We think that an open source framework attracts more users and improves faster;
- More standardisation is better; the SO-ALM framework could be used to achieve this. Standardisation leads to lower cost and higher supplier flexibility;
- The meta-model is a good model but it needs careful explanation, people do not always get it the first time;
- The SO-ALM framework delivers a complete set of ALM service;
- Creating uniform names for ALM functions is difficult and should involve multiple review rounds by multiple experts;
- Some ALM services are candidates for outsourcing, like development, others are best kept in-house, like project & program management;

Recommendations

- Further development and testing of the framework in real life situations;
- Investigate the risks/negative aspects of moving towards a service oriented organisation;
- Standardise on metrics and measure the ALM service performance;

PREFACE

This thesis is the result of month's hard work. I have had an exciting time working on this thesis. I learned a lot about what aspects of work I like, and which parts I like a bit less. During my master project I have had some help and firstly I would like to thank my supervisors at Capgemini: Ad Strack van Schijndel and Jan Borsje. They offered me this exciting project and they have been very helpful during the project. Capgemini is a nice place to graduate, nice colleagues and a lot of knowledge to be gained. I learned that wiki's are very versatile tools, and working on the technical implementation for my project gave me my needed technical challenges. Graduate Association Capture introduced me to the other graduate students at Capgemini and presented us with some welcome activities. I would like to thank my colleagues and fellow students at Capgemini for making my time at Capgemini more exiting. It was quite fun to see Bart van Diest, a fellow student from the University, graduating at the same practice. We have had some good time at the office reading *geenstijl*, *nu.nl*, watching youtube or doing other very important work related business. Besides the fun part, helping each other with the master projects was very welcome.

I also would like thank my supervisors at the university; Maria Iacob and Maya Daneva. Their feedback was very useful and learned me a lot. Although in the beginning my slow process of putting things on paper was making understanding my progress difficult. Fortunately this went better later on. I would like to my parents for support, feedback and keeping me focussed. Finally I would like to thank my sister Tessa, my aunt Violet and Martijn Schneider for reviewing my thesis.

Having written this thesis and finished my master program feels like a great relief and achievement. Sometimes it proved to be quite challenging, especially during the last weeks in the summer. I am looking forward to putting the knowledge I have gained during my 8 years of studying into practice.

August 2009,

Sander Schoot Uiterkamp

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1 INTRODUCTION

This chapter provides a motivation for the research and explains the main theme: Service Oriented Application Life cycle Management. The setting in which the research takes place is presented and an introduction to the research approach is given.

1.1 RESEARCH MOTIVATION

Nowadays, information technology (IT) is the backbone of almost every organisation. It is important that the IT is in line and up-to-date with the business it supports. From an IT perspective, this alignment is achieved through Application Life cycle Management (ALM). ALM is the set of processes and tools with which the application portfolio is kept up to date. ALM covers all processes across the life cycle of applications, from development to retirement.

In many organisations IT is not a core competence. IT is therefore often organised inefficiently or cannot deliver the quality the organisation demands (Hagel 3rd & Singer, 1999). Because of this, the ALM processes are a potential subject for (out)sourcing. It might be better and / or cheaper to have them performed by another, specialised organisation or centralize them in the organisation by using a shared service centre. Although the outsourcing discipline is maturing fast, there are areas which have to be improved for a more successful adoption of outsourcing. The next sections explain some of the problems in the current situation and suggest an idea to help solve these problems.

1.1.1 CURRENT SITUATION

Based on research, the following key problems regarding outsourcing can be defined (EquaTerra, 2009; McCray, 2008; Platform outsourcing Nederland, 2008).

Key outsourcing problems are: lack of good governance, unclear responsibilities and cultural differences.

The main cause of these problems is the entanglement of the IT processes (Figure 1-1), and the entanglement between the IT and business processes (Lizatec, 2009). When the IT is outsourced the detaching of the IT processes breaks this entanglement. This causes the processes to stop working properly. Information cannot flow as it used to, and there is no new standard applied on how information should flow when a process is outsourced.

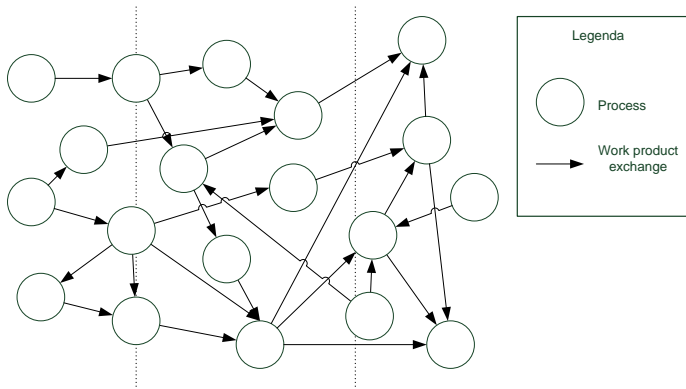


Figure 1-1: Illustration of entangled processes in the current situation ¹

By combining the problems of the previous section, it can be noticed that the main problem is the lack of standard separated services which are documented in a proper way.

The assumption is that a service approach to ALM can deliver an important contribution to solving the outsourcing problems by reducing the entanglement of the IT processes.

A service oriented approach to ALM (SO-ALM) means that ALM is organised with a number of standardized ALM services. These ALM services are clusters of processes which are defined to standardize the input to the services and the result. The ALM services are documented in a framework; the SO-ALM framework. The precise implementation of the ALM services can be chosen by the service provider. Figure 1-2 illustrates how the usage of services differs from the classic approach of using processes regarding entanglement. In the new situation, there are less processes and less entanglement between the processes. However, there are more advantages besides the decrease of process entanglement when using a service oriented approach.

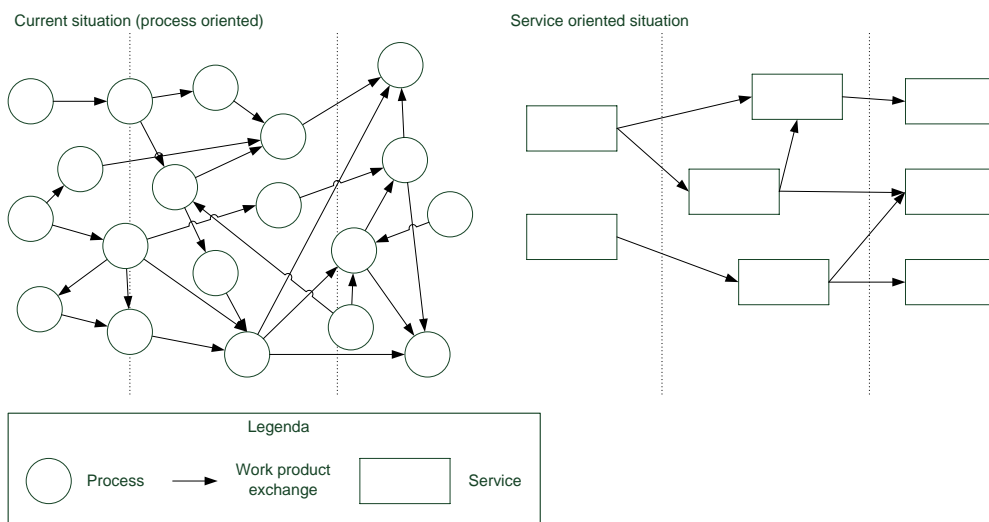


Figure 1-2: Illustration of current versus service oriented situation regarding entanglement

¹ Work products are information or results from processes, e.g. a requirement document or a change requests.

Using a service oriented approach, the advantages are:

- A limited number of clearly defined services;
- Standardization of the work products¹ that are exchanged between services;
- Standardization of service levels and monitoring of services.

With standard services in place, a demand organization² will be able to:

- Better define the responsibilities and tasks of a service provider;
- Better organize cooperation between service providers and the demand organization;
- Focus on results rather than processes;
- When necessary, replace service providers (supplier flexibility);
- Eventually get better results.

The reasoning behind the advantages is schematically shown in Figure 1-3. The advantages on the right are a result of the causes on the left. The figure is explained in detail in Appendix A. The advantages are formulated from the perspective of the business organisation.

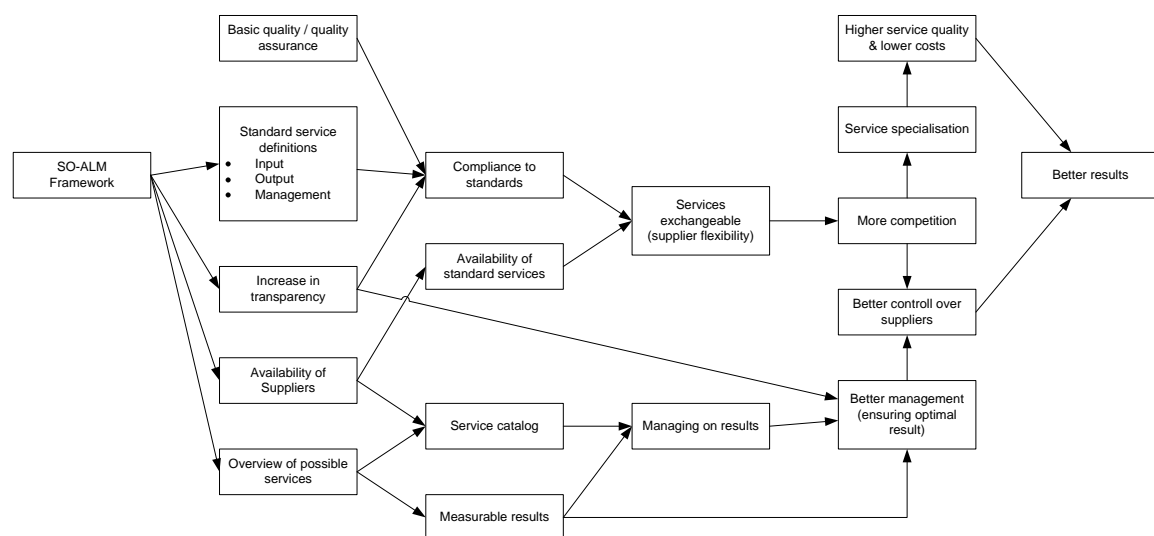


Figure 1-3: SO-ALM framework benefits from business' organisation perspective

1.1.2 SO-ALM FRAMEWORK AND PROCESSES

The previous section introduced the SO-ALM framework as a wrapper around processes. The processes that will be wrapped are already know and documented in process frameworks. Examples of those process frameworks are: ITIL (OGC, 2007) or ASL (van der Pols, 2006). This

² The demand organisation is the representative of the business organisation that is consuming the IT services.

section elaborates on the differences between these process frameworks and the SO-ALM framework, and why those process frameworks alone are not sufficient.

The SO-ALM framework tries to make the information from other process frameworks easier accessible and provides an overview of the entire application life cycle. The SO-ALM framework acts as a starting point to identify what one likes to know and provides a checklist with items that should be discussed in a further stadium. The SO-ALM links to process frameworks that can be used during implementation. In section 2.2 an overview of the used process frameworks and their relation to the SO-ALM framework is given.

The difference between the SO-ALM framework and a process framework is that the SO-ALM framework does not try to be a replacement for the already existing process frameworks but it makes using those frameworks easier. To use the existing process frameworks, one need experience with those frameworks. This is often lacking with many customers. When organisations are outsourcing for the first time, knowledge is often missing and the process frameworks are too complicated to quickly get a hold off.

1.1.3 STAKEHOLDERS

The SO-ALM framework can be used by different stakeholders. As the advantages of the SO-ALM framework are mainly for the business organisation it important to specify all the stakeholders are involved to complete the context. The involved stakeholders are:

- **Consumer**; consumes the ALM service (e.g. who needs some software tested). Normally the business, but it can also a service provider acting as the consumer, delegating some ALM service to another service provide;
- **Service provider**; provides the ALM service (e.g. testing);
- **Consultant**, provides advise as a service, can be for both other stakeholders,
 - Provides advice to the customer about what should be looked for when consuming an ALM service (e.g. what must be in the SLA, what should be tested, which party to choose);
 - Provides advice to the service provider on the implementation of an ALM service (e.g. what testing methods could be used or what may the service cost).

The relation between the stakeholders is visualized in Figure 1-4.

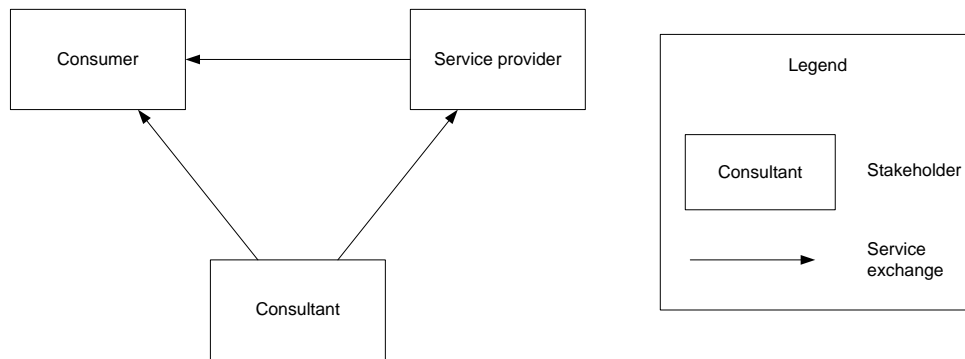


Figure 1-4: Service exchange between stakeholders

1.2 RESEARCH DESIGN

In the previous section the base for the research has been introduced. In this paragraph the goal of the research will be linked to the research questions. The research approach will be outlined using a research framework and the strategy will be explained.

1.2.1 HYPOTHESES

The previous paragraph outlined the problem and introduced a possible solution. Formalizing that statement leads to the following hypotheses:

Organising ALM around Services, and document them in a framework will lead to:

1. More supplier flexibility
2. Higher service quality
3. Easier IT governance, via better overview of the IT organisation and more clear responsibilities

Although three hypotheses are stated, only the first hypothesis about supplier flexibility will be tested. Testing all three is not possible due to time available for this research.

1.2.2 GOAL

We have seen the need for having better defined services regarding ALM so that outsourcing can be more successful. Therefore the goal for this research is stated as:

To develop a framework for Service Oriented Application Lifecycle Management (SO-ALM) which will help improve supplier flexibility, service quality and IT governance.

The framework that we will be developing will consist of a list of services for ALM. It will describe the goal of the service, the work products, the clustering of processes and how the

interaction between services in terms of input/output. As pointed out only the supplier flexibility will be tested.

1.2.3 RESEARCH QUESTIONS

To achieve the research goal of developing a SO-ALM framework we need to know how to do this. Our main research question can therefore be defined as:

How to develop a framework for service oriented ALM?

To answer this question, first the following sub questions are to be answered.

- What is the current state of ALM, how is it currently used?
- What are the requirements/motivation for the service consuming organisation and the service provider to use/provide SO-ALM?
- How can ALM processes be clustered in such a way that the process clusters can be wrapped in and delivered as ALM services?
 - What processes are critical in the current ALM?
 - What are the criteria for clustering these processes?
 - How are the ALM services “orchestrated” (i.e., related to each other in terms of input – output)?
 - What kind of governance do the ALM services need?
- What are the benefits of a SO ALM, and how can they be measured?

1.2.4 RESEARCH FRAMEWORK

The research is designed by implementing the framework by Verschuren & Doorewaard (2000). It is graphically showed in Figure 1-5. The numbers in the boxed represent the chapters in which that subject is handled. The research framework also represents the outline of this thesis.

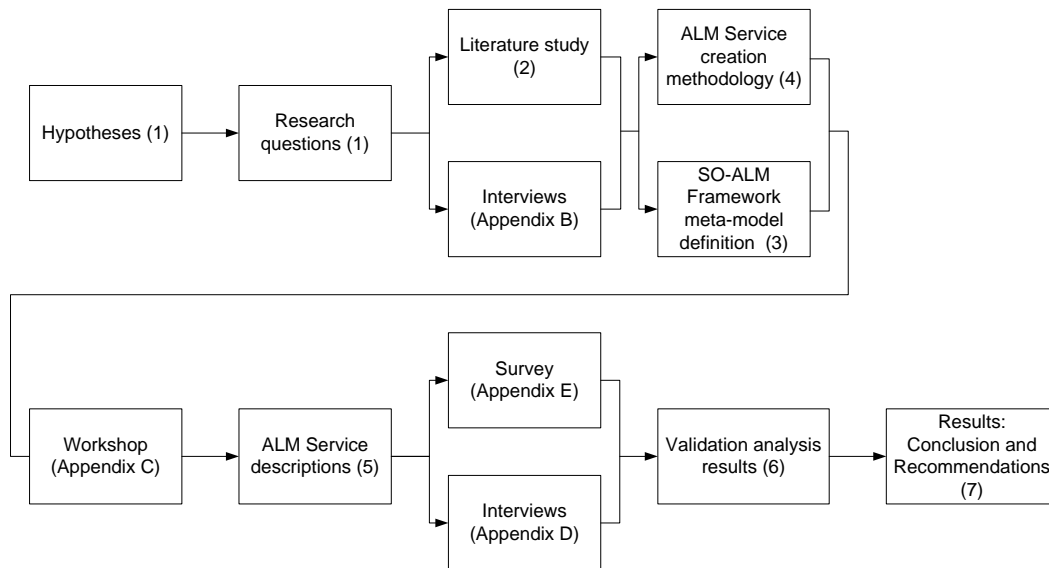


Figure 1-5: Research framework

First the research question is formulated based on assumptions that a service oriented approach to ALM could be beneficial to organisations that outsource this kind of processes. Using a literature study and interviews with Capgemini experts, information is gathered about available process frameworks and methods for clustering criteria are developed and measures are created to evaluate the framework. The following subjects are surveyed:

- Current state of ALM, with specific attention for outsourcing;
- Proof that using a service approach has benefits;
- Processes and tools that make up ALM;
- Clustering criteria;
- Outsourcing governance;
- Flexibility measures.

To create the ALM services a methodology and an ALM service meta-model are needed. Using this methodology the ALM services can be created and presented. From this list of services, a selection of 3-4 services are chosen and further analyzed in terms of functions, responsibilities and relations to other services. Starting with one service gives the opportunity to verify whether the service description is sufficient for our needs. A workshop is organised to get the opinion of Capgemini experts about what ALM services should exist in the SO-ALM framework, and of what processes these ALM services should contain.

In the validation phase, the SO-ALM framework will be validated using a survey and interviews. Before executing this survey, the way of processing and interpreting the results will be developed. Based on the results of the survey and interviews, conclusions about the usage and supplier flexibility can be made. The results will be used to improve the SO-ALM framework, advice about the use of the framework, and how it can be improved.

1.3 CONTEXT AND RESEARCH SETTING

Capgemini provides a wide range of IT services to customer organisations. They experience the problems with their customers as described in Section 1.1. Their vision is to seek the best solution and with that help their customers (Capgemini, 2008b). Given this vision, this research provides an opportunity of trying to find a solution to the increasing amount of problems regarding ALM.

Capgemini is divided into three divisions: consulting, technology and outsourcing. The research is held at the technology division which has most experience with development and sourcing consultancy. The target customer group for the SO-ALM framework of this research are large companies or government organisations.

1.3.1 RESEARCH STRATEGY

At first the literature is searched for background and foundation. Exploring interviews with people from Capgemini are held to gather information about the current state of ALM. Besides the scientific literature, industry standards and market research are used.

A workshop is held to explore which ALM services should be incorporated in the SO-ALM framework. Validation of the framework is done via expert interviews, in combination with a qualitative survey.

1.3.2 DOCUMENTATION APPROACH

The framework is documented by using a wiki ("Wiki," 2008). A wiki is a simple but effective application for knowledge management. Using a wiki in this context makes it possible to access the framework information faster than using a traditional document. It adds the ability to search and create relations between information subjects. It also makes it possible for people to add comments so that the quality of the framework can be increased. The ability of versioning, storing the previous content of a page when a change occurs, ensures no information gets lost. As tooling Mediawiki (Wikimedia foundation, 2008) is used with the Semantic Mediawiki extension (Krötzsch & Vrandečić, 2008). This extension is needed to make relations in a wiki, which is otherwise not possible.

2 LITERATURE REVIEW

This chapter provides an overview of the important concepts regarding the SO-ALM framework. First ALM is explained in section 2.1. A definition of ALM is given, the life cycle of applications is defined and the relation between the two is explained. The processes that will be clustered into ALM services are part of process frameworks. In section 2.2 these process frameworks are explored, a description is given and explained how they relate to the application life cycle.

The service orientation concept, which is the way of using the clustered processes, is explained in section 2.3. It explains how the service orientation concept relates to the ALM services. ALM services can be sourced in different ways and at different organisations. Section 2.4 explains how sourcing is used in this research, which types of sourcing are possible, and how this is relevant for the ALM services. Section 2.5 elaborates on what is supplier flexibility, and how the SO-ALM framework might increase this.

2.1 APPLICATION LIFE CYCLE MANAGEMENT (ALM)

In Chapter 1 the term ALM is introduced. ALM covers “*the processes and tools used to keep the application portfolio up to date*”. In this section a background of ALM is provided and the life cycle of an application is defined.

2.1.1 DEFINITION

ALM is an abbreviation for Application Life cycle Management. It is about managing the life cycle of an application. A life cycle is defined as: *evolution of a system, product, service, project or other human-made entity from conception through retirement (ISO/IEC & IEEE, 2008)*.

Searching for a *definition* of ALM in the top 25 IS journals on the terms “application life cycle management” and “ALM” in title, abstract and keywords, provides 47 results³. Filtering the results with no citations leaves 35 results. Browsing through the abstracts leaves *no* paper that uses the *term* application life cycle management (ALM). It can therefore be concluded that ALM is not a scientific term but an industrial term and a definition has to come from the industry.

However, an examination of several organisations active in this area did not lead to a clear definition of ALM. Definitions differ as each organisation uses it for marketing purposes and bases the definition on what they offer. Forrester Research, a bit more independent, defines

³ See Appendix F for search query.

ALM as: *The coordination of development life-cycle activities, including requirements, modelling, development, build, and testing, through: 1) enforcement of processes that span these activities; 2) management of relationships between development artefacts used or produced by these activities; and 3) reporting on progress of the development effort as a whole* (Schwaber, 2006).

Tool vendors like Borland, who markets itself as ‘the open ALM company’, do not give a sound definition of ALM. They say it is about the integration of tools that are being used throughout the whole application life cycle, without explicitly defining what that application life cycle is. However they focus merely on application creation and do not cover the whole life cycle (Borland, 2007). Capgemini defines ALM as: *ALM is a standardised approach for the management of applications during their whole life cycle. ALM has the goal of maximizing the functional and technical life cycle of application by offering the current required functionalities* (Capgemini, 2008a).

The definition of ALM used in this thesis will be: *“ALM is the whole of processes and tools with which the application portfolio is kept up to date. ALM covers all processes across the life cycle of applications, from conception to retirement.”* This differs from the other definitions in that the application life cycle for the whole life cycle is used, as it is defined from conception to retirement. This application life cycle and the phases of the life cycle are explained in the next section.

2.1.2 APPLICATION LIFE CYCLE

The definition of ALM states that it is about *all* the processes in the application life cycle. This section defines the phases of the life cycle of an application.

In practice the life cycle of an application is split into 2 major phases: development and maintenance (Banker, Davis, & Slaughter, 1998; Swanson & Beath, 1990). In the development phase the application is created. In the maintenance phase the application is used and maintained. These two phases do not make up the whole life cycle. The maintenance phase is an ongoing process and is not the final stage of an application. The final stage of an application is when it is no longer being used. Thus after the maintenance phase an extra phase has to be added, covering the ‘taking out of use’ of an application. Some process frameworks cover this phase and call it *retirement*; ISO 12207 (ISO/IEC & IEEE, 2008), and Enterprise Unified Process (Amber, 2008). Retirement is the third and final phase that will be used in this’ research application life cycle model.

Figure 2-1 shows the application life cycle as it will be used in the SO-ALM framework. Section 2.2 provides an overview of the processes that are used in each phase of the application life cycle.



Figure 2-1: Application life cycle

2.1.3 CONCLUSION

ALM is the whole of processes and tools with which the application portfolio is kept up to date. ALM covers all processes across the life cycle of applications, from conception to retirement. The life cycle covers three main phases: development, maintenance and retirement.

2.2 PROCESS FRAMEWORKS

In section 2.1.1, the application life cycle was introduced. A list of processes is needed to identify actions in each life cycle phase, and to have processes on which the ALM services for the SO-ALM framework can be based. These processes are derived from process frameworks. Process frameworks are collections of processes, tasks and best practices that provide ways how to implement a process. The frameworks that will be used describe the processes that belong in the phases of the application life cycle.

Section 2.2.1 describes what process frameworks are available and how they relate to the phases of the application life cycle. The sections after that explain the process frameworks used in this research.

2.2.1 FRAMEWORK SELECTION

The method used for the selection of process frameworks consists of two steps. Firstly, research was carried out to find frameworks that would cover the whole life cycle. Secondly, implementations were sought for each phase. Besides process frameworks; methodologies and process libraries also share the same purpose of providing ways to implement life cycle phases, the difference is predominantly the name.

Whole life cycle

There are a few frameworks which describe all the processes in the entire application life cycle; ISO 12207 (ISO/IEC & IEEE, 2008) and The OPEN Process Framework (OPF) (OPEN Process Framework Repository Organization, 2006). OPF has not been updated since 2006 and is therefore omitted. ISO 12207 does not describe the relations between the processes, but can be used as it provides a complete list of processes.

Development phase

For the development phase there are a lot of software development methodologies and process frameworks which describe how one could develop an application; (Eclipse contributors, 2008; Kruchten, 2003; Turner, Langerhorst, Hice, Eilers, & Uijtttenbroek, 1990). As application development evolved, the development processes also evolved, leaving some older frameworks obsolete. The Open Unified Process framework (OpenUP) (Eclipse contributors, 2008) is used as the development methodology. OpenUP is the lightweight version of Rational Unified Process (RUP) (Kruchten, 2003) which is a widely used framework and the company standard of Capgemini. However, OpenUP is less complex and covers the basics of RUP which are sufficient for this research.

Besides the development methodologies, a maturity framework also exists; The Capability Maturity Model Integration (CMMI) (Software Engineering Institute, 2009). CMMI is used because it describes maturity and as such it indicates the most important processes for development. This will provide a starting point for process clustering (starting with the most important).

Maintenance phase

The maintenance phase is described by Looijen (2004). He splits application maintenance into three types of maintenance, because of the different functions that have to be achieved by maintenance. Acknowledging these functions lead to better application maintenance. For maintenance, Looijen distinguishes two main actors:

- **User organisation, demand side or *business***

The organisation responsible for the execution of the business processes, which are supported by information systems. This organisation consists of the end users, middle management and higher management of this organisation. They are *demanding* their business processes to be supported by IT and are also often referred to as: *the business*.

- **IT (service) organisation or supply side**

Organisation that is delivering (supplying) services, project or products, which are necessary for the realisation, exploitation, maintenance or renewal of the information systems. The IT organisation can be organised in different ways, see section 2.4.2 for the ways of how to supply IT.

The IT organisation can also be split into two sub organisations. This is based on the architecture of information systems, it can also be split into:

- **infrastructure (hardware)** – e.g. laptops, servers, operating systems, storage, network
- **applications (software)** – the actual applications, databases

Based on these separations Looijen split maintenance is into:

- **Functional management**
On behalf of the user organisation responsible for the functional alignment between the organisation and the IT services. Functional management acts as owner and client of the IS.
- **Application management**
Responsible for the maintenance of IS; the applications and databases.
- **Infrastructure management**
Responsible for the maintenance of the IS infrastructure; the hardware, operating systems and network.

Each of the maintenance management types is implemented by a process framework (Table 2-1). Figure 2-2 shows how the types of maintenance relate to each.

Maintenance management type	Implemented by
Functional management	BiSL, Business information Service Library (van der Pols, Donatz, & van Outvorst, 2007)
Application management	ASL, Application Service Library (van der Pols, 2006)
Infrastructure management	ITIL, Information Technology Infrastructure Library (OGC, 2007)

Table 2-1: Maintenance management type implementation

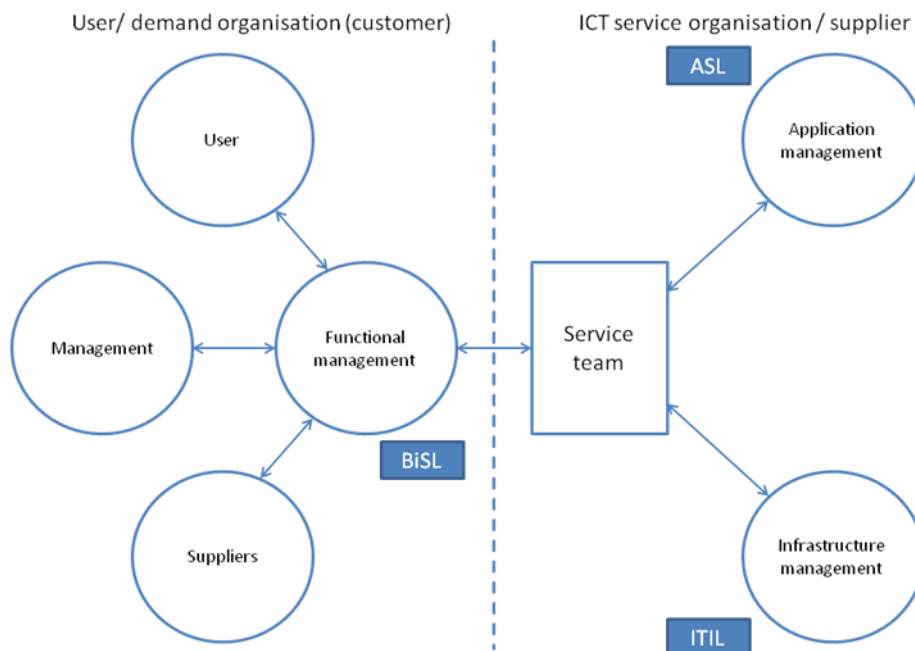


Figure 2-2: Positioning of maintenance frameworks (van der Pols, et al., 2007)

Retirement

There are no process frameworks available that *only* handle retirement. The retirement processes are present in ISO 12207.

Process frameworks applied to the application life cycle

Figure 2-3 shows the overview of relating the given process frameworks to the application life cycle. Making it clear what process framework covers which part of the application life cycle.

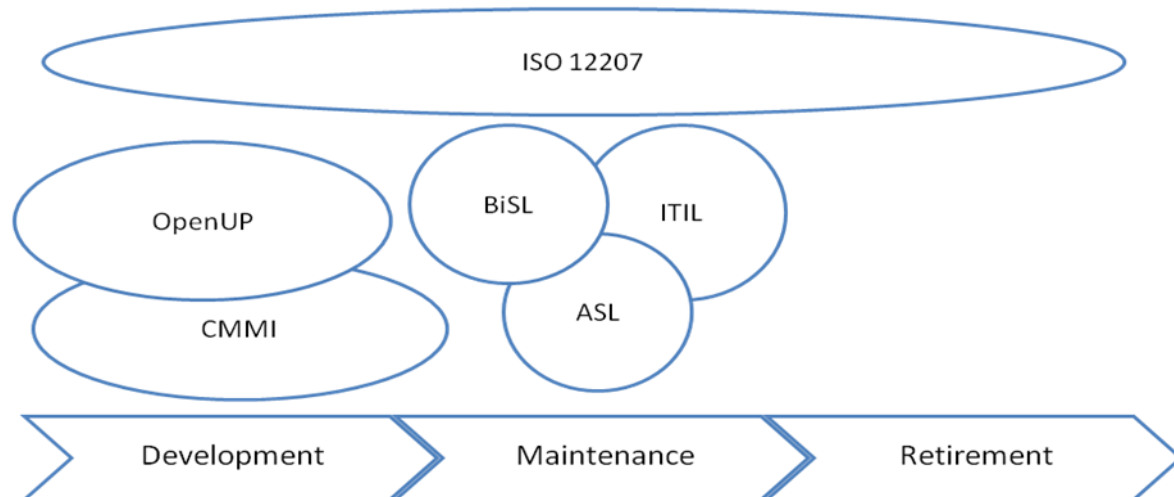


Figure 2-3: Overview of process frameworks applied to the application life cycle

In the next sections each framework will be explained.

2.2.2 ISO 12207

ISO 12207:2008 Systems and software engineering — Software life cycle processes (ISO/IEC & IEEE, 2008) is the ISO standard that defines all processes available in the entire application life cycle.

The purpose of the standard is: *To provide a defined set of processes to facilitate communication among acquirers, suppliers and other stakeholders in the life cycle of a software product.*

Because of the total view on all processes in the application life cycle and the purpose of facilitation of communication, this standard is a good starting point.

The processes that make up the ISO are divided into seven process groups. Each of the life cycle processes within those groups is described in terms of its purpose and desired outcomes and lists activities and tasks which need to be performed to achieve those outcomes. The overview of all the processes in the international standard is shown in Figure 2-4. The groups are:

- **Agreement Processes** - These processes define the activities necessary to establish an agreement between two organizations.

- **Organizational Project-Enabling** - The Organizational Project-Enabling Processes manage the organization's capability to acquire and supply products or services through the initiation, support and control of projects.
- **Project Processes** – The processes concerned with planning, assessment and control.
- **Technical Processes** - Used to define the requirements for a system, to transform the requirements into an effective product, to permit consistent reproduction of the product where necessary, to use the product, to provide the required services, to sustain the provision of those services and to dispose of the product when it is retired from service.
- **Software Implementation Processes** - Used to produce a specified system element (software item) implemented in software. Those processes transform specified behaviour, interfaces and implementation constraints into implementation actions resulting in a system element that satisfies the requirements derived from the system requirements.
- **Software Support Processes** - Provide a specific focused set of activities for performing a specialized software process. A supporting process assists the Software Implementation Process as an integral part with a distinct purpose, contributing to the success and quality of the software project.
- **Software Reuse Processes** - Support an organization's ability to reuse software items across project boundaries. These processes are unique because, by their nature, they operate outside the bounds of any particular project.

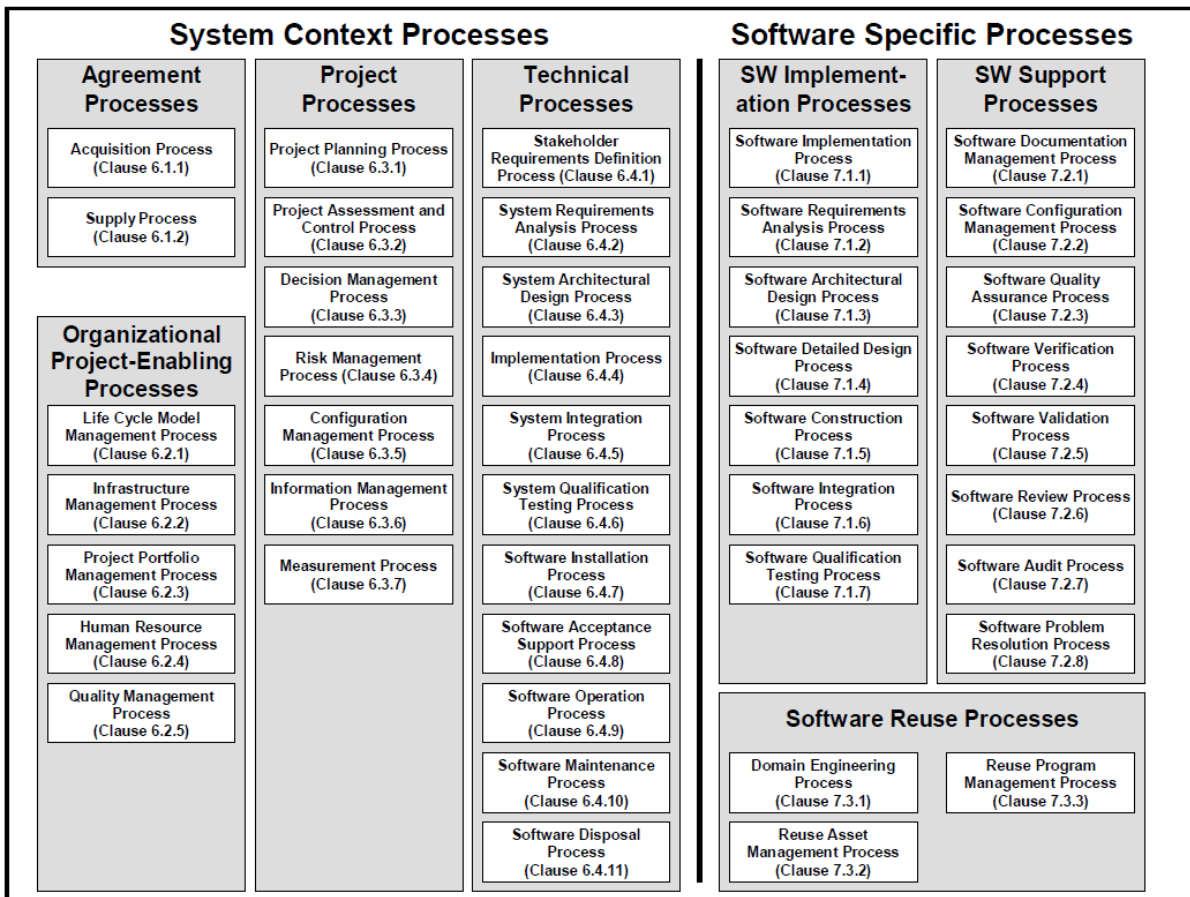


Figure 2-4: ISO 12207 overview

ISO 12207 is not a replacement of the SO-ALM framework as it does not describe how processes relate to each other. It only describes output and not the input for processes. Furthermore, the standard is not very accessible as it is only documented as a reference book and lacks an implementation guide.

2.2.3 OPENUP

OpenUP (Open Unified Process) is a development process framework. *It is a lean Unified Process that applies iterative and incremental approaches within a structured lifecycle. OpenUP embraces a pragmatic, agile philosophy that focuses on the collaborative nature of software development. It is a tools-agnostic, low-ceremony process that can be extended to address a broad variety of project types* (Eclipse contributors, 2008). Figure 2-5 shows the layout of the framework.

OpenUP preserves the essential characteristics of RUP / Unified Process (Kruchten, 2003), which includes iterative development, use cases and scenarios driving development, risk management, and architecture-centric approach. The idea behind RUP is to have a complete set for almost

every possible project, as it has a very large base set. In RUP you choose what you do not need, in OpenUP you choose what you need. This makes RUP much more complex than OpenUP.

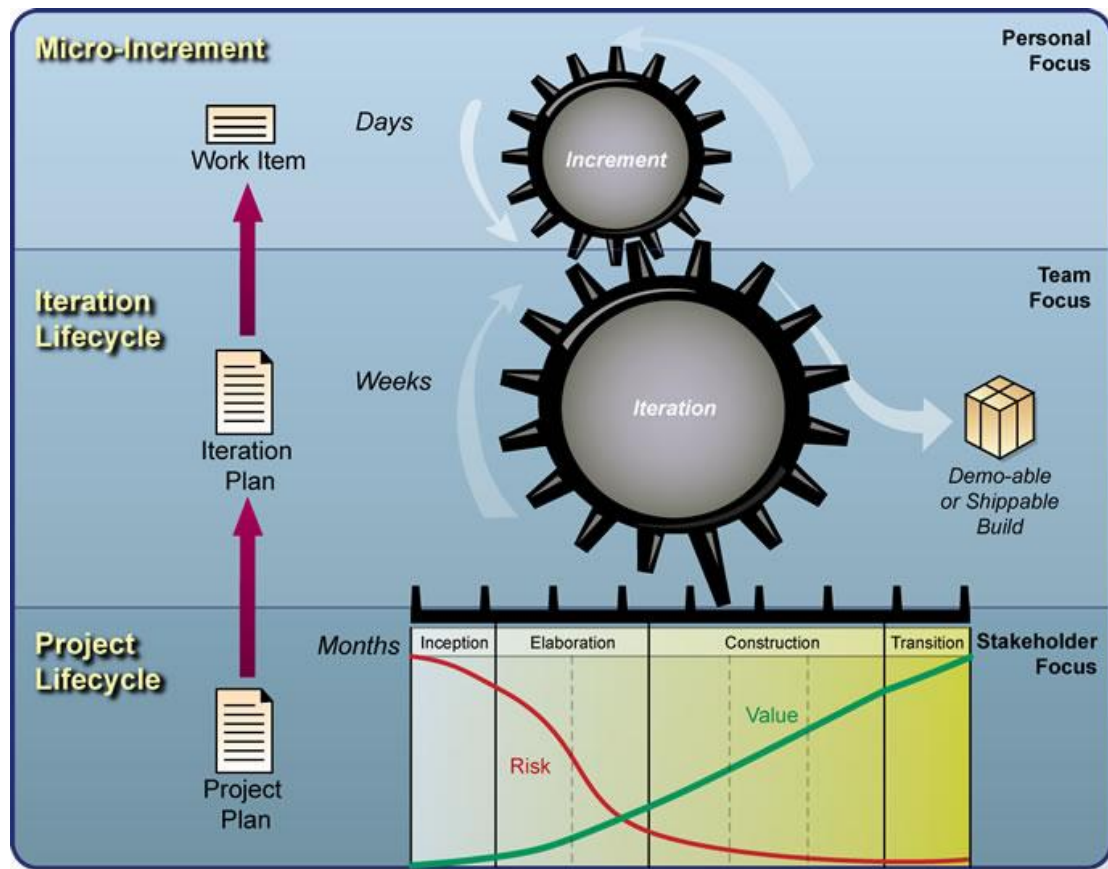


Figure 2-5: OpenUP layers: micro-increments, iteration lifecycle and project lifecycle (Eclipse contributors, 2008)

Personal effort on an OpenUP project is organized in micro-increments. These represent short units of work that produce a steady, measurable pace of project progress (typically measured in hours or a few days). The process applies intensive collaboration as the system is incrementally developed by a committed, self-organized team. These micro-increments provide an extremely short feedback loop that drives adaptive decisions within each iteration.

OpenUP divides the project into iterations: planned, time-boxed intervals typically measured in weeks. Iterations focus the team on delivering incremental value to stakeholders in a predictable manner. The iteration plan defines what should be delivered within the iteration, and the result is a demo-able or shippable build. OpenUP teams self-organize around how to accomplish iteration objectives and commit to delivering the results. They do that by defining and "pulling" fine-grained tasks from a work items list. OpenUP applies an iteration lifecycle that

structures how micro-increments are applied to deliver stable, cohesive builds of the system that incrementally progresses towards the iteration objectives.

OpenUP structures the project lifecycle into four phases: Inception, Elaboration, Construction, and Transition. The project lifecycle provides stakeholders and team members with visibility and decision points throughout the project. This enables effective oversight, and allows you to make "go or no-go" decisions at appropriate times. A project plan defines the lifecycle, and the end result is a released application.

OpenUP is used as a process framework for the development processes because it is the simplified version of RUP, which is a well established widely used framework. RUP however is overcomplicated and the SO-ALM framework is about simplicity which makes OpenUP a better framework.

2.2.4 BiSL

BiSL is a framework for functional management. BiSL is an abbreviation for Business information Services Library and is a framework of the ASL BiSL foundation (2009). It is created to give an interpretation to functional management as described by Looijen (2004). An overview of the BiSL framework is given in Figure 2-6.

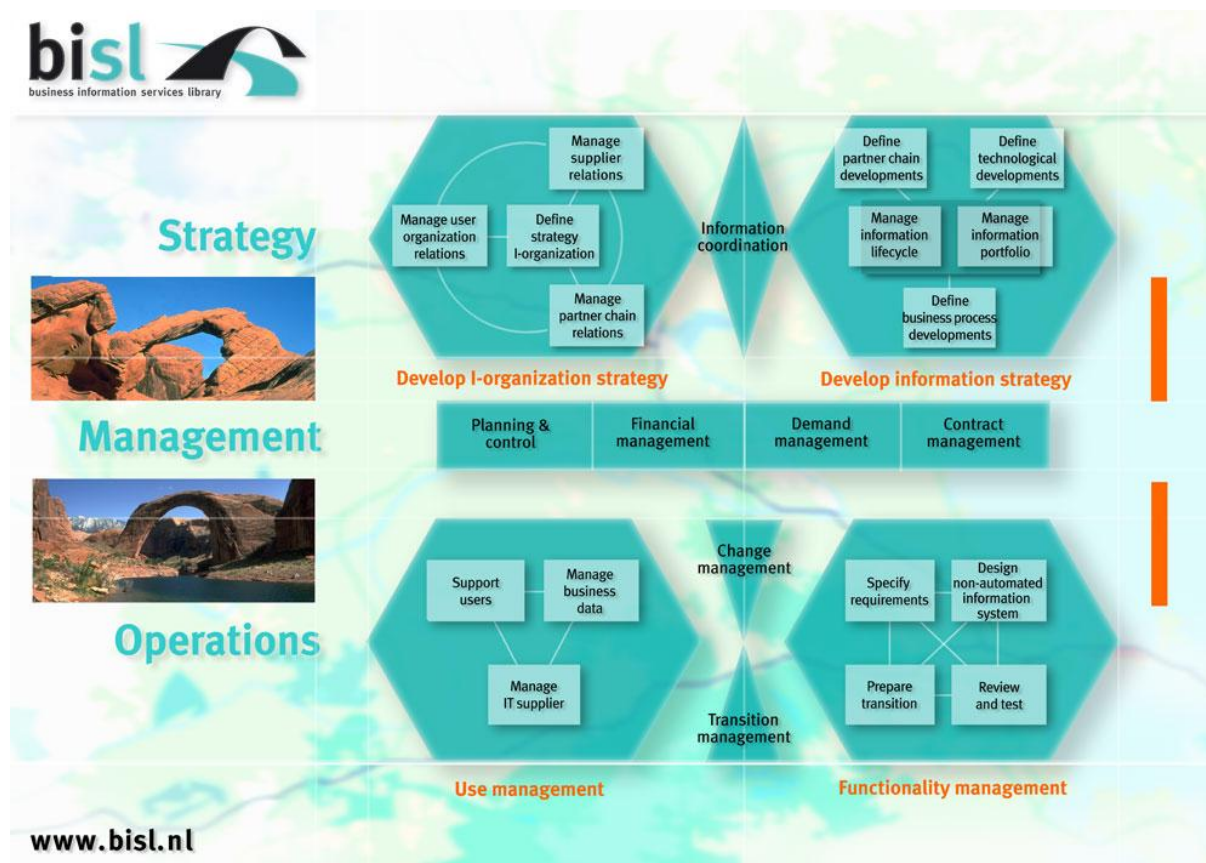


Figure 2-6: BiSL overview

The main tasks of BiSL can be listed as:

- Recognize the needs or demands within the user organisation;
- Translate this demand to solutions in terms of functional changes to IS;
 - Not every demand has to be solved with IS, or IS change, it could also be solved with organisational change;
- Determine and give out orders to IT service providers;
 - Manage and evaluate the execution of these orders.

BiSL has three levels of which are corresponding to the 3 levels described by Looijen (2004).

These levels are:

- **Operations** – the implementation or operational processes involve the day-to-day use of the information provisioning, and determining and effecting changes to the latter;
- **Management** – the management processes involve income, expenditure, planning, the quality of the information provisioning and making arrangements with IT suppliers;
- **Strategy** – as part of the processes at the strategic level one determines the nature of the information provisioning in the long-term and how its management should be structured.

Within these three levels the various processes are grouped in seven process clusters, three at the operational level, one at the managerial level and three at the strategic level. These clusters are discussed in detail in the following sections.

Clusters of processes at the operational level

The following three clusters of processes can be found at the operational level:

- **Use management** – the purposes of the processes in these classes is to provide optimum, ongoing support for the relevant business processes. The use management processes focus on providing support to users for the use of the information provisioning⁴, the operational management of IT suppliers and the control of data administration. The key question pertaining to use management is as follows: Is the operational information provisioning being used and managed properly?
- **Functionality management** – the aim of the processes in the functionality management cluster is to structure and effect changes in the information provisioning. The key question pertaining to functionality management is as follows: What will the modified information provisioning look like?

⁴ Information provisioning in BiSL is defined as: *the whole of information processing processes of an organisation, viewed from the perspective of the demand organisation. Including everything required such as infrastructure and information systems (van der Pols, et al., 2007).*

- **Linking processes** (at the operational level) – the goal of the processes in this cluster is decision making about which changes need to be made to the information provisioning and their actual implementation in the information provisioning within the user organization. The key question pertaining to the linking processes at the operational level is as follows: Why and how should we modify the information provisioning?

Cluster of processes at the management level

The management processes are umbrella processes: they are situated above the operational processes. These managerial processes act as a bridge linking the strategic level and the operational processes. The processes at the managerial level ensure the comprehensive management of the implementation of the information provisioning. Viewed from the perspective of planning, cost-effectiveness, needs, contracts and service levels, direction is given to administrative work, and maintenance, innovation and the linking processes. The key question pertaining to the managerial processes is as follows: How do we manage the information provisioning?

Clusters of processes at the strategic level

There are also three clusters of processes at the strategic level. These clusters involve the formulation of policy concerning the information provisioning and the organizations involved in this.

- **Information strategy** – the purpose of the processes in the information strategy cluster is to translate developments affecting business processes, the organization's surroundings, and technology into a view of the nature of the information provisioning in future. The key question in connection with the processes for formulating information strategy is as follows: What will the information provisioning look like in the medium and long term?
- **I-organization strategy** – the processes in this cluster focus on coordinating the communication, management, structures and methods of all the parties involved in making decisions about the information provisioning. The key question in relation to the processes for determining strategy for structuring the information provisioning is as follows: How will the management of the information provisioning be structured?
- **Linking process** (at the strategic level) – the aim of the linking process at the strategic level is the coordination of all of the parties involved in and the plans of the various subsidiary elements of the information provisioning. The key question pertaining to this cluster of processes is as follows: How can we act together?

BiSL is used as the library that gives implementation to functional management.

2.2.5 ASL

ASL is a framework for application management. ASL is an abbreviation for Application Service Library and is a framework of the ASL BiSL foundation (2009). It is created to provide an interpretation to application management as described by Looijen (2004). An overview of the ASL framework is given in Figure 2-7.

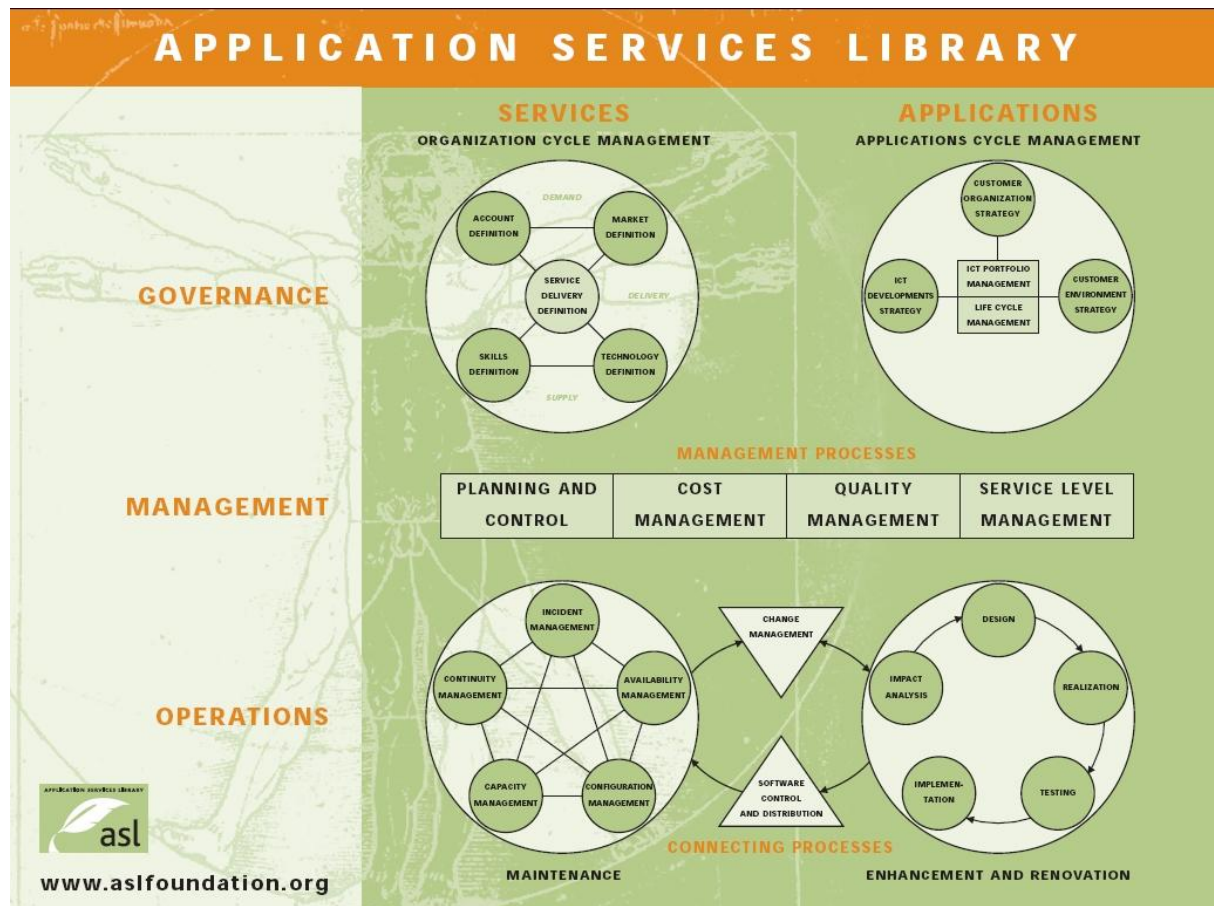


Figure 2-7: ASL Overview

ASL consists of a list of processes, which are split into 6 process clusters:

- **Maintenance** – Ensuring that applications are used optimally to support the business processes with a minimum of means and disruptions in the operation;
- **Enhancement and Renovation** – To change applications to the changing demand of the customer;
- **Connecting processes** – To synchronize and tune *maintenance* and *enhancement and renovation*;
- **Management processes** – To safeguard that the operational processes are executed according to targets, SLA's and strategy;
- **Application cycle management** – To design a long term strategy for the objects in the information provisioning relating to the long term strategy of the organisation;

- **Organisation cycle management** – To have policies for the future strategy of the service organisation.

ASL has three levels of which are corresponding to the 3 levels described by Looijen (2004). The process clusters belong to one of the levels. These levels are:

- **Strategy** – Periodical execution of processes to create a new future policy
- **Management** – Processes regarding cost, yields, contracts and planning
- **Operational** – The processes that execute the application maintenance

ASL is used as an implementation for application management.

2.2.6 ITIL

ITIL is a framework for infrastructure management. ITIL is an abbreviation for Information Technology Infrastructure Library and is a trademark of the United Kingdom's Office of Government Commerce (OGC) (OGC, 2007). ITIL emerged from the IBM yellow books in the 1980's (IBM Global Services, 2006) which contained a set of best practices for managing an IT infrastructure.

ITIL gives an implementation to the infrastructure management section as described by Looijen (2004). An overview of the ITIL framework is given in Figure 2-8.

ITIL consists of four phases and a continual service improvement layer around those phases. Those phases are:

- **Service Strategy** – Determining the IT services in function of the business activities
- **Service Design** – Development of an IT service based on the strategy
- **Service Transition** – Creation of the new or changed IT service and the transition to operation.
- **Service Operation** – Execution of the IT services

- **Continual Service Improvement** – Adjusting and improving the IT services

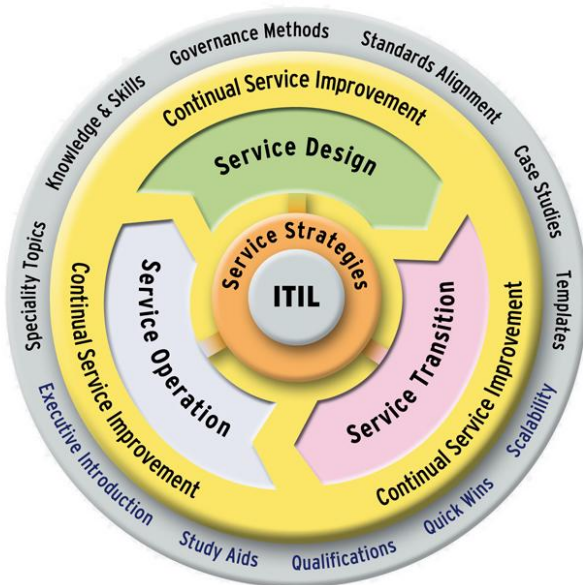


Figure 2-8: ITIL overview

The processes used in ITIL are placed in one of the phases so that each phases can be published as a separated book. However some processes span multiple phases (Figure 2-9). The phases used in ITIL consist of the following processes:

Service Strategy

- Demand Management
- Strategy Generation
- Service Portfolio Management
- IT Financial Management

Service Design

- Service Level Management
- Service Catalogue Management
- Capacity Management
- Availability Management
- Service Continuity Management
- Information Security Management
- Supplier Management

Service Transition

- Transition Planning and Support
- Change Management
- Release and Deployment Management
- Service Asset and Configuration Management

- Service Validation and Testing
- Evaluation
- Knowledge Management

Service Operation

- Event Management
- Incident Management
- Request Fulfilment
- Problem Management
- Access Management

Continual Service Improvement

- Service Measurement
- Service Reporting
- Service Improvement (The Seven-step improvement Process)

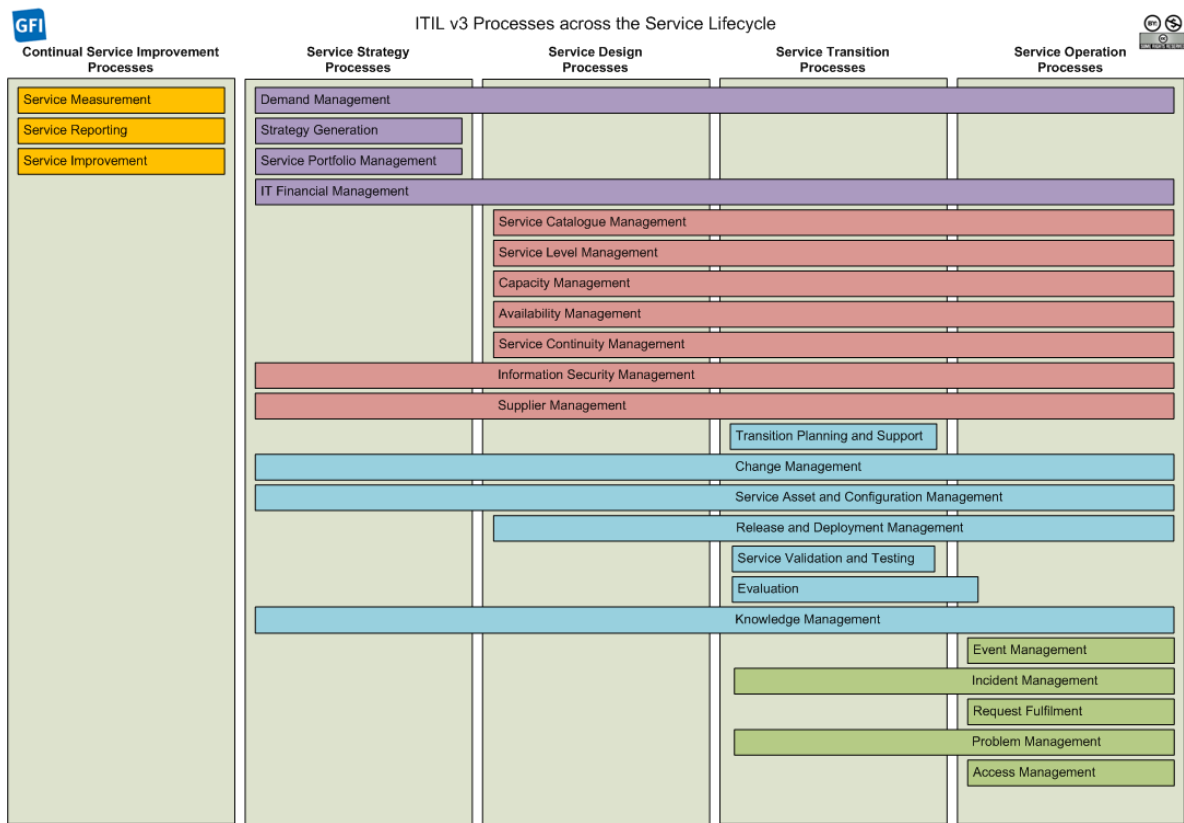


Figure 2-9: ITIL processes across the ITIL service life cycle

ITIL is used as an implementation for Infrastructure management as it is a widely used framework.

2.2.7 CMMI

Capability Maturity Model® Integration (CMMI) (Software Engineering Institute, 2009) is a process improvement approach that provides organizations with the essential elements of effective processes. It can be used to guide process improvement across a project, a division, or an entire organization. CMMI helps integrate traditionally separate organizational functions, set process improvement goals and priorities, provide guidance for quality processes, and provide a point of reference for appraising current processes. CMMI is *not* a process model, as it describes the characteristics of the processes. As the framework is also about the boundaries of the processes and not about the processes itself, CMMI can be used as input for the framework.

CMMI exists in three forms, schematically shown in Figure 2-10.

- CMMI for development
- CMMI for services
- CMMI for acquisition

As acquisition is not a part of this research it will not be used in the framework.

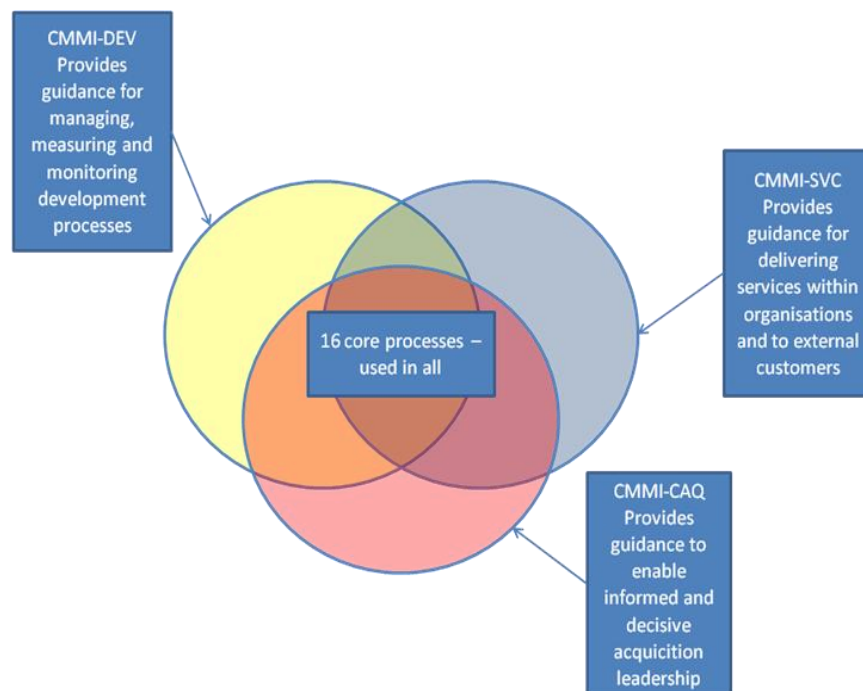


Figure 2-10: CMMI constellation overview

The processes that are described in CMMI-dev and CMMI-svc are categorized. They also belong to a certain maturity level. Table 2-2 shows the list of processes, and lists their category, maturity level and to which of the CMMI specifications they belong.

Process	Category	Dev/svc	Maturity level
Configuration management	Support	Dev & svc	2
Measurement and analysis	Support	Dev & svc	2
Process and product quality assurance	Support	Dev & svc	2
Project planning	Project management	Dev & svc	2
Project monitoring and control	Project management	Dev & svc	2
Requirements management	Engineering / project management	Dev & svc	2
Service delivery	Service establishment and delivery	Svc	2
Capacity and availability management	Project management	Svc	3
Decision analysis and resolution	Support	Dev & svc	3
Integrated project management	Project management	Dev & svc	3
Incident resolution and prevention	Service establishment and delivery	Svc	3
Organisational process definition	Process management	Dev & svc	3
Organisational Process focus	Process management	Dev & svc	3
Organisational training	Process management	Dev & svc	3
Project integration	Engineering	Dev	3
Requirements development	engineering	Dev	3
Risk management	Project management	Dev & svc	3
Service continuity	Project management	Svc	3
Service system development	Service establishment and delivery	Svc	3
Service system transition	Service establishment and delivery	Svc	3
Strategic service management	Service establishment and delivery	Svc	3
Technical solution	Engineering	Dev	3
Validation	Engineering	Dev	3
Verification	Engineering	Dev	3

Organisation process performance	Process management	Dev & svc	4
Quantitative project management	Project management	Dev & svc	4
Casual analysis and resolution	Support	Dev & svc	5
Organisational innovation and deployment	Process management	Dev & svc	5

Table 2-2: CMMI processes

The difference between CMMI-dev and CMMI-svc are the processes on level 3. CMMI-dev adds the category engineering and CMMI-svc adds the category service establishment and delivery. The list of processes with their maturity level is what will be used for service creation and is the only what will be used from CMMI.

2.2.8 CONCLUSION

This section has described how the phases of the application life cycle can be implemented by processes from different process frameworks. Some process frameworks overlap, which is shown by placing the process framework in the life cycle phases. The overlap of the process frameworks does not pose a problem. When the processes are clustered into ALM services, which will be further explained in chapter 3, they provide links to the various process implementations leaving room for user preference about how to implement an ALM service.

Although each process framework has a different setup, they all provide a list with processes, which is what the process frameworks will be used for in this research. Each process framework has some kind of process clustering. That clustering is used in the ALM service creation process.

2.3 SERVICE ORIENTATION

In Section 1.1 the concept of service orientation was introduced. This section will elaborate more on what in this thesis is seen as service orientation, and how it is used in the SO-ALM framework.

ISO 12207 defines *service* as: *performance of activities, work, or duties associated with a product* (ISO/IEC & IEEE, 2008). The association with the delivered product is what it is all about. A service is seen as a black box, it delivers a product without the need for the requester of the product to know how it is created.

The services in the SO-ALM framework are ALM services. They deliver the products that are the result of processes from the application life cycle. ALM services are organisational services

which are parts of the IT organisation, it are thus *not* about the services used in Service Oriented Architecture (SOA). However some tasks of the IT organisation, and thus of the ALM services, can be implemented by a SOA service.

2.4 (OUT)SOURCING

The previous sections described the *what* the SO-ALM framework is about, the ALM services. This section describes the context of the ALM services, in what way will they be orchestrated and fit into existing organisations. First IS sourcing is defined. An overview is given about the possible options how to source services, and the sourcing process is explained. How the ALM services will be managed is explained in the section about IT governance.

2.4.1 DEFINITION

IS sourcing is defined in the literature as: *the organizational arrangement instituted for obtaining IS services and the management of resources and activities required for producing these services* (Dibbern, Goles, Hirschheim, & Jayatilaka, 2004). We see this definition as too limited as it does not address the need for an optimal fit between the organisation and the service provider. Adjusting the previous definition, sourcing is defined as: *the organizational arrangement instituted for obtaining IS services from the most suitable source (organisation or organisation unit) and the management of resources and activities required for producing these services*. What is most suitable is defined by the organisation and could be based on strategy, cost, expertise, availability, or quality. Sourcing is a continuous process as the service provider that can offer the best suitable result may change over time. The sourcing process in the context of this research is about sourcing ALM services.

Outsourcing is having the result delivered by an external source. Outsourcing in the context of information systems (IS) is defined in many ways (Dibbern, et al., 2004). Lacity and Hirschheim provide a general definition and define outsourcing as: *the purchase of a good or service that was previously provided internally* (M. C. Lacity & Hirschheim, 1993).

In the literature there are two literature survey papers about outsourcing; (Dibbern, et al., 2004; Gonzalez, Gasco, & Llopis, 2006). Both provide a good overview about *why* organisations outsource, *what* organisations outsource, *which* decision process to take, *how* to implement sourcing decisions and what is the *outcome* of the sourcing decisions. The literature surveys provides input for the next section which explains the types of sourcing.

2.4.2 TYPES OF SOURCING ARRANGEMENTS

Dibbern, et al. (2004) describe the fundamental parameters that determine the kind of outsourcing. There are four fundamental parameters that determine the kind of outsourcing arrangement that an organisation may enter into:

- **Degree** (total, selective, and none), the amount of processes from the IT organisation to outsource;
- **Ownership** (totally owned by the organisation, partially owned, externally owned), is the provider delivering the services owned by the consumer?;
- **Mode** (single vendor/client or multiple vendors/clients), how many service providers will be working together to deliver a service and will they a certain service deliver only to the organisation or also to other organisations;
- **Time frame** (short term or long term).

Combining the degrees of outsourcing with ownership leads to Table 2-3; explaining the possible types of sourcing arrangements.

Degree of outsourcing	Ownership		
	Internal	Partial	External
Total	Spin-offs (wholly owned subsidiary)	Joint-venture	Traditional outsourcing
Selective			Selective outsourcing
None	Insourcing / back-sourcing	Facilities sharing among multiple clients	N/A

Table 2-3: Types of sourcing arrangements

- **Spin offs** – a situation where the ownership is still internal but the function is either totally or selectively outsourced (Heinzl, 1993).
- **Joint ventures** - when the 'spin off' is jointly owned between the client and vendor organizations. Such joint ventures are based on a strategic partnership (Fitzgerald & Willcocks, 1994; Marcolin & McLellan, 1998).
- **Traditional outsourcing** – when IS ownership is totally handed over to the supplier (Earl, 1996);
- **Selective outsourcing** – when only selected parts of the IS are outsourced (M.C. Lacity, Willcocks, & Feeny, 1996).
- **Insourcing** – when an organisation does not outsource anything (M.C. Lacity & Hirschheim, 1995).

- **Backsourcing** is when an organisation decides to insource again after something has been outsourced (Hirschheim & Lacity, 1998).
- **Facilities sharing** – when an organisation chooses to share ownership of IS with either a supplier or others in the same industry (Currie & Willcocks, 1998).

The SO-ALM framework focuses on selective sourcing and spin-offs due to its modular approach. Although the framework is aiming for selective outsourcing it does not mean that it does not support total outsourcing.

The third parameter is the mode of outsourcing. The mode of outsourcing defines how many parties are involved in the outsourcing and how the client / vendor relations are. Table 2-4 outlines the possible relation forms (Gallivan & Oh, 1999).

Client	Vendor	Single vendor	Multiple vendors
Single client		Simple dyadic (1:1)	Multiple vendor (1:n)
Multiple clients		Multi client (n:1)	Complex relationship (n:m)

Table 2-4: Outsourcing modes

Four different types of arrangements can be distinguished:

- **Simple dyadic** – the simplest, only one vendor and client.
- **Multi-vendor** arrangements. Formed to mitigate the risk that of vendor opportunism (Chaudhury, Nam, & Rao, 1995; Cross, 1995). Spread the risk over more than one vendor.
- **Multiple client** – also named cosourcing (Gallivan & Oh, 1999); when several client organisations in the same or related industry might have similar needs, it could be more efficient by forming an alliance when obtaining services from a single vendor (Sharma & Yetton, 1996)
- **Complex relationship** - when several client companies form an outsourcing relationship with more than one vendor. Gallivan and Oh (1999), provide an example of seven insurance companies holding contract negotiations with two vendor companies supporting this.

The different modes of outsourcing are not directly of influence for this research. However the benefits of the framework increase in a more complex situation by providing a standard for information/product definition and exchange moments definition.

2.4.3 IT GOVERNANCE

This section explains different constructs of how to implement IT governance. IT governance is defined as: *‘the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organisational*

structures and processes that ensure that the organisation's IT sustains and extends the organisation's strategies and objectives' (IT Governance Institute, 2003).

Based on interviews⁵ it can be stated that IT governance is an important aspect of sourcing, and that IT governance is often immature in many organisations. A reason for this immaturity is moving from a traditional IT organisation, with all IT services in-house, to an organisation that has a lot of IT outsourced. This requires different skills from the IT governance organisation. The emphasis shifts to procurement and away from delivering the actual service. For this research it is important to acknowledge the possible ways of organising IT governance as this function will manage the ALM service. The implementation of IT governance is out of scope of this research. There are frameworks which can be used for implementation like: eSCM (IT Services Qualification Center, 2009), ISPL (ITSMF, 2009), or the 9 squares model (Maes, 2003).

The IT governance organisation can be organised in different ways. The different ways are described in the models from: Quint Wellington Redwood (Figure 2-11) (Rozemeijer, van Herwaarde, & Lousberg, 2008) and Capgemini (Figure 2-12) (van Dijk & Welten, 2008). Although the models are overlapping on some aspects they complete each other on other aspects. Each model is discussed next.

Quint model

Quint argues that IT governance should be the core function of the IT organisation (Rozemeijer, et al., 2008). This is based on the paper of Hagel & Singer (1999), who state that organisations have three core processes: customer relationship, product innovation, and infrastructure management. Maximum performance of all three of the processes requires *unbundling*, or splitting. Having the IT organisation to focus on IT governance also means outsourcing the other activities. Section 2.4.2 described the various forms of outsourcing. Different forms of outsourcing require a different implementation of IT governance. To describe how to organise IT governance, Quint uses the term 'IT governance function' in their model, which is: *an organisational function that solely and entirely focuses on the coordination and control of supply and demand of IT products and services*. Quint distinguishes four archetypes of an IT governance organisation. Figure 2-11 shows the four archetypes which are:

⁵ See interviews with Ad Welten and Peter-Paul Feijen in Appendix B

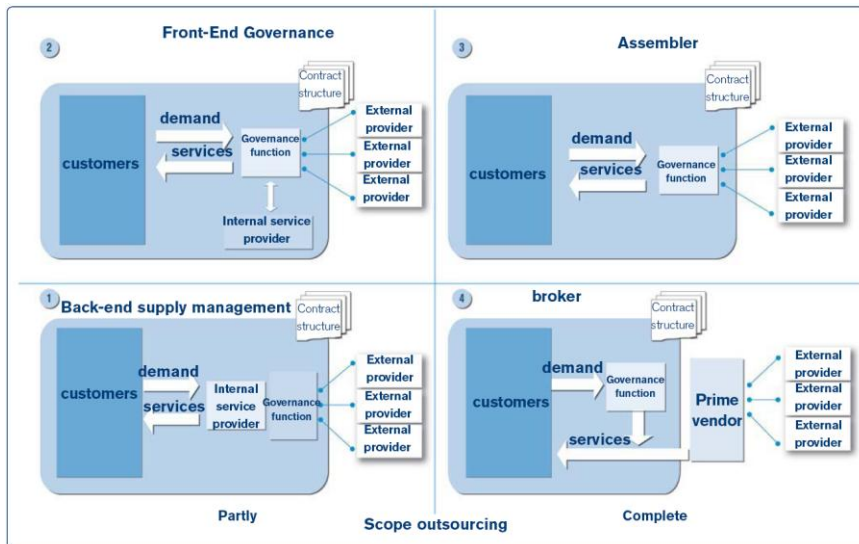


Figure 2-11: Quint, archetypes of a governance organisation

1. **Back-end supply management.** In this form, the governance function is positioned at the back-end of the internal service provider. The governance function focuses on management of external providers and definitely has no direct customer interface.
2. **Front-end governance.** In this form, the governance function does have a direct customer interface and manages both the internal service provider as well as external providers. The governance function integrates the contributions of the various different providers into end-to-end services for the customer.
3. **Assembler.** The assembler configuration is the most extensive governance function. All services are provided by external providers. None of the providers bears end-to-end responsibility. The governance function integrates the contributions of the various different providers into end-to-end services for the customer.
4. **Broker.** In the broker configuration, services are outsourced to one or a few external providers. One of the providers acts as prime vendor and delivers end-to-end services.

Capgemini model

Where the Quint model focuses on the position of the IT governance function, Capgemini focuses on the position of the system integrator (van Dijk & Welten, 2008). Organisations often outsource to multiple service providers (Rozemeijer, et al., 2008). When multiple service providers are involved an important question is who is responsible for the IT services as a whole, who has the risk. The system integrator is the one who brings all IT services together and this is responsible for all those IT services. Capgemini distinguishes four different models (Figure 2-12), the four models are:

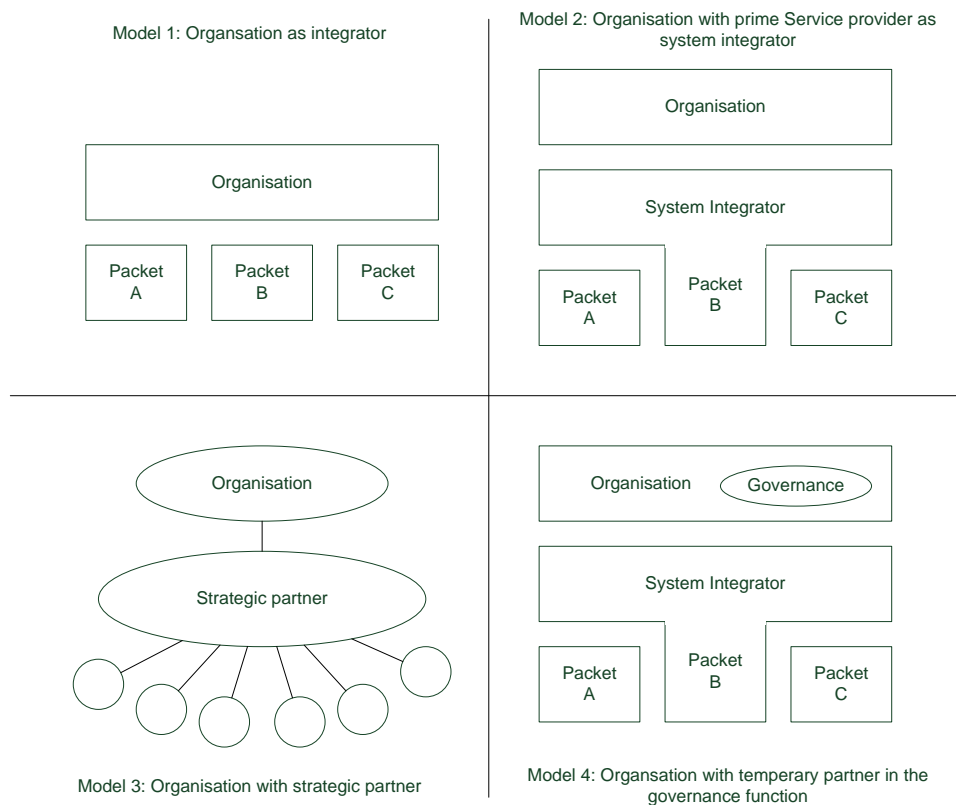


Figure 2-12: Capgemini governance archetypes

1. **Organisation as integrator** – The organisation itself manages the service providers that are involved;
2. **Organisation with prime service provider as integrator** – When having multiple service providers, one (or sometimes more) is chosen as the prime integrator. They are responsible for managing the sub-service providers. The organisation keeps a contract relation with all the (sub-) service providers. The advantage is that the governance function in the organisation is smaller and needs less maturity. The organisation can focus more on its core functions;
3. **Organisation with strategic partner** – An organisation, or a group of organisations, chooses a strategic partner as main contractor. The strategic partner could be a company or a special established organisation for this purpose. The strategic partner chooses the service providers. This model requires the governance function of the organisation to be very mature;
4. **Organisation with temporary partner in the governance function** – A variant to models two and three. When the organisation that is going to do the governance function is not ready (mature enough) at the start of the outsourcing deal, a specialized party can handle the governance function as an interim. It is preferred that the organisation that advised, or mediated, about the sourcing deal does this temporary as they already have knowledge about the situation.

2.4.4 MARKET TRENDS

The current market shows outsourcing is moving to smaller projects (Matzke, 2009; Potter, 2007), as large projects are more difficult to govern. Besides that, the market for smaller outsourcing projects is growing as not all organisation want to have big outsourcing projects, and smaller organisation are now also investigating how they could benefit from outsourcing (Young, et al., 2008). The benefit of the SO-ALM framework is that it can support smaller organisations in knowing where to pay attention to when outsourcing is a part of their IT organisation.

2.4.5 SOURCING PROCESS

The SO-ALM framework is not relevant in all steps of the sourcing process. To get an understanding of where the framework can have benefits, the sourcing process has to be defined first.

The sourcing process is a decision making process. A well know decision making model is the model of Simon (1960). Simon describes four phases.

- **Intelligence** – identification of the problem that needs to be solved.
- **Design** – refers to the alternative solutions that the individual problem solver avails himself of to solve the identified problem.
- **Choice** – choosing among the various alternative solutions identified in the design stage.
- **Implementation** – the execution of the solution choice made in the previous stage. It also includes the continuous reporting on the progress of the chosen solution.

Whereas the model from Simon is a general decision making model, Capgemini applies the theory in a decision making model called the 'sourcing wheel' (van Dijk & Welten, 2008). This is shown in Figure 2-13. The first four phases are equivalent to Simon's phases, only implemented for IS sourcing. The phases of the sourcing wheel are:

- **Analyze and strategy** – determine why one would outsource, what could be outsourced and the strategy to follow in the further process
- **Scenario's and business case** – creation of cases how could be outsourced and what parts of the IT organisation could be outsourced.
- **Selection and preparation** – offerings by vendors, evaluating the cases and choosing a vendor
- **Transition and transformation** – transition of the outsource part of the organisation to the outsourcing vendor
- **Operate** – running the organisation

The model is a cyclic model, after the operation phase the chosen direction can be evaluated and the process starts again.

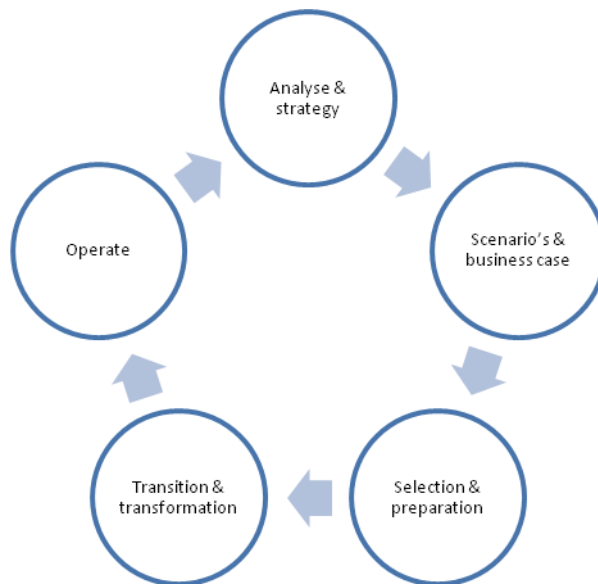


Figure 2-13: Capgemini sourcing wheel (van Dijk & Welten, 2008)

The SO-ALM framework can be used in the first two phases. In the analyse and strategy phase the framework can contribute by giving an overview about what services can be outsourced. In the scenarios and business case phase the framework can help creating the business cases by providing example scenarios.

2.5 SUPPLIER FLEXIBILITY

It is hypothesized that the SO-ALM framework will increase supplier flexibility. This section defines what supplier flexibility is, why it is needed, and how it influences the SO-ALM framework.

2.5.1 DEFINITION

Flexibility is defined as: *characterized by a ready capability to adapt to new, different, or changing requirements* ("Flexible," 2009). Flexibility in the context of this research is about the capability to change, or switch, supplier. The *ready capability* is too limited and does not give any concrete measure for flexibility. In their concept of Life cycle flexibility, Verganti and Buganza (2005) define the ready capability as: *at low costs and in the shortest possible time*, thus making flexibility measurable. Combining these definitions, defining supplier flexibility as: *the capability of changing a service provider (supplier) at low costs and in the shortest possible time*.

Supplier switching flexibility is needed by consumers because it could be possible that another service provider offers a service that has lower cost or delivers a better quality. For consumers it becomes beneficial to switch supplier if the price of switching combined with the future service cost are lower than the current service cost (Wagner & Friedl, 2007). Having the opportunity to easily switch to another service provider also increases the negotiation position when renewing contracts with the current service provider, which could result in a lower price.

2.5.2 SO-ALM FRAMEWORK IMPLICATIONS

Measuring supplier switching flexibility, and thus the cost and time required to switch a service provider is not possible during this research. It can only be measured after analysing organisations that have changed service provider and are using the SO-ALM framework. To incorporate supplier flexibility in the SO-ALM framework, the framework must include characteristics which are linked to an increase in supplier flexibility.

Klemperer (1995) states that the cost of switching a service provider can be lowered via standardisation. Furthermore it requires less time to switch supplier if the service that is being switched to another service provider does not differ much. For the SO-ALM framework to increase supplier flexibility it has to add to standardisation.

Baldwin & Clark (1997) argue that flexibility can be achieved by making use of modularity. For modularity it is necessary that the modules are standardized. This endorses the theory of Klemperer that standardization adds to flexibility. Modularity is achieved by partitioning (or clustering) information into *visible design rules* and *hidden design parameters*. Modularity is only beneficial if the partition (or clustering) is precise, unambiguous and complete. Visible design rules define the outside of a module and are split up into three categories (Baldwin & Clark, 1997):

- An *architecture*, which specifies what modules will be part of the system and what their functions will be;
- *Interfaces* that describe in detail how the modules will interact, including how they will fit together, connect, and communicate;
- *Standards* for testing a module's conformity to the design rules (can module X function in the system?) and for measuring one module's performance relative to another (how good is module X versus module Y?).

The hidden parameters define the implementation of a module. They do not influence other modules and can therefore be specified later on.

The SO-ALM framework can be related to the design rules set by Baldwin & Clark. The SO-ALM framework is the implementation of the architecture and the services used in the SO-ALM framework, the ALM services, are the modules. Section 3 will elaborate on how the ALM service meta-model will incorporate the modular design rules set out by Baldwin & Clark.

2.5.3 CONCLUSION

Supplier flexibility is needed by consumers to get the best deal in outsourcing their services. In this research it is not possible to measure the effect of the SO-ALM framework on supplier flexibility. However by ensuring the SO-ALM framework adds to standardisation and follows the rules of modularity a reasonable assumption can be made about the contribution of the SO-ALM framework to supplier switching flexibility. Questioning experts can also help to get an indication about this.

2.6 CONCLUSION

The SO-ALM framework consists of ALM services which are clusters of processes. These processes are described in process frameworks of which a few have been chosen based on their adoption in the Netherlands and the usage at Capgemini. The list of ALM services covers the whole application life cycle which is split up in the phases: development, maintenance, and retirement. Organisations have a couple of options when it comes to sourcing ALM services. When outsourcing ALM services IT governance plays an important role because the qualifications required from the IT organisation are different then in a situation where an organisation has everything not outsourced.

The gain in supplier flexibility that the SO-ALM framework is expected to deliver is not measurable during this research. However by adopting principles that are proven to lead to more flexibility, and by questioning experts, an assumption can be made about whether the SO-ALM framework adds to more supplier flexibility.

3

SO-ALM FRAMEWORK

In this chapter the concepts from the literature study and interviews are used to define what the SO-ALM framework is and how it looks like. First a definition of the SO-ALM framework is given in section 3.1. Second, the meta-model of the SO-ALM framework are explained in section 3.2. The meta-model explains the constructs that are present in the SO-ALM framework and defines how they are related. The scopes that ALM services can have are explained.

3.1 SO-ALM FRAMEWORK DEFINITION

The Service Oriented – Application Life cycle Management framework is about managing the application life cycle in a service oriented way. The services that are managed by the SO-ALM framework are called *ALM services*.

The SO-ALM framework is defined as:

A collection of *ALM services* that gives an idea about how the IT organisation could be split up into building blocks (ALM services). The SO-ALM framework defines what product exchange moments there are, what products should be exchanged at these moments and how the ALM services are related to each other.

The SO-ALM framework does not define how the information that is to be exchanged between ALM services should be structured, but only that information about a certain subject needs to be exchanged. It provides links to process frameworks that give ways to implement an ALM service.

3.2 SO-ALM FRAMEWORK META-MODEL

The previous sections already introduced a couple of the constructs that are present in the SO-ALM framework. The meta-model links all these constructs together.

3.2.1 THE META-MODEL

The meta model is based upon the rules of modularity from (Baldwin & Clark, 1997) (see section 2.5) and interviews with Capgemini experts⁶. The starting points for the meta-model are the modularity rules. The following list shows how they relate to the constructs in the meta-model which is show in Figure 3-1 and are explained after that.

⁶ Interviews with Jan Borsje and Ad Strack van Schijndel, see Appendix B.

- **Modules** – the ALM services;
- **Architecture** – the SO-ALM framework;
- **Interfaces** – the functions;
- **Standards** – the SO-ALM framework provides a set of ALM services and functions that provide a standard minimum set of what a service should have. Because of the many differences in each situation, e.g. project, organisation, standardization of all products cannot be achieved. However metrics exist that can be used to measure performance.

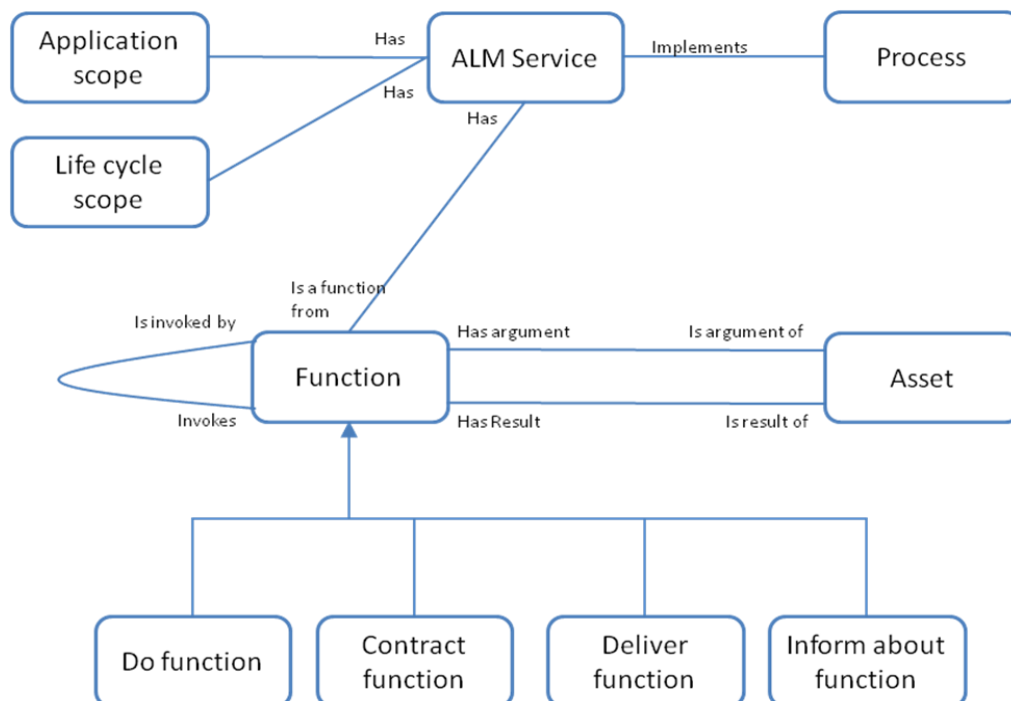


Figure 3-1: SO-ALM framework meta-model

ALM Service

An ALM service is a building block or module that suggests what functionalities could be bundled together. ALM services act as a black box, *what* is delivered is important, the *how* is less important. This does not mean that it is not important what the quality of the process of the service provider is. But as long as the service provider can prove his quality and it is measurable; how they do it is less important for the consumer, so ALM services have functions as an interface to their consumer.

Function

A function is the interface of an ALM service that describes and formalizes the interaction moments. What product is being exchanged is described in the arguments and results of the function. The arguments and result of a function are assets.

Each information exchange moment has a goal to achieve. This goal is the name of the function, or should at least be captured in the name. An ALM function can be compared to a software function, which also has a goal with arguments and results. The notation of a function is also similar to that of a software function:

Function notation:

Function name (argument 1, argument 2, argument N): result 1, result 2, result n
--

Function types

The products that are being exchanged via the functions can service different goals. To make the framework better understandable, four types of functions are defined, each with a different goal⁷.

- **Contract functions** - to make agreements about the usage of a service;
- **Do functions** - give an ALM service assignments to do something, *initiate action*;
- **Deliver functions** - retrieve products which are the result from actions initiated by do functions;
- **Inform about functions** - deliver management information / statistics about an ALM service. The goal is to measure the ALM service to verify it performs to the made agreements.

Asset

An asset describes *what* products are being exchanged by a function. Assets do not describe how that product is structured. How it will be structured has to be agreed on when using the service.

An asset can have many forms; it can be information printed, a document, has the form of a filled database, be a complete hardware infrastructure or something else. The only criterion is that it has to have value for the consumer and is according to the agreements.

Process

Processes describe how ALM services could be implemented. The processes in the SO-ALM framework are part of larger process frameworks, methodologies or standards; they are described in section 2.2.

ALM service scopes

Where some ALM services are only used for one application, other ALM services add more, or only, value when they are used for more applications. The same can be said for the application

⁷ Interviews with supervisors at Capgemini see Appendix B.

life cycle; some ALM services are only useful when they are spanning more phases. These differences we call the *scope* of an application. The scopes are based on interviews⁸.

The following scope types can be defined.

- **Application scope**, how many applications does a service cover;
- **Life cycle scope**, how many phases of the application life cycle does an ALM service cover.

Application scopes

The application scope of a service consists of 3 levels, illustrated in Figure 3-2; the icons represent applications.

1. One application;
2. Domain (all application for a specific domain);
3. Whole application portfolio (all applications).

The domain and application portfolio scope do not differ much, both are about managing more applications. When an ALM service has a domain or portfolio scope, it means that the ALM service is not suitable for just one application. An ALM service that has the scope of one application on the other hand can also be used for more application. This can also be implemented with multiple contracts for the same ALM service with one service provider, creating a new instance of that service for every application.

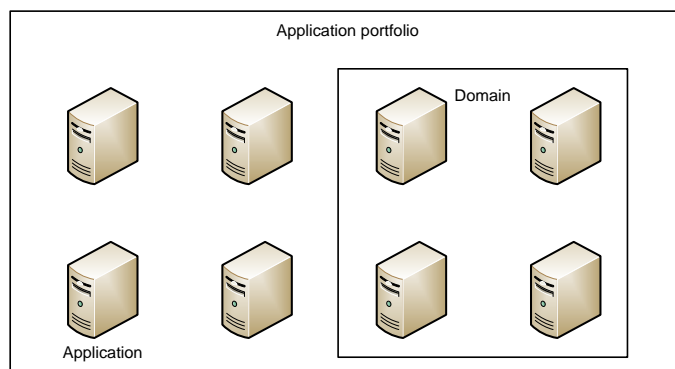


Figure 3-2: Application scopes

Life cycle scope

Another scope that a service can have is the phase of the application life cycle it is used in (Figure 3-3). When a service is spanning multiple phases, it will probably be a managing / governing service. Services spanning more phases are likely to have more relations with other services than a service that only spans one phase.

⁸ Interviews with Capgemini experts and Jan Wiggers see Appendix B.

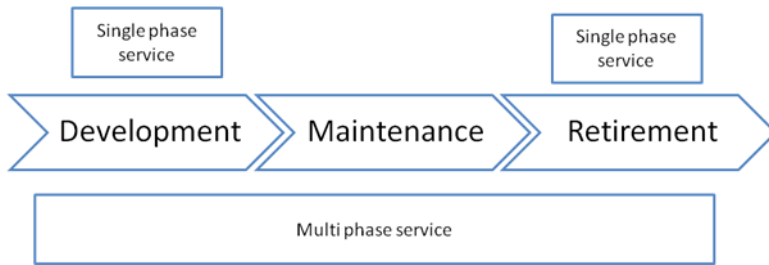


Figure 3-3: Single versus multi phase ALM services

3.2.2 EXAMPLE

To give a better understanding about how an ALM service looks like an example about the development service is given in Figure 3-4. The figure does not show all constructs for simplicity. In the figure only the constructs of the *ALM service* and *functions* are visualized. The green box in the middle represents the ALM service. In the big font the name of the ALM service is described and in small font the goal of that ALM service. The blue boxes outside represent the four different function types. Next to the bullets in each blue box are the functions for the ALM service of that type. Displaying an ALM service as presented in Figure 3-4 provides a quick overview of what the responsibilities of an ALM service are.

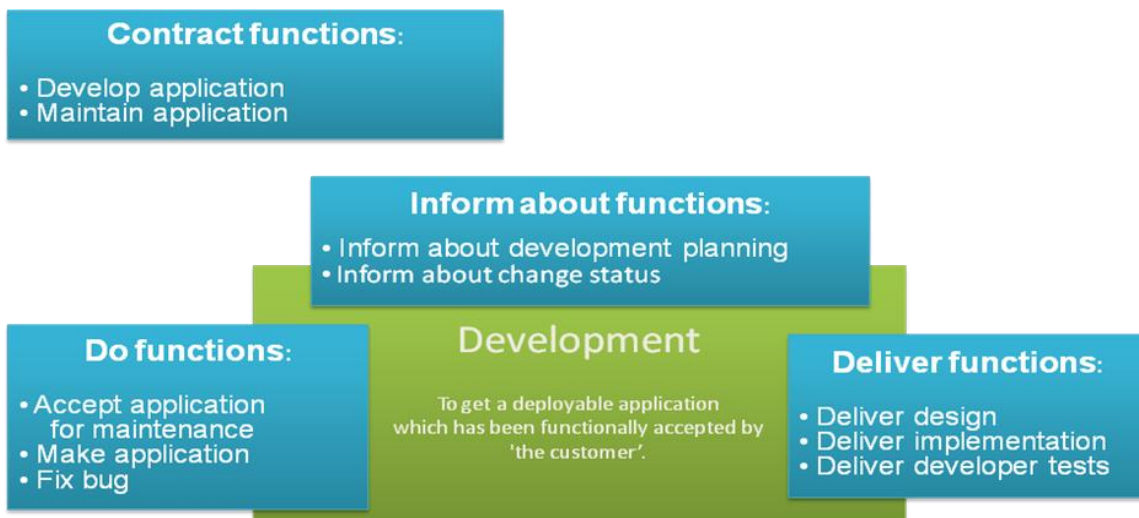


Figure 3-4: ALM service goal/function view

3.3 CONCLUSION

In this chapter the SO-ALM framework meta-model has been introduced. The constructs of the framework and the relation between the constructs have been explained. The meta-model is based upon the following base constructs: the ALM service, the four function types, assets and processes. An ALM service can have different scopes that determine the relation to other ALM services and to the customer. The scopes are represented as constructs in the model. Based on the meta-model ALM services can be created. In the next chapter the method of ALM service creation will be described, which will lead to the ALM services described in Chapter 5.

4

ALM SERVICE CREATION METHODOLOGY

For the processes to be transformed into ALM services, a method needs to be established to ensure a repeatable and organised process. This chapter explains that method. Figure 4-1 shows the used process. Each activity is described in the next sections. The numbers in the figure refer to the sections in this chapter.

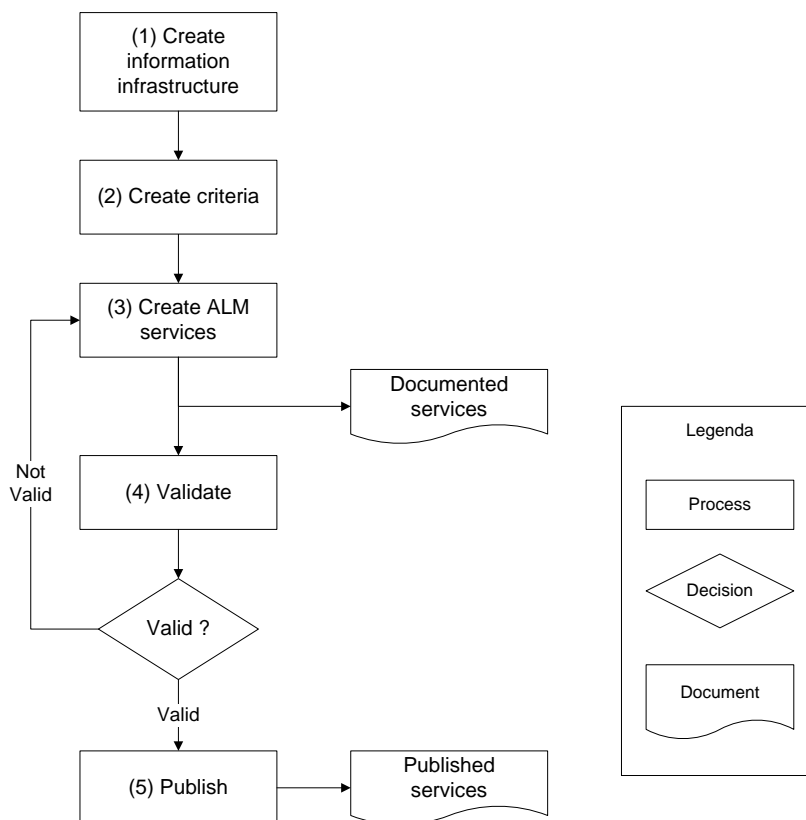


Figure 4-1: Service creation methodology

4.1 SETTING UP INFORMATION INFRASTRUCTURE

Before creating the ALM services the way of documentation has to be established. The tool that will be used for documenting the SO-ALM framework must meet the following requirements:

- **Structured and relational** – the ALM services are based upon the meta-model. This means that ALM services are structured and there are relations between the constructs. A tool is needed that can visualise these relations;

- **Future proof** – the tool should be usable now and in the upcoming years. This means the data format of the tool should be accessible and support for the tool should be available for the upcoming decade;
- **Accessible and searchable** – for the SO-ALM framework to be effective, multiple people must be using it. People will use the documentation as a reference. Search capabilities and always having access to the latest version are important;
- **Changeability** – during the creation of the SO-ALM framework a lot of changes are expected. Processes that are first bound to an ALM service move to another ALM service, and functions may also change. These changes must be easy and fast executable with minimum chance for errors;
- **Tracking changes** – while most changes would likely lead to a better framework, it could be that an older choice might be better. Thus, the old state of the SO-ALM framework must be retrievable.

Microsoft Word, or another text editor, does not qualify as a tool because it is not capable of using relational data. Having no capability of defining relations makes it also harder to make fast changes as lots of text has to be ‘copied around’. This may also result in errors. Creating a custom application would take too much time and would be hard to maintain in the future. Using a wiki is the best option: Mediawiki (Wikimedia foundation, 2008) together with some extensions meet all the requirements. Knowledge about Mediawiki is present at Capgemini⁹. If required the information in the wiki can be extracted with the use of a Webservice, or exported to other documentation forms such as Microsoft Word or Adobe PDF. Mediawiki is also the application that is running Wikipedia (Wikimedia foundation, 2008). Because Wikipedia is a well established organisation it makes it likely that Mediawiki will be maintained for a long time. And because Mediawiki is open source; data can always be retrieved for future use. The URL of the wiki is: www.so-alm.nl/wiki.

The core of Mediawiki does not provide all the sufficient functionalities. Additional functionalities can be added by the using extensions. The most important extension that is used is the Semantic Mediawiki (SMW) extension (Krötzsch & Vrandecic, 2008). This extension allows adding semantic data in the form of page properties. These page properties can be used to create relations between pages. A page is the base object in a wiki. The first step in building the wiki is to implement the SO-ALM meta-model (see section 3.2.1, Figure 3-1). The constructs of the meta-model are implemented in the wiki by the use of templates. A template is a prototype which prescribes what properties there are for a page.

⁹ My supervisor: Ad Strack van Schijndel, is using wiki’s for customers of Capgemini and has a lot of experience with them.

The default way of entering data into a wiki is by using one big textbox (html text area) which allows for a lot of freedom for the user and does not force certain properties to be filled. A better way of entering data into the wiki is by using forms. A form can ensure the required properties are entered and enforced. Also it provides the functionality of auto completion. With auto completion the page suggests what to be filled in into a field. This is particularly useful when linking an ALM service to processes. The auto completion ensures a correct spelling of the process name. The semantic forms extension (Koren, 2009) is used to provide form functionality. Other extensions that are used are: the ImageMap extension; to allow clickable image maps (Starling, 2006), and the Cite extension; to allow references in the pages (Bjarmason, 2009).

The figures below show screenshots of the wiki to give an impression about its use. Figure 4-2 shows the main page, Figure 4-3 shows how to edit by using a form, and Figure 4-4 shows the page of an ALM service (the dotted lines represent a page break, otherwise the whole page would not fit in).

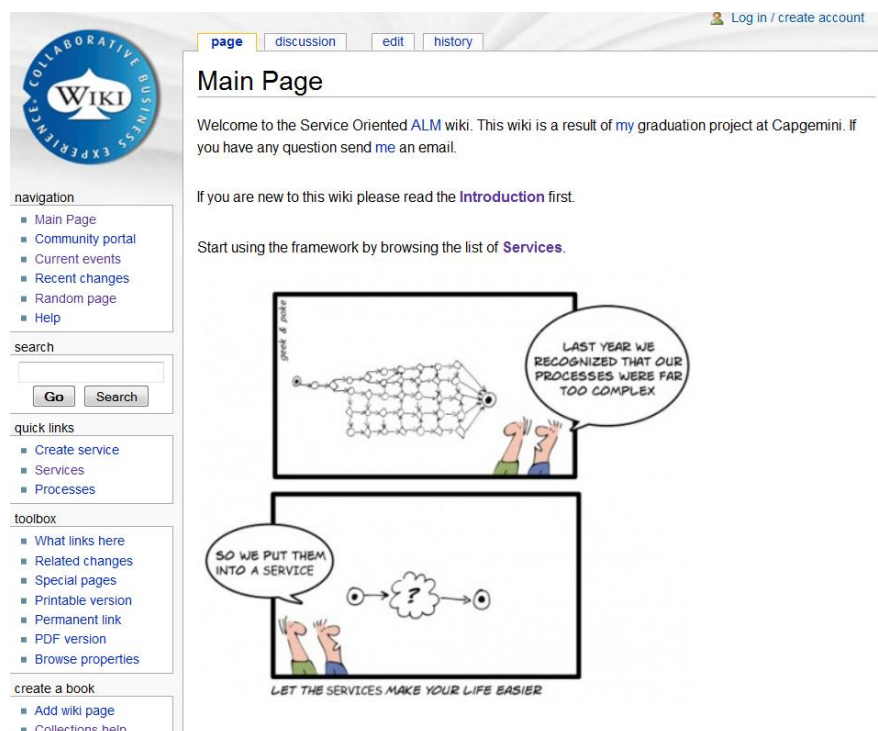


Figure 4-2: Wiki example: front page

[page](#) | [discussion](#) | [edit with form](#) | [edit](#) | [history](#) | [delete](#) | [move](#) | [protect](#) | [watch](#) | [refresh](#)

Edit Function: Make application

Service:

Function type:

Goal:

Description (optional):

Arguments:

Results:

Invokes functions:

This is a minor edit Watch this page

 [Cancel](#)

Choosing an ALM service and selecting the service type ensure this function show up at that ALM service page (see next figure)

Figure 4-3: Wiki example: edit by using forms

Development

Goal: To get a deployable application which has been functionally accepted by 'the customer'.

ALM Service functions

Contract functions			Do functions		
Function	Arguments	Results	Function	Arguments	Results
Develop application		Service level agreement	Accept application (Development)	Design (asset) Developer test Implementation model Change list (Development)	Acceptance report (Development)
Maintain application (Development)		Service level agreement	Give change impact indication (Development)	Change specification (Development) Change request	Change impact report
Add contract function			Add do function		
Inform about functions			Deliver functions		
Function	Arguments	Results	Function	Arguments	Results
Inform about change status (Development)	Change specification (Development)	Change status (Development)	Deliver change list (Development)		Change list (Development)
Inform about development		Escalation plan	Deliver deployable application	Version specification	Build
Add inform about function			Add deliver function		

Relations between the functions and thus ALM services

Service functions invoked from other functions		Functions invoked by service functions	
Is a function from	Function	Is a function from	Function
Development	Accept application (Development)	Development	Deliver change list (Development)
Development	Change requirements	Development	Deliver design

Involved processes

Process	Goal
Develop Solution Increment (OpenUP)	<ul style="list-style-type: none"> For developers: To create a solution for the work item for which they are responsible For project managers: To have a goal-based way of tracking project status
Develop the Architecture (OpenUP)	This activity refines the initial high-level architecture into working software. The objective is to produce stable software that adequately addresses the technical risks in scope.
Identify and Refine Requirements (OpenUP)	This activity describes the tasks you perform to gather, specify, analyze, and validate a subset of system's requirements prior to implementation and verification. This does not imply that all requirements are detailed prior to commencing implementation. Rather, you pe stakeholders and the entire development team collab verifiable, and feasible set of requirements is available
Realization	The actual building of the required changed / new app

List of processes that can be used to implement the ALM service

Figure 4-4: Wiki example: development ALM service

4.2 CRITERIA

Criteria have to be created in order to determine when an ALM service is a good service. The criteria have been developed in a session with experts from Capgemini¹⁰, and are also based upon the different application scopes introduced in section 3.2.1. The following criteria are used:

- **Overview services versus single application services**

Based on the application scope. Some processes have the purpose of keeping the overview of the whole application landscape (or at least a domain), e.g. portfolio management. These processes are more beneficial when they have knowledge about other applications that are used by an organisation. Some processes, like training, do not need to be aware of other applications. Overview processes and single application processes should not be in the same ALM service. Having a mix-up in a specific ALM service means that the organisation is forced to use that ALM service for tasks (that are bound to only one application) where it would otherwise have the opportunity to source them at a different service provider. Having the opportunity to source at different service providers increases the flexibility.

- **'Short' running ALM services**

Based on the life cycle scope. Basically the ALM services should be kept as short living as possible. However, some processes are bound to be running during the whole application life cycle. They need to be split from ALM services that have only purpose in one or two phases of the application life cycle. This prevents unnecessary long use of an ALM service or parts of that service.

- **Specialisation**

Make ALM services about a specialisation or a discipline. This makes it possible to staff an ALM service with a 'smaller' group of people, no need for a lot of diverse skills. Also, having the opportunity for specialist service providers; providers who only deliver a few ALM services but with a high service quality.

4.3 ALM SERVICE CREATION

The initial set of ALM services is based upon the process clustering's from the process frameworks, which are described in section 2.2. In addition to these process frameworks, input from experts is used as they have experience in what processes could best be clustered.

¹⁰ Session with Jan Borsje & Ad Strack van Schijndel see Appendix B.

After creating the initial ALM service set, the criteria have been used to improve the ALM services. When an ALM service does not meet a criterion it will be modified. Processes might switch to another ALM service or a new ALM service can be created. After modifying an ALM service it will be checked with criteria and experts again. Besides using the criteria a workshop has been held, and results from interviews have been used to create good ALM services. The interviews for ALM service creation did not use a specific protocol. Results from earlier explorative interviews have been used together with the results of weekly meetings with my supervisors¹¹.

4.3.1 WORKSHOP

The main goal of the workshop is to get knowledge about the composition of the ALM services and how they relate to each other. The advantage of a workshop is that people can interact with each other. This can lead to an outcome with more diverse results in relation to interviews, and can lead to an outcome that is already been approved by the participants.

The workshop was structured as followed:

1. Presentation about the SO-ALM framework;
2. Defining ALM services;
3. Work out of an example ALM service, in this case the development service;
4. Feedback on the SO-ALM framework.

Afterwards the ALM service composition outcome is compared with my own created ALM services. This way the outcome of the workshop is also used for validation. Furthermore the feedback is used to improve the SO-ALM framework and the way of presenting the framework. The outcome of the workshop can be found in Appendix C.

4.4 ALM SERVICE VALIDATION

The goal of the validation is to demonstrate whether or not the SO-ALM framework supports the hypotheses set in the beginning of this research. Besides using the criteria, the ALM services are also validated by questioning experts. This is done to validate the practical use of both the ALM services and the SO-ALM concept. The experts are questioned by using an online survey, interviews and results from the workshop presented in section 4.3.1. The results of the validation are elaborated more in detail in chapter 6. Although interviewing many people is preferred, not all people are available for this and have to be sent a survey invitation.

¹¹ Interviews with Ronald van Duuren, and Ad Strack van Schijndel and Jan Borsje. See Appendix B.

4.4.1 VALIDATION BY SURVEY AND INTERVIEWS

The survey hold in this master project is a qualitative survey. A selective group of people is surveyed. The people represent the experts regarding parts of the application life cycle and some clients of Capgemini who might be interested in using the SO-ALM framework. The experts together make up for coverage of the whole application life cycle. All people were sent an email with a request to participate in the online survey.

The survey is split into three parts:

1. General questions regarding service approach;
2. Questions regarding the services and completeness of the framework;
3. Questions about the implementation of one ALM service.

Before one could answer the questions, all interviewees were asked to read an introduction to the SO-ALM framework. This introduction was in the wiki. The wiki proved to be valuable as it gave people the opportunity to browse quickly trough the ALM services. It also gave the opportunity to make changes to the SO-ALM framework, which was however not used. The questions of the survey and the answers of the respondents can be found in Appendix E.

4.4.2 INTERVIEWS

The goal of the interviews is the same as the survey, namely, to validate the usefulness of both the service concept and the created ALM services. Interviews have been hold with both my supervisors and two other people¹². The interviews with my supervisors are part of the weekly progress meetings we had, which are worked out in Appendix B. The other interviews are worked out in Appendix D.

The interviews are structured using the following topics:

- Explanation of the SO-ALM framework;
- Evaluate the purpose and general understanding of the SO-ALM framework;
- Validate the completeness of the services in the SO-ALM framework;
- Validate the naming of the functions of some ALM services.

4.5 PUBLISH

After the ALM services have been validated and adjusted, they are published. Publishing of the ALM services means making the wiki accessible for everyone. Standardisation can only be achieved if lots of organisations use that standard, making it public and open can help making the framework a standard as it is accessible for more people. Also people can add modifications

¹² See interviews with Jan Wiggers and Albert van Dijk, Appendix D.

to the SO-ALM framework, thus improving it. Advertising the SO-ALM framework is not part of this research.

4.6 CONCLUSION

By defining the methodology of ALM service creation and validation, the process becomes transparent and repeatable. ALM services are created based on process clusters from process frameworks. Using criteria and experts' opinion the ALM services are improved. After completion the ALM services are validated by using an online survey and by interviews. Finally the ALM services are published in an online wiki. Using a wiki is a powerful tool for more easy documenting ALM services; it also makes them better accessible and improvable.

5

ALM SERVICE DESCRIPTIONS

Following the method presented in the previous chapter leads to a collection of ALM services. This chapter presents these ALM services. The ALM services are identified based on the criteria explained in chapter 4. Figure 5-1 gives an overview of the ALM services that are present in the SO-ALM framework.

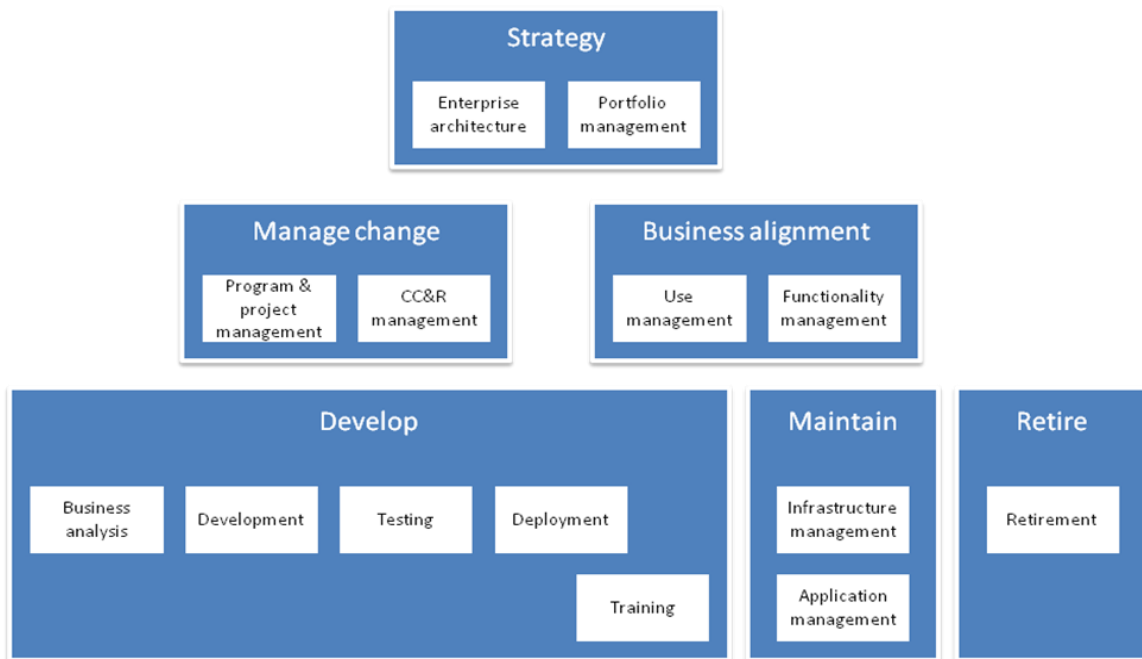


Figure 5-1: ALM Service overview

5.1 ALM SERVICE GROUPS

The ALM services can be grouped together. The grouping of the ALM service is based on similarity in characteristics (criteria). The first distinction in ALM services is based upon the application scope of an ALM service. ALM services that have more potential when used for multiple applications are shown at the top of Figure 5-1, and ALM services that are also feasible when using them for only one application are shown at the bottom. Grouping ALM services together makes it easier to understand why they are formed in such a way and how the criteria are applied.

The ALM service groups that can be used for single applications are:

- **Develop** – creation of functionalities, which could be new applications or changes to applications.
- **Maintain** – ensuring the applications are ready to use by the users;

- **Retire** – having an application taken out of production, and ensure the old data related to that application is deleted, stored or reused.

The naming of these three ALM groups is similar to that of the application life cycle phases, which is also the reason for this separation. The ALM services inside these groups are mainly used within that phase of the application life cycle. The ALM services in the develop group are also used in the maintenance phase, the ALM services from the maintenance phase, however are not used in the development phase. In the development phase the ALM services create new applications, where in the maintenance phase applications are only changed.

The other ALM service groups are not based on activities in a certain application phase. These ALM service groups are:

- **Strategy** – to determine the future application landscape (to-be situation). To make the right step to the to-be situation the current situation (as-is) has to be known on an abstract level about the whole application landscape. To determine whether choices lead to the desired to-be situation, results of decisions (or projects) have to be measured afterwards. Results have to be measured after a project is finished and after one or two years and compared to the expected effect;
- **Manage change** – ensuring that changes are carried out on time, according to plan. To make this possible: keep track of all the changes which have happened in the past and which are planned for the near future. Change management can be applied to one application. But as applications are getting more integrated with each other, knowledge about changes made to other applications is important as those might be of impact. ALM services are thus viable for more applications;
- **Business alignment** – the first contact for the users of applications. Ensuring that the applications contribute to what users want; now and in the future. Registration of problems with applications and making sure those problems are being resolved.

The separation of the ALM service groups is also based upon the separation between activities on the strategically, tactical and operational level. These levels are also used in the ASL and BiSL frameworks, which are in turn based upon the separation made by Mintzberg (Mintzberg, 1979). The strategy group is positioned on the strategic level, manage change is on the tactical level and the other ALM service groups are on the operational level. Business alignment can also be seen as part of maintenance¹³. However, as it is usually implemented for multiple applications it is a separated ALM service here. The ALM services in the business alignment group are based on BiSL processes.

¹³ Business alignment as explained as an ALM service group here overlaps a lot with functional management described by Looijen (2004), where it is part of maintenance.

5.2 ALM SERVICES

Each ALM service group consists of ALM services. The groups are split into ALM services based on the criteria of specialization, and results from interviews and the workshop. Next the ALM services will be explained for each group¹⁴.

5.2.1 DEVELOP

The ALM services in the develop group are based upon OpenUP roles and the separation is based on specialisation.

Business Analysis (BA)

Identifying business needs and problems. The creation of solutions for those needs and problems, and documenting those solutions as requirements in a functional design document. BA should ensure the business prioritises the requirements. BA informs about the impact of requirements, about possible cost and effects of solving problems via offered solutions. The development service should be involved in determining what is technically possible. BA is responsible for keeping the documented requirements up to date for as long as it is contracted. Before the ending of the contract the service should hand over the requirements documentation to CC&R management.

Deployment

Responsible for taking an application, or a new version of an application, into production. A first step is to certify a new software version, although this is not necessary for small applications. After which the application has to be integrated in the technical environment, e.g. distributed to the servers. Deployment needs to work with CC&R management which determines the release calendar, application management as they are maintaining the application and infrastructure management as they are running the application on their servers. Deployment informs about any problems about releases and time it takes. The need for a deployment service is based on interviews and is mostly necessary for large applications where moving to new versions has a high complexity.

Development

To get a deployable application that has been functionally accepted by 'the customer'. Development is responsible for coding, unit testing¹⁵ and technically documenting an

¹⁴ The ALM services are ordered alphabetically to prevent the suggestion of having to execute the ALM services after each other in the provided order. Multiple ALM services can, and must be used together to create good products and customer satisfaction.

¹⁵ Unit tests test a piece of code in an isolated environment, they are written by developers.

application. The service needs to inform about planning, and the quality of the created software. During the time development is contracted it is responsible for the source code and documentation, before ending the contract those should be handed over to application management. Development can create new application or create new versions for existing application. Applications are developed according to the requirements created by BA. Requirements can change during development time. How changes in requirements are handled must be documented in agreements. When new versions for existing applications are created it often involves changes (or a group of changes) that are too big to handle in application maintenance. Before starting development, the ALM service will give an indication about how long it will take and what it will cost to develop an application according to the requirements. Application and infrastructure management should be involved in the development process so they can already prepare as they will be taking over the application later on.

Testing

The responsibility of the testing service is to advise, coordinate and execute application tests. An application can be tested on many levels. Testing is not responsible for unit testing; this has to be done by development, although testing can advise about how to do so. For integration and functional tests testing is responsible for creation and execution of the tests. Testing is also responsible for the creation of a testing environment which simulates the production environment. Testing delivers test results and if possible provides the source for the failure. When tests fail it is then up to development to fix them or up to the business to decide whether to live with them. While testing can handle all the tests of an application its services can also be called upon in specific cases to simulate a certain test case. Testing should be involved in an early development stage to ensure timely preparations and continuous testing of applications. The service informs about test progress.

Training

To train the users for working with a new application or version. This ALM service ensures the creation of training material and provides ways of transferring knowledge about new applications. The ALM service can be made responsible for keeping the training material up to date with the latest version of applications, however this depends on agreements. Ensuring that users will carry out the training is the responsibility of the business. Training can also be made responsible for informing about the results of trainings regarding the knowledge enhancement of users.

5.2.2 MAINTAIN

The maintain ALM service group is based upon the separation which Looijen (2004) has made for the maintenance phase, the same names are used. Functional management is not in this

group because it is implemented via Business alignment group. Application management is based upon ASL and Infrastructure management upon ITIL.

Application management

Responsible for keeping an application up and running. When small changes have to be made to an application they are handled by application management. Small changes are changes which do not take up a lot of hours, e.g. max 150 hours for a change. When changes take up more hours it is better have the change be executed by development and make a new project. Application management usually does not have enough people staffed for large changes. Application management informs about uptime, the amount of changes and incidents, and impact of those changes and incidents.

Infrastructure management

Responsible for keeping the infrastructure up and running. Where application management is responsible for the applications, infrastructure management is responsible for the infrastructure. Infrastructure involves hardware (servers, laptops, lan), operating systems, file systems and backups. Infrastructure informs about uptime, the amount of changes and incidents, and impact of those changes and incidents.

5.2.3 RETIRE

Retirement is the last phase of the application life cycle. The retire ALM service group is based upon ISO 12207 which provides processes for this phase. In interviews and the workshop¹⁶ it was argued that retirement is often not well addressed in organisations. Creating a specialised ALM service for this purpose would firstly mean acknowledgment for the discipline, but also that organisation would start to think more about how to handle retirement of applications. Retire contains one ALM service:

Retirement

Determine what should be done with the currently old systems, and initiate that process. Create and document procedures for retrieving information from old systems (if possible). Maintain the overview of what happened to old applications, why did they were replaced, what information did they store and how to retrieve that information again. When information from systems that have been taken out of production is required, and that information is not migrated to a new environment, the retirement service offers a function for retrieving that information.

¹⁶ Interviews with Jan Wiggers (Appendix D), Jan Borsje (Appendix B) and the workshop (Appendix C).

5.2.4 USER CONTACT

The user contact ALM service group is based upon BiSL. It is the group that is close by the users of applications. The groups is split into two ALM services because in practice the service desk, which is a service delivered by use management, is often outsourced where functionality management is not. Both ALM services are based upon the two operational process clusters of BiSL. The ALM services are:

Functionality management

In cooperation with the users determine what changes are required to the application landscape. When the required changes are clear, structure the changes and take actions to prepare the changes. Because requested changes can be handled faster if they are standardised (like a request for a certain kind of software or vpn access) a responsibility is to determine what standard changes are. Functionality management informs about the amount of changes and impact of those changes that are processed.

Use management

To ensure continued and optimal support for daily use, or exploitation, of the IT services by the end users. Use management is responsible for first line support. This means having a help/servicedesk and online manuals for most common problems. Having a contact point for users is only useful when actions can be taken based upon the input from the user. Use management is responsible for ensuring actions are taken by other ALM services, e.g. functionality management or application management, to ensure user requests are handled. This also involves supplying feedback to the user about the current state of their requests. Use management is also responsible for formalising definitions and business information models to ensure a consistent use by the IT organisation. The ALM service informs about which kind of support is delivered most, total amount of service calls, time it takes to resolve service calls and user satisfaction.

5.2.5 STRATEGY

The strategy ALM service group determines what the future application landscape looks like in relation to strategic business needs, and evaluates the choices made in the past. Strategy is split into two ALM services. They are both acknowledged specialisations.

Enterprise architecture (EA)

To create the coherence between the application landscape and the business. Determine, on a highly abstract level, what has to be changed to meet the goals of the business. Enterprise architecture has to have the overview of the application landscape of the whole organisation. Enterprise architecture is responsible for the creation of strategy and vision concerning IT.

Portfolio management

Responsible for doing the right projects. Determine what projects have to be executed based on priority and budget which both have to be determined together with the business. Evaluate projects after they have stopped against the goals set at their beginning and quantify the efforts of IT investments.

5.2.6 MANAGE CHANGE

The manage change ALM service group is divided into two separate ALM services. Project & program management (PPM) deals only with projects and programs. CC&R management deals with tracking all changes and releases also out of scope of projects. PPM is often not in the maintenance phase; opposed to CC&R management which is mostly in the maintenance phase. Furthermore CC&R manages changes for the whole application landscape, where PPM often has a more limited scope. Finally they are both established disciplines in this form.

Configuration, Change & Release Management (CC&R management)

Registration, keeping, controlling changes to and distributing application objects¹⁷. The ALM service responsible for centralised storing of all documentation involved in changes. Because all the information regarding changes is available at this service it is responsible for the release management. The service delivers a release planning and informs about amount of releases for every application and possible difficulties regarding the releases.

Project & Program Management (PPM)

Responsible for doing the projects right: the planning, organising and managing resources that are involved in a project or program, ensuring the project is delivered on time, within budget and satisfying the customer. PPM is responsible for the phasing of a project and having the right ALM services, and thus resources, available at the right moment. PPM should inform about the progress of the project regarding planning, budget, scope and resources. PPM also deals with programs. A program is a group of projects with the same goal (the umbrella). They are grouped together to make changes more manageable and have benefits of economies of scale. The role of program management is to manage links between projects, coordinate and prioritise resources across projects and dealing with overall cost and risks.

5.3 CONCLUSION

The ALM services deliver all required functionalities an application requires in its life cycle to satisfy business needs. The ALM services can be grouped together to get a better understanding

¹⁷ Program objects and additional objects such as documentation, information definitions, etc. This is often stored in a Configuration management database (CMDB).

about their goals. The functions of the ALM services are described in the wiki as the list would be too long to explain in this chapter.

We make a note that for the 'develop' cluster, the ALM services are ordered in such a way as used by traditional waterfall development methodology. This does not mean that the ALM services have to be used after each other, but as in Rational Unified Process (RUP) (Kruchten, 2003) the emphasis on certain ALM services is earlier in the process and others later.

6

VALIDATION RESULTS

This chapter presents the outcome of the validation phase of this research. As already discussed in section 4.4, three different instruments have been used for validation: A survey, interviews, and a workshop. Section 4.4 also describes the structure of the validation and the selection of experts. The findings of this validation are shown in detail in: Appendix C for the workshop, Appendix D for the interviews, and Appendix E for the survey.

This chapter summarizes the result of the validation activity. First, the results about the SO-ALM framework general use are presented. In section 6.2 the test results about the created ALM services are presented. Overall the results of the survey, the workshop, and the interviews show similar results and are therefore handled at the same time. Reflection and discussion on the results is written in *italic*. References to survey questions are made in the format (Q). The survey has been sent out to 13 people of which 8 complete returned.

6.1 SO-ALM FRAMEWORK

This section provides a summary of the validation results regarding the SO-ALM framework in general, and the usage of the framework.

Use of the SO-ALM framework

The overall conclusion of the respondents who took part in the survey, in the interviews and in the workshop regarding the usefulness of the framework are the following:

- The respondents agreed on that the SO-ALM framework can be used very well in decision making about how to organise or source ALM services; specifically, respondents perceive the framework useful in the following concrete ways:
 - It may helps in formulating questions about what products an ALM service must deliver (Q 2a.1);
 - It may lead to better agreements about when products must be delivered (Q 2a.2);
 - It might help in defining and implementing a (multi-) sourcing strategy (Q 3.2);
 - It could serve as a brainstorming tool and help in formulating thoughts on flexible IT services (Q 3.3);
- The SO-ALM framework can lead to easier switching of suppliers (supplier flexibility)(Q 2a.3);
- The SO-ALM framework might help to keep a better overview of the entire IT organisation (Q 3.1);

- The SO-ALM framework was rated an average grade of 6.5 (scale of 1-10) (Q 16).

Results of the survey show that 25% would use the framework, while 75% of the respondents are not certain about that (Q 9). Furthermore, the results from the interviews and workshop state that the SO-ALM framework is a good start. The respondents agreed that the idea is useful and sounds promising, but to make it work in real-life and make it part of the Capgemini service delivery methodology, it still needs more fine-tuning and completion. Regarding the practical usability the conclusions are:

- Moving from a process oriented organisation to a service organisation requires more than only a SO-ALM framework. (Interview and workshop results, and (Q 6a+b));
 - E.g. a change in the governance organisation. The SO-ALM framework does not address this issue;
 - The SO-ALM framework is a good step with the integration with the process frameworks;
- Maintaining the SO-ALM framework could be done best by an open source organisation (Q 7);
- The SO-ALM framework will probably not lead to specialisation by suppliers (Q 4.1);
- It is doubtful that specialisation leads to higher service quality and productivity (Q 4.2);
- Based on the interview with Albert van Dijk:
 - The SO-ALM framework might lead to specialisation because service providers want to differentiate on quality for their offered ALM services;
 - It is more likely that increase in standardisation will lead to an increase in competition which will lead to lower prices.

Discussion on the results

The answers of the survey show that the majority of respondents are not certain about whether they would use the SO-ALM framework. However, the results also show no respondents not wanting to use the SO-ALM framework and also 25% who are willing to use the framework. Together with the average grade of 6.5 makes that work has to be done on the SO-ALM framework before it will be usable. A reason for this low rate of perceived acceptance could be that they the SO-ALM framework has not been introduced properly or is not mature enough at this point. It is known that the SO-ALM framework is not the only thing to get an organisation moving towards a service oriented organisation. More explanation on the context and requirements for the SO-ALM framework, such as the need for a different type of governance, might turn the acceptance rate up. The interviewees all answered that they would use the SO-ALM framework, in contrast to the survey results. This adds to the conclusion that the introduction in the survey could have been better. However due to the small number of interviewees, this cannot be said with certainty. Furthermore, practitioners might prefer to use a

framework for which they know for sure that it has already been tested and experienced in real-life settings. Unless this happens, practitioners are likely to be reserved regarding their personal commitment to using it in their own practice. This finding motivates further research which will focus on the evaluation of the applicability of the framework in real-life settings.

The response to the expected increase in supplier flexibility is promising, as it indicates the framework is well designed for this purpose. The SO-ALM framework could also be used during the decision making process. Having the SO-ALM framework as a checklist for what must be present for in service contracts. This could be a benefit for (less experienced) consumer and service provider.

Last, an interesting finding emerged during the validation activity: our assumption that the SO-ALM framework would lead to more specialisation and thus an increase in service quality has proven wrong. It might be possible, but it is unlikely. Further research is, therefore, needed in replication studies, to collaborate with this finding or disconfirm it.

Standardisation

Standardisation cannot be measured at this moment as standardisation would require adoption by multiple organisations. This is not possible because the SO-ALM framework is not 'market ready'. What could be investigated is the *possibility* of becoming a standard. This has been done in the interviews by explaining what the framework incorporates to achieve this. We argued that by formalising the interfaces and presenting a uniform solution standardisation can be achieved. The interviewees endorse this ability of the SO-ALM framework. Presenting a clear structure is a step towards standardisation. The reuse of common used process frameworks can speed up the acceptance for standardisation. The following points describe the benefits when standardisation can be accomplished:

- More standardisation is better for both service provider and consumer;
- Standardisation of the services from one supplier:
 - Service provider can work more cost efficient, lower cost (by offering the same service to multiple customers). Therefore they are likely to adopt what increases standardisation, and thus the SO-ALM framework;
 - Lower cost means higher profit for the provider or lower prices for consumers.
- Multiple suppliers offering the same standardised services;
 - Switching service provider becomes easier;
 - Because service providers will use the same naming for their services, consumers will know what to expect (and not only marketing tech talk) (Tower of Babel).

Discussion on the results

While standardisation could not be measured, the responses are promising; experts think the SO-ALM framework is a step in the right direction with the formalising of interfaces. These

responses are not a surprise as the aim for the SO-ALM framework is standardisation. As standardisation is one of the aspects of modularity, which is linked to supplier flexibility, an increase in supplier flexibility could also be expected.

SO-ALM meta-model

Regarding the usefulness of the meta-model, the following was found:

- The ALM service function types make it easier to understand what a service is about (Q 5a);
- The chosen four function types provide sufficient distinction (Q 5b);
- One respondent did not understand the differences between the *do* and *deliver* function types (Q 5c). During the interviews and workshop the explanation of the differences required extra attention as some people did not directly understand the differences. After explaining more carefully they would understand and find it useful.

Discussion on the results

During the interviews and the workshop it has come forward that the differences between the function types have to be carefully and clearly explained. This might explain that one survey respondent did not understand the difference between them.

6.2 ALM SERVICES

This section presents the results about the ALM services that make up the SO-ALM framework. Each ALM service has been tested about whether one would outsource that ALM service.

6.2.1 SOURCING

The survey contained a question (Q 10) about whether to outsource an ALM service or not to. There are three possible answers: 'do not outsource', 'suitable for outsourcing' and 'highest priority (outsource this as one of the first ALM services)'. The results are summarized in Figure 6-1.

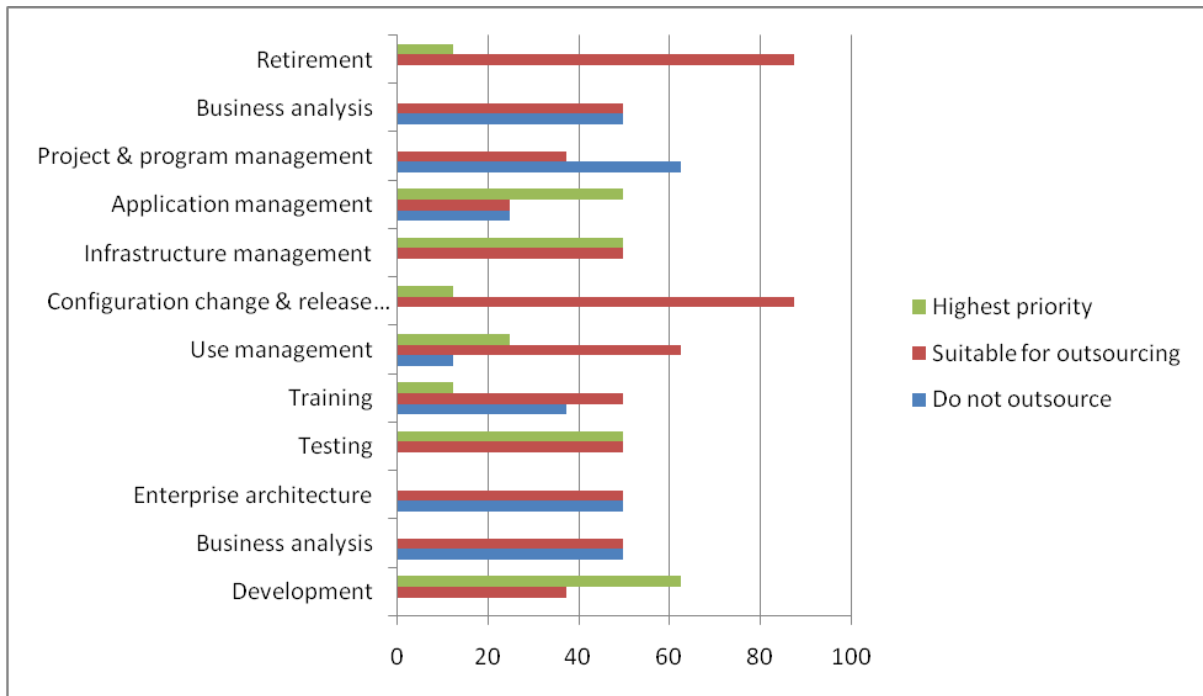


Figure 6-1: Survey outsourcing results

All respondents of the survey entered that the following ALM service are suitable for outsourcing or should be outsourced with the highest priority.

- Development (would be outsourced first often);
- Infrastructure management (would also be outsourced first often);
- Testing;
- Configuration change & release management;
- Retirement.

Possible candidates for outsourcing, having only 1 or 2 respondent choosing not to outsource, are:

- Use management;
- Application management.

Project & program management is less suitable for outsourcing, having most respondents choosing not to outsource. For the rest of the ALM services, the respondents are too divided, having about just as much respondents pro outsourcing as against. These ALM services are:

- Business analysis;
- Training;
- Enterprise architecture.

Discussion on the results

Knowing the ALM services that are likely to be outsourced gives organisations the knowledge about what could be outsourced best. This way, business organisations can keep the right ALM services in-house, and outsource the ones which are best suitable for outsourcing.

6.2.2 COMPLETENESS

The ALM services in the SO-ALM framework must cover the whole application life cycle. This has been explored in the workshop and demonstrated with the survey.

One of the goals of the workshop was to identify the ALM services. The workshop brought forward that there needs to be an ALM service between development and maintenance. This ALM service should test or verify whether the application is ready to be taken in production. Certification of the application, moving it to maintenance and ensuring the proper training has been done by people who need to work with that application. This ALM service has been included as the *Acceptance and transition* service.

In the survey, a question (Q 11) was asked about whether the respondents missed any service from the list presented. This did not bring forward any results. A comment at the end of the survey (Q 17) indicated the absence of portfolio management. After the survey was sent out the list of ALM services changed, some ALM services were added. Indeed, one of the added ALM services was portfolio management, fixing the absence in the survey list. Because the survey was already sent out, it could not be modified at that point in time. The survey only covered the list of services handled in the previous section. The final list has been validated by my supervisors who think it is sufficient.

Discussion on the results

The completeness of the SO-ALM framework is proven sufficient. Having the respondents not missing the ALM services which were not present in the survey could be explained by the question form. It has been asked whether respondents would miss any ALM service, opposed to if they would see opportunities for other ALM services. However, having everything covered does not mean it could be smarter to create extra ALM services. Furthermore the completeness is open to interpretation, where respondents could think some functionality might be covered by a certain ALM service while this is not the case.

6.2.3 ALM SERVICE FUNCTIONS AND NAMING

One service has been tested for completeness on the functions and on the clearness of those functions. The ALM service that has been tested is the development service.

Development service

Most of the functions are found to be proper and clear functions (Q 12-15). However the do functions were unclear to some of the respondents. Of the inform about functions the inform about development escalation scored unclear by 2 respondents.

ALM service naming

Besides the naming the functions of one ALM service, the respondents answered that some ALM services names are not self explaining. For one the retirement service was unclear. Someone else expected that the application maintenance service would do all the development once an application has been moved to maintenance. He could therefore not place the maintain application function at the development service.

Discussion on the results

Choosing the best name for ALM functions turned out to be a difficult task. Creating better function names is very important so that everyone understands what is meant with a certain function. To come to clear function names, they have to be reviewed by multiple people. Using common names for ALM services has the advantage that people are more likely to know what is meant by such an ALM service. The disadvantage of common names is that people already have an interpretation for that name, which could be a wrong one. To avoid professionally biased people: ALM services always have to be explained or placed in the context of the full range of ALM services. Showing all ALM services might prevent people to think an ALM service would include a particular process, which is actually is present in another ALM service.

6.3 CONCLUSION

This chapter presented a summary of the validation results, of which the full results can be found in the appendix. The overall reaction by the participating respondents is that the SO-ALM framework is in principle a good idea. There is a need for standardisation and the SO-ALM framework is a step in the right direction. The service-oriented concept of the SO-ALM framework fits the market with the 'everything as a service' hype. The SO-ALM framework can be a mean in the designing of new services for IT organisations. Nevertheless to be a service organisation requires more than only a SO-ALM framework and for that the SO-ALM framework need improvement. Naming of ALM service functions proved to be difficult, the chosen do function names are unclear to 30-40% of the respondents. These function names should be renamed. Because people already have an interpretation for ALM services names, extra care has to be takes when explaining them.

7

CONCLUSION

This chapter presents the conclusions of this research. At first a summary is given about the research. The second section describes how the results of the research have been validated and what the shortcomings of the research are. Section three discusses how those validation shortcomings can be prevented and what work must be done in the future to further evolve the SO-ALM framework. Section four presents the practical value of the SO-ALM framework and the final section presents the recommendations for future development and use of the framework.

7.1 PROJECT SUMMARY

The goal of this research project was to develop a framework for Service Oriented Application Life cycle management (SO-ALM). After the creation of the framework test the possible advantages of the framework regarding supplier flexibility, service quality and IT governance.

The first step in the creation of the SO-ALM framework was to gather information about what the constructs of an ALM framework would be. The framework is based on constructs from the literature and expert knowledge of Capgemini employees. Chapter 2 describes the literature involved in the SO-ALM framework. The background of the constructs and context of the framework are described together with the process frameworks which are used as input for the framework. These findings lead to the meta-model, which is described in chapter 3.

The SO-ALM framework is composed of ALM services. These services are a wrapper around a collection of processes which act as a black box. How IT processes are organised is already known and the SO-ALM framework does not try to reinvent those, only to present them in another way. Each ALM service has a number of functions. The ALM service functions define the interaction; they are the interfaces of the ALM services: what asset is when exchanged. Functions are separated into four different function types for clarification: do, deliver, inform about and contract functions. Chapter 3 describes these constructs and their background in detail.

The methodology of how the SO-ALM framework would be created and validated had to be established. It is described in chapter 4. This chapter describes the criteria that have been used to create the ALM services and the three methods of validation: workshop, interviews and a survey. The workshop is also used as input for ALM service creation. A wiki has been used to document the ALM services. This wiki uses templates which incorporated the meta-model. The ALM services that have been created are described in chapter 5. After the ALM services had

been created they had to be validated. Not only had the ALM services to be validated, but also the SO-ALM concept. The way of validation is explained in section 4.4. The result of the validation is summarized in chapter 6. Appendixes C, D and E contain the raw validation results.

7.2 HYPOTHESES EVALUATION

The expected advantages of the SO-ALM framework have been tested to validate whether the SO-ALM framework complies with the goal stated at the start of the research. Next, each of the hypotheses is evaluated.

Higher service quality

The expectation was that the standardised services of the SO-ALM framework will lead to more competition and thus specialisation. This specialization would then result in higher service quality. Results of the survey and interviews show that it is not likely that the SO-ALM framework will lead to more specialisation. It might be possible that specialisation leads to higher service quality. However, in interviews it has come forward that an increase in competition is more likely to lead to a differentiation on price rather than on service quality. Because the indirect assumption proved to be wrong it can be concluded that the SO-ALM framework will not necessary lead to higher service quality.

Easier governance

Most of the respondents argued that having the SO-ALM framework could lead to having a better overview of the IT organisation. However, they also stated that moving to a service oriented organisation would require a total different governance organisation. Although the SO-ALM framework might provide a better overview it does not mean that governance will be easier as it consists of a lot more facets.

More supplier flexibility

All survey respondents and interviewees think that the SO-ALM framework will lead to more supplier flexibility. An increase in supplier flexibility is the result of standardisation on ALM services. However, multiple service providers need to offer standard ALM services before switching supplier can be easier.

Other purposes of the SO-ALM framework

During the workshop, it has come forward that the framework could also be used as a communication tool in decision making about the way to organise the IT organisation, or how parts of the IT organisation could be outsourced. This has been tested in the survey and all respondents agree on that goal. The framework could also be used for strategic purposes where it might lead to new service offerings, this has not been tested.

7.3 DISCUSSION ON HOW TO INCREASE THE PRACTICAL VALUE OF THE FRAMEWORK

This section discusses how the SO-ALM framework could be used in organisations and what aspects to keep in mind when moving to a service oriented organisation. Clearly, an organisation should consider some prerequisites before the framework can add value to the organisation. Organisations should also consider potential risks associated with the introduction of the SO-ALM framework. The prerequisites, risks and usage are discussed in this section next.

Prerequisites

Before an organisation is ready to move to a services oriented organisation other aspects also have to be organised. One important aspect is governance. As mentioned in the interviews a governance organisation has to be organised differently and requires a different set of skills. Choosing for a service oriented organisation, opposed to a process organisation, is a management decision. Although the SO-ALM framework describes ALM services, each organisation will have to make agreements about the use of those ALM services to fit their organisation. These agreements have to be formalized in a standard way to minimize differences between service level agreements (SLA's). This makes it easier to manage multiple contracts (SLA's).

Risks

The SO-ALM framework proposes a different way of working. Besides the benefits that are discussed in this research moving to a service oriented organisation also involves risks related to most organisational changes, such as resistance against change by employees. As a service oriented organisation requires different skills from employees there is a risk that the current employees are not able to adapt, or no new skills can be attracted. There are no guarantees that a service oriented organisation performs better than a process orientated organisation. The transformation to a service oriented organisation also brings costs which might not be returned in the short term. Although using standardised ALM services and the cost of switching a service provider might be lower, these cost are still present. A service provider should be selected carefully.

When an organisation has chosen to use a specific ALM service the next choice is whether to outsource it or not. This research has shown that some ALM service can very well be outsourced and others are best kept in-house (see section 6.2.1). Outsourcing introduces new risks, but also benefits. An organisation must always bear in mind that outsourcing involves handing over control and information to another organisation. Risks of outsourcing include: underestimating costs, loss of critical skills, loss of access to assets, etc (Dibbern, et al., 2004). Risks of outsourcing are not part of this research.

Usage

The framework should be used to define the ALM service: what are they, what are their boundaries and how do they interface. The framework is not the Holy Grail. It tries to achieve standardisation but every situation is still different and requires some tweaking. However, when about 80-90% can be covered it makes life a lot easier. When organisations choose not to use the ALM service as defined by the framework they can use it as input for their own service creation, knowing what aspect to pay attention to.

7.4 LIMITATIONS AND FUTURE WORK

There are some limitations to this research. The framework could not be tested in a real life test situation due to the time available for this research. The results from the validation are therefore only predictions. However they are predictions made by experts. The number of respondents and interviewees is not very high, but they do cover expertise for the whole application life cycle. All but one expert are Capgemini employees (of which one ex-Capgemini); it might be possible that people outside Capgemini have different opinions about the subject matter. Validating the framework in a real life situation gives more insight in what the framework can really be useful for. To achieve the supplier flexibility, the framework must be adopted by multiple organisations. As the framework is currently only known within Capgemini, other organisations; consuming businesses and service providers, must be persuaded to use the framework. Only then businesses can choose from service providers who offer the same ALM services. Future research should also focus on *how* to transform a process oriented organisation into a service orientated organisation. Currently not all ALM service have all functions defined. Defining all ALM services in detail must be a high priority. This research only focussed on the positive aspects of a service organisation and the usage of the SO-ALM framework. Future studies should also investigate the negative impact.

7.5 RECOMMENDATIONS

In order to maximise the benefits of the SO-ALM framework the following issues have to be addressed.

- Further development and testing of the framework in real life situations. The SO-ALM framework is not finished and it has to be proven in real life situations before people will start using it.
- Investigate what the risks/negative aspects are when moving towards a service oriented organisation. Furthermore, investigate if other benefits can be achieved by using the framework.
- Standardize on metrics and measure the ALM service performance. This way, ALM service providers can be compared better, making the choice for a service provider more transparent.

- Urge users of the framework to share experiences. The knowledge platform is already present in the form of the wiki. A lot can be learned from other peoples experience and mistakes can be prevented. The boundaries of the ALM services may also need adjusting, which can only be learned if experiences are shared.

GLOSSARY

Term	Explanation
ALM	Application Life cycle Management
ASL	Application Service Library
BiSL	Business Information Services Library
ITIL	Information Technology Infrastructure Library
SLA	Service level agreement
SO-ALM	Service Oriented Application Life cycle Management
CMMI	Capability Maturity Model Integration
CMMI-SVC	CMMI for Services
CMMI-ACQ	CMMI for Acquisition
CMMI-DEV	CMMI for Development
RUP	Rational Unified Process
OpenUP	Open Unified Process

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APPENDIX A SO-ALM FRAMEWORK ADVANTAGES EXPLAINED

We assume that using a framework with standardized services will have benefits for the consumer of those services. Via these benefits the service provider will also gain from these benefits as they can serve the customer better. This appendix elaborates on the expected advantages of the SO-ALM framework. The advantages are made up in sessions with Capgemini experts. Capgemini uses a benefits logic to represent the logic behind the advantages or benefits.

The benefits logic is a cause and effect schema that visualizes the logic behind the expected benefits. Figure A-1 below shows the expected benefits from using a service oriented approach to ALM. On the left is our framework and moving to the right are the expected benefits. The benefits at the right side are the ones that help solving the problems introduced in chapter 1.

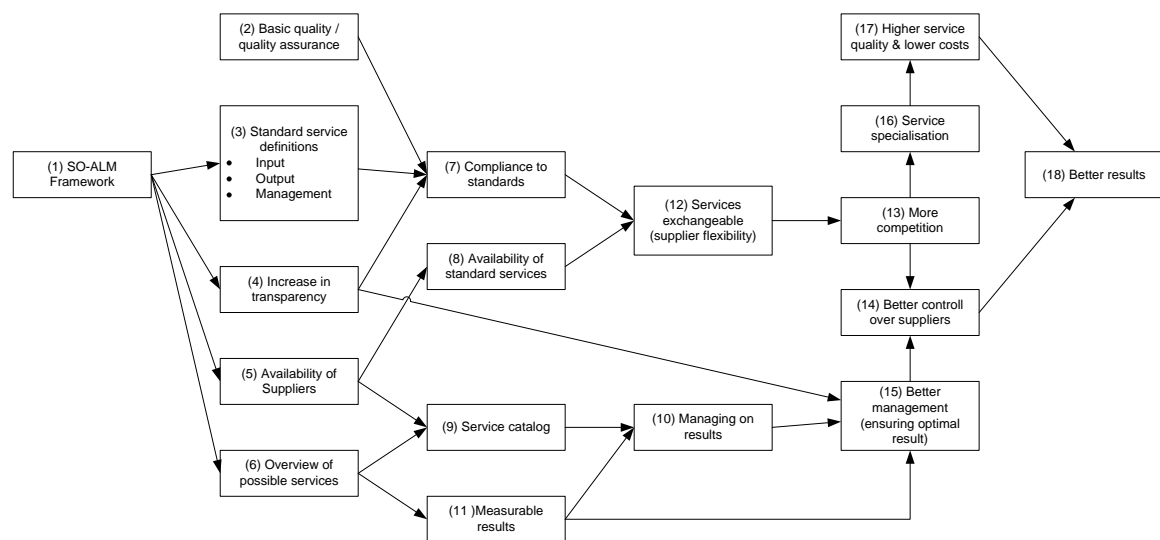


Figure A-1: Expected advantages of the SO-ALM framework

The first effect is that the framework defines standard services and their interfaces (3). Because of the formalization of what a service is responsible for, it can be cut loose from the rest of the organisation. Transparency will increase because it will be formalized who is responsible for what instead of leaving it a vague (4).

Besides our framework there needs to be a basic quality standard for services (2). This is outside the scope of this research, but important before services can lead to compliance to standards. Compliance to standards can be accomplished when it is known what the standards are and when there are methods in place to test the compliance (7).

Service providers will become available when they know what services to deliver (5). An overview is given of the possibilities because they are defined by the framework (6). Standard services become available once there are suppliers who are offering those (8).

The service catalogue combines the list of possibilities with providers providing those services (9). This service catalogue is an important instrument for consumers to choose their provider. Knowing if the delivered service is performing well opposed to other service providers, and thus managing on the results of a service (10), is made possible by the availability of results from other service providers (11). Comparing results from different service providers is out of our scope as it is impossible to measure within the given timeframe, but we assume they will be created as is currently done for other industry services.

Service exchangeability (12) can be achieved because multiple suppliers are offering services according to the standard (8) which comply with a minimum quality assurance (7). If services are exchangeable service providers have higher risk of being replaced by another provider. This will increase the competition (13). To distinguish themselves from other service providers they will specialize in certain services (16), which in turn leads to higher service and lower service cost (17).

Better management (15) can be performed with the increase of transparency (4) and the possibility to make a comparison to other service providers (10). We see better management in this context as the means of having more and better information about the service performance to make decisions.

Together with the ability to easier switch suppliers (12) and the increased competition (13) better management (15) will lead to a better control over suppliers (14), which is a gain in negotiations.

In the end better control over suppliers (14) and higher service quality & lower service cost (17) will lead to better result when outsourcing ALM (18).

APPENDIX B EXPLORATIVE INTERVIEW RESULTS

1 17-12 AD WELTEN – SOURCING

Date:	Wed 17 December 2008
Who	Ad Welten
Role	Sourcing expert
Time	15.00 – 16.15
Location	Z.5.56

Governance (regie) is very important when sourcing things. Many organisation do not have a mature governance organisation.

A problem is that not the right people are in place. E.g. governance requires more procurement skills and the communication of services must go via the specified formal interfaces. It is often the case that people from the old service organisation move to the outsourcing party, as they have the knowledge about the systems. The people in the governance organisation still have contact with these persons and arrange contacts around the proposed formal way (e.g. calling them).

A problem for supplier is that in the contrast with say phone and electricity companies a lot of knowledge has to be migrated. This makes supplier flexibility more difficult.

Sourcing wheel (Capgemini method)

Cap has its own sourcing wheel. Cap can both do the intermediary role as the service provider role. They make the customer very clear that they can do both and when they also want to bid on the project they quit in the RFI/RFP phase.

Incidents and responsibilities (how to act)

It is possible to make arrangements about who is responsible for resolving an incident in a multi sourcing environment. The problem is that someone has to solve that incident.

When everything (or the involved services) is sourced at one provider that provider can make the resources available easier because at the top of it all there is a common boss, who can set priorities easier.

When there are multiple providers they can solve (look at) the problem, even if they perform according to their KPI's, (thus on command of the governance organisation or prime vendor). However for this to happen the governance organization has to make agreements for this (or the prime vendor, just who is made end responsible for that part). An agreement could be made in 2 ways

- To have people (resources) standing by in case of a problem
 - The downside is that you'd have to pay for those people standing by, while they probably won't be solving incidents the whole time (let's hope so..)
- Make an agreement to solve problems on your demand
 - Cost could be per incident, with start etc (many variations)
 - Downside is that the needed people or resources may be not available at the time

Responsibilities (shared)

It is not possible to move 'all' responsibilities to a shared service. When talking e.g. about security it is spread along a number of application and services each having to do its own part.

Note: I think enterprise authentication and authorization (enterprise user management) could be a separated service. Each application however should have its own authorization for specific parts. Enterprise should only do high level authorization such as organisational roles. Apps should use delegation. Shared could also be expert teams.

Tevredenheid = prestatie - verwachting

2 19-12: AD & JAN - WEEKLY REVIEW - IMPACT

Date	Fri 19 December 2008
Who	Ad & Jan
Role	Supervisors Cap
Time	10.00-11.00
Location	Z.5.56

Escalation mechanism is important. Who is responsible for impact analyses, especially when something impacts a lot of other services. Could be a separate service.

2.1 SIZE CATEGORIZATION (IMPACT)

We can separate 3 levels:

1. Application

2. Domain (domains could also be nested)
3. Whole application portfolio

Although one domain could be substantially bigger than another introducing a form in between makes it more unclear.

Service modules could have functions for each level

2.2 LEVELS FOR CHANGE

We can separate 3 levels for changes

1. Changes (small)
2. Project (begin & end)
3. Programme (long term)

By separating these levels the impact analysis could go different ways.

3 05-01: RONALD VAN DUUREN – ITIL V3

Date	Mon 05 January 2009
Who	Ronald van Duuren
Role	ITIL expert
Time	9.00-10.00
Location	Z.2.xx

ITIL

Currently almost every organisation knows ITIL. However not every organisation has implemented every process, e.g. the maturity of the organisations vary.

The processes in ITIL are best practices. They could be used as a guideline as what processes should be available in the total service offering.

The processes are used in various phases in the application life cycle, and are therefore not bounded to one phase.

Phases

The 3 main phases maybe too limited, it is important to recognize more phases because services have different tasks in each phase. Maybe the 6 phases used in the presentation by Peter-Paul could better be used.

Scoping (afkaderen)

I need to do more scoping because it is too broad now. Scoping needs to be done on 2 levels:

- Kind of application; it matters a lot if it is a custom app or package (SAP)
- The services in which phase, or which make up for a group (if we can define that).

Better scoping is very important! It makes it also easier to talk about the subject.

Realization

When do I want the outcome of the research to be applied? E.g. when should Cap and its customers use it? Within 5 years? Maybe earlier? Think about it.

4 23-01: AD & JAN - WEEKLY REVIEW - PROBLEM AREAS

Date	Fri 23 January 2009
Who	Ad & Jan
Role	Supervisors Cap
Time	10.00-11.00
Location	Z.5.56

Problems with outsourcing

Entanglement of processes

- Need to be untied
- Formal vs informal (people just calling each other)
- Example not having access to certain files when something is outsourced

Regarding cases for reasons for this research; Capgemini has a lot of knowledge in the experience of employees. This is not always put on paper. Furthermore outsourcings gone bad are not widespread in the media.

ABN Amro deal outsourcing to EDS. Reverted because ABN saw IT more as a core business. The problem is that they outsourced all IT and not some parts.

Criteria for clustering

- Variables vs constants in processes, what is the same every time and what is different
- Specialism and methods, there are companies / organisation units which specialized already in what could be seen as a service.

Processes which are 'close on' the business do not need to be outsourced because they require too much knowledge of the business which outsourcers do not have.

Opposed to:

Processes which is just the processing of information

Examples:

- Enterprise architecture requires a lot of knowledge of the business and it is questionable if it is wise to outsource this.
- Continues documentation of the as-is and to-be situation is not a project task and requires lot of knowledge

5 30-01: AD - WEEKLY REVIEW

Date	Fri 30 January 2009
Who	Ad
Role	Supervisor Cap
Time	9.00-10.00
Location	Z.5.56

Talked about restructuring 1st chapter.

How to use the top 10 of outsourcing problems in relation to my subject.

http://platformoutsourcing.nl/issues/index_03.html

- Governance: again entanglement!

Culture could be fixed by

- Better standardization, also on operation procedures
- Better information
- Better understanding of each other

Cultural example

Rabo Hypotheken: Outsourced to Ordina but they outsourced it to India who do not have a clue about how we treat mortgages.

- Keeping providers sharp, via measurable results
- Lack of architecture: if there would be a specialized service this could be done better
- Bad setup of multi sourcing: if things could be separated better and be accounted for clear defined results this would not be an issue.

Specialism should be in the benefits logic.

6 20-02: AD & JAN - WEEKLY REVIEW

Date	Fri 20 February 2009
Who	Ad & Jan
Role	Supervisor Cap
Time	9.00-10.00
Location	Z.5.56

Clustering criteria are meant as a tool and not for clustering all the processes in a batch. Common sense is still important when clustering. Criteria are not the rules for automated splitting.

Possible questions for validation

Questions for a survey which could be hold besides the wiki which contains the data about the framework.

- Which services would you outsource?
 - o And which would you keep internally?
- How detailed have you looked at the model?
- Make combinations of services and then let them choose if they think these services can be separated
 - o E.g. Dev/test

7 20-03: AD & JAN - WEEKLY REVIEW

Date	Fri 20 March 2009
Who	Ad & Jan (via phone)
Role	Supervisor Cap
Time	9.00-10.00
Location	Z.5.56

Q: Should we use something to document that a service must deliver something back to the requestor? E.g. Let the Servicedesk give a reaction when a call has been handled ?

A: No, describing it in the functions should cover it, otherwise it becomes too complicated.

For services provide what other service they could use, are useful for delivering their results. Service could choose to outsource to another service provider or fulfil that functionality their self. It does however make it more transparent as it shows where the cost are coming from.

BiSL, use the operational processes for the services. Split the according into the clusters already available; use management & functional management.

Same for ASL, the operational clusters below are most important. Governance is not important for externals using a service.

Within functions define how the input arguments lead to the results. What is happening in the service.

Q: Should we also include finance information? E.g. how to calculate what a service should cost for the consuming organisation?

A: No, making it to complicated, keep it simple!

8 03-04: AD & JAN - WEEKLY REVIEW

Date	Fri 03 April 2009
Who	Ad Strack van Schijndel & Jan Borsje (via phone)
Role	Supervisor Cap
Time	9.00-10.00
Location	Z.5.56

Survey

Aim for a global validation of the approach / vision. People will not have 30 minutes to do the survey, use interviews / workshop for better validation of the content of the wiki.

Let users browse the wiki first and then ask questions. Using the survey to send users trough the wiki works distracting and does not give feedback of the usability of the tool.

Make sure there is a good introduction / exploitation / landing page on the wiki.

Use little open questions, use mostly yes/no scale questions.

At Tax office (Belastingdienst) opportunity for testing, in 2 weeks 17-04.

9 20-05: JAN – WEEKLY REVIEW

Date	Wed 20 May 2009
Who	Jan Borsje
Role	Supervisor Cap
Time	14.00-15.00
Location	Z.5.56

The grouping and the completeness of the ALM services seems logical and understandable.
Talked about how to visualise the grouping.

Use management: business + information provisioning knowledge:

I want something in the business, is this possible in the IV?

I want a non standard report

Meldingen incidents

10 25-05: AD – WEEKLY REVIEW

Date	Mon 25 May 2009
Who	Ad Strack van Schijndel
Role	Supervisor Cap
Time	14.00-15.00
Location	Z.5.70

- List of services is complete
- In the wiki make the services which are most 'worked out' appear at the top of the list
- Services can get colours depending how well they are worked out
- Change infra/app maintenance -> infra/app management
- Change requirements to business analysis in the survey
- Doubt at function groups when new names are introduced, this may cause confusion
- Make a list of which processes are used by what ALM service, and what processes are not used.
- 'Accept' functions not clear

APPENDIX C WORKSHOP RESULTS (DUTCH)

The goal of the workshop was to get an idea about what others think about the approach behind the framework, the model, and to check upon the completeness of ALM services and ALM development service functions.

The workshop has been held on April the 23th from 16.00 – 20.00. The following people were present:

- Sander Schoot Uiterkamp, student
- Ad Strack van Schijndel, Managing consultant (supervisor)
- Dick van Maaren, Senior Consultant, Change and configuration manager
- Mark Pijnenburg, Engagement Manager
- Kees Notenboom, Senior Consultant, Business Analyst
- Wouter van Twillert, Project manager
- Leon Smiers, Pricipal consultant, Expert group lead Oracle Technology

1 MODEL / SERVICE BENADERING

- Wouter is sceptisch over de toepassing voor het opstellen van RFP's. Zijn er niet al voldoende middelen en evt in templates van sales/engagement mangement?
- Het verschil tussen de inform en deliver methoden moet duidelijker worden uitgelegd.
- Definitie van een service moet duidelijker!
- Verschil tov andere frameworks moet duidelijker naar voren komen.
- Duidelijker het probleem definiëren; dus dat het moeilijk is de overdracht momenten te beschrijven en niet dat het lastig is om RFP's te maken. (benefits logic terug laten komen)
- Leon kan de 4 problemen uit de wiki nog niet echt goed mappen naar wat wij willen bereiken met het framework. (-> wiki aanpassen)
- Wouter zie het wel zitten dat het makkelijker is om de overdrachtsmomenten goed duidelijk te hebben dit is handig voor het opstellen van het 'DAP', Dossier Afspraken en Procedures bij de belastingdienst.
- Vraag is vooral of het daadwerkelijk wel echt toepasbaar is in de praktijk. Immers is elke situatie weer anders en is elke situatie niet te verschillend om dit goed te ondervangen.
- Beter naar voren brengen dat het gaat over de samenhang van de verschillende frameworks.
- Ad, uit eindelijk zullen we denk ik naar een markt toegaan met vooral specialisten. Dingen worden complex en dus lukt dat niet meer zo makkelijk.
- Er is dus onderscheid tussen services die per app zijn en die voor meer apps gelden. (bevestiging onderscheid)

- Release

Maar dan ben je kwijt dat je het totale overzicht houdt wat er aan zit te komen en er nu is

- Dit heb je ook op meerdere niveau's en in diensten dus goed duidelijk maken wat het nu uiteindelijk doet.
- Planning & control is de meer initiërende dienst / aansturing van development ed.

De uitwerking van een aantal van de diensten is te zien in de onderstaande figuur.



Figure C-2: Service overview

APPENDIX D VALIDATION INTERVIEWS

1 17-04: JAN WIGGERS

Date	Fri 17 April 2009
Who	Jan Wiggers (JW), Ad Strack van Schijndel, Jan Borsje
Role	Manager at tax office ICT (Belastingdienst) Supervisor Cap
Time	11.00-12.15
Location	Tax office offices, Apeldoorn

- JW geeft aan dat hij hier op persoonlijke titel zit en niet de belastingdienst vertegenwoordigd;
- Kwaliteit waarborgen van de diensten is belangrijk, hoe zorg je ervoor dat de diensten op het juiste niveau is. (product en proces kwaliteit);
 - Het gebeurt vaak niet dat bij outsourcing de proces kwaliteit van een dienst word bekeken, wat niet slim is. Dusdanig heb je dus geen garanties voor goede kwaliteit;
 - Als het proces van de leverancier maar duidelijk, transparant en meetbaar is (audits) dan maakt het eigenlijk niet uit hoe de leverancier dat proces inricht (service benadering bevestiging);
 - Maken van afspraken over beoordelingscriteria en kwaliteit is belangrijk. Ook is het belangrijk dat een leverancier kan tonen dat hij die kwaliteit kan nakomen;
- Uitleggen verschil tussen de 4 verschillende type functies duurt even maar komt goed over en word ook als duidelijk ervaren;
- Praktische haalbaarheid is misschien niet heel groot als je alles probeert in een framework samen te vatten maar;
- Als je de hele IV keten weet op te delen in blokken en de overdracht daartussen weet te beschrijven en formaliseren dan heb je al een groot voordeel te pakken;
- Architectuur zou bij de belastingdienst best wel geoutsourced kunnen worden;
- Probeer ook niet alles in het framework te proppen. Zorgt dat je meeste afdekt 80%, dan kan over de laatste 20% wel afspraken worden gemaakt, organisaties en wensen verschillen immers toch. Echter zoveel verschillen bedrijven ook niet maar zorg ervoor dat er ruimte is voor specifieke invulling per klant;

- Framework kan goed dienen als handvat voor de klant en Capgemini bij het maken van offertes. Dan heb je een paar handvatten waar je je afspraken aan op kunt hangen;
 - Concretiseren voor elke situatie is niet mogelijk;
 - Zorgt ervoor dat niet elke keer het wiel opnieuw wordt uitgevonden;
 - Bij offerte trajecten helpt het ook aan de klant kant, het helpt deze met het stellen van vragen;
- Het model zou open moeten worden. Op die manier kan iedereen er gebruik van maken. Zorg er dan wel voor dat Capgemini de meeste kennis houdt zodat het het meest profiteert ervan heeft.

2 28-05: ALBERT VAN DIJK

Date	Thu 28 May 2009
Who	Albert van Dijk
Role	Sourcing consultant Capgemini
Time	15.00-15.40
Location	Capgemini, Daltonlaan, 1.3.26

- Standaardisatie is ook nuttig voor de leverancier van de diensten. Deze kan dmv standaardisatie kostenbesparing bereiken;
- Plaatjes maken het SO-ALM concept duidelijk;
- Doelen SO-ALM framework van de presentatie / uitleg zijn niet helemaal in lijn met wat er echt behaald kan worden. De benefits logic geeft hier een beter beeld. Hier vaker naar refereren voor een compleet beeld;
- Wijst erop dat governance erg belangrijk is bij outsourcing;
- Bevestiging dat retirement een ondergeschoven kindje is;
- Diensten overzicht plaatje kwam duidelijk over;
- Compleetheid van de diensten is prima, ontbreekt niets maar;
- Misschien zou er nog een financiële service kunnen komen. Dit ivm sourcing wat vooral een kosten vraagstuk is. (SSU: dit ergens anders onderbrengen en is misschien toch wel handig);
- *'Hard to get an overview of whole IT organisation'* probleem is minder herkenbaar. Maar kan de link zien als wordt uitgegaan van dat een service organisatie dit probleem niet heeft;
- Bevestigt de problemen met entanglement en formalization;
- Wiki ziet er leuk uit en is duidelijk en snel te begrijpen.
- Overall: Leuk concept zou zijn waarde kunnen bewijzen.

Invulling enkele survey vragen, voor de complete lijst van vragen zie volgende appendix.

#	Question	Answer
2a	Do you think that using the SO-ALM framework:	
2a.1	Will help you formulating the right questions about what products a service must deliver when making agreements about using new services?	4
2a.2	Will lead to better agreements about when a product is being delivered (at what moment)?	4
2a.3	Can lead to easier switching of supplier by having the boundaries of a service better defined?	5
3	In general; do you think that using the SO-ALM framework	
3.1	Can help you to keep an overview of the entire IT organisation?	1;
3.2	Can help you to define and implement a (multi-) sourcing strategy?	4
3.3	Would help in brainstorming and formulating thoughts on flexible IT-services?	5
4	Specialization:	
4.1	Do you think using the SO-ALM framework may lead to more specialization by suppliers?	4 (Alleen als er ook daadwerkelijk meerdere aanbieders komen, concurrentie)
4.2	Do you think that more specialization by suppliers will lead to higher service quality and productivity?	4 (Alleen als er ook daadwerkelijk meerdere aanbieders komen, concurrentie)

5	The services from the SO-ALM framework have functions. Four types of functions are defined to make a distinction in function goal and to make a service better understandable: <ul style="list-style-type: none"> * Contract functions * Do functions * Deliver functions * Inform about functions 	
5a	Do you think the application of different types of functions makes a service better understandable?	4
5b	Do you think the four function types that are defined provide sufficient distinction?	yes
6	In the SO-ALM framework a service is linked to processes that could be used to implement a service.	
6a	Do you judge the integration with existing process models sufficient for a transition from process organization to service organization?	Als de processen goed terugkomen zou het wel te doen moeten zijn.
7	Who should be the owner of the SO-ALM framework?	Open source
8	What opportunities do you see for the framework?	End of 'Tower of Babel'
9	Usage:	
9.1	Would you use the framework?	Yes
9.1	Would you recommend it to someone else?	Yes
16	Rating	7

APPENDIX E SURVEY QUESTIONS AND ANSWERS

In this appendix the survey questions are listed together with the results of the survey. The results of the survey are handled anonymous. The survey consists of an introduction and the questions. Before people would fill in the survey they first have to read the introduction about the framework, which is also stated in the introduction. The survey has been sent out to 13 people and is executed by 8, of which 7 are Capgemini employees and 1 external.

1 INTRODUCTION

Welcome to this survey about Service oriented - application life cycle management (ALM). This survey is part of my master project for my study Business Information Technology at Twente University.

We developed a framework which uses a new, service oriented, approach to ALM (SO-ALM). The goal of this survey is to investigate if this approach is valid. The framework is documented in a wiki. This wiki contains the services and explains the model and concepts behind the framework. Before answering the questions please start by checking out the wiki first. Start with the introduction which will explain the model and concepts behind the framework. www.so-alm.nl/wiki/
SO-ALM survey

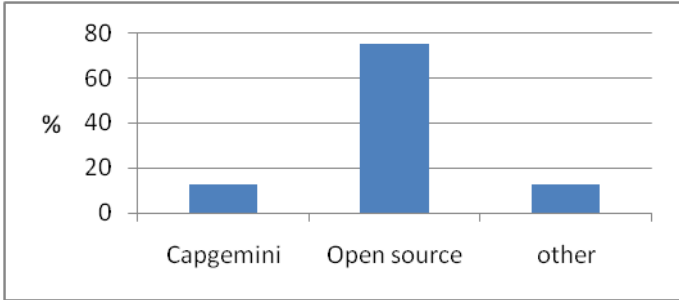
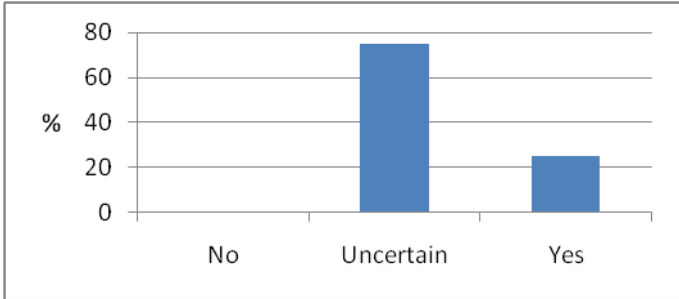
2 QUESTIONS AND ANSWERS

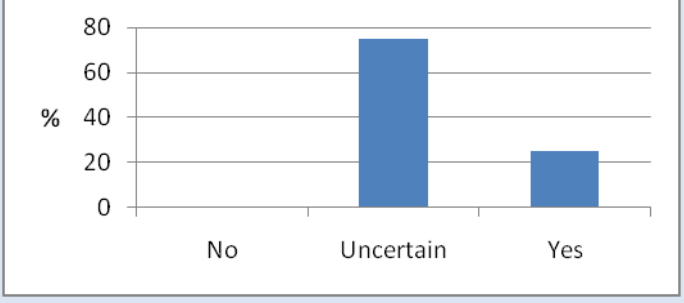
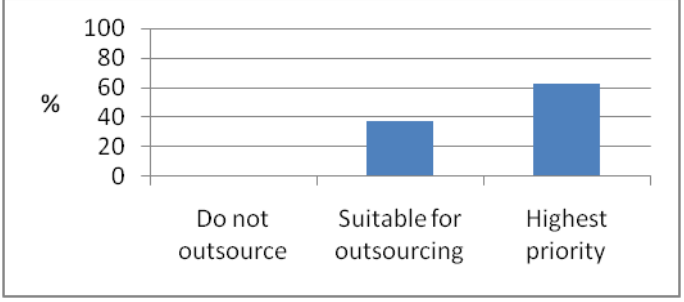
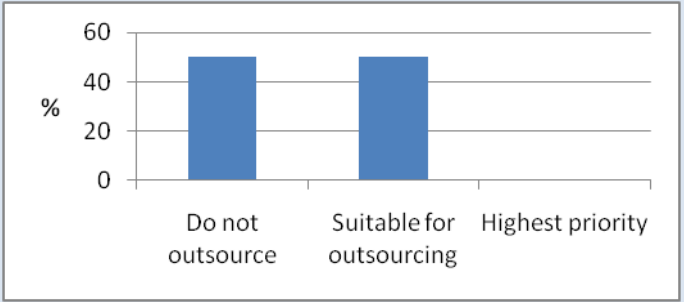
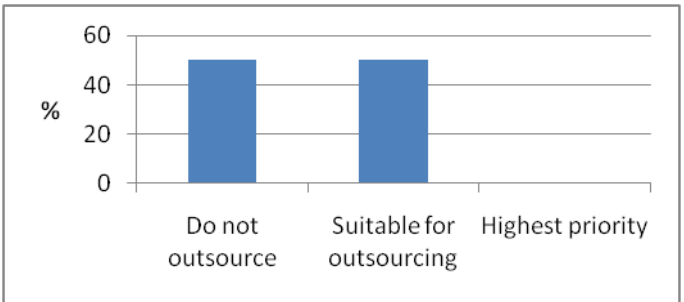
#	Question	Answers
1	What is your function / role in the organisation	<ul style="list-style-type: none">• Consultant/program manager• Consultant• Principal consultant / Client Engagement Manager• Projectmanager• Managing consultant (on Sourcing/Governance/Proces Improvement)• Project Manager• Principal consultant/architect• Afdelingshoofd

2	<p>The SO-ALM framework defines ALM services and their functions. The services are based on clustered processes derived from process frameworks like ASL/BiSL/OpenUP. The functions describe the interaction of an ALM service and are the interfaces of a service. The functions thus describe the boundaries and responsibilities of a service, and the moments that an asset (or product) is being exchanged from one service to another or to the customer. When an agreement has to be made about the usage of a new service the SO-ALM framework can be used as a checklist to make sure the agreement is 'complete'.</p>															
2a	Do you think that using the SO-ALM framework:															
2a.1	<p>Will help you formulating the right questions about what products a service must deliver when making agreements about using new services?</p>	<table border="1"> <thead> <tr> <th>Rating</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>1: Not at all</td> <td>0</td> </tr> <tr> <td>2</td> <td>0</td> </tr> <tr> <td>3</td> <td>25</td> </tr> <tr> <td>4</td> <td>50</td> </tr> <tr> <td>5: A lot</td> <td>10</td> </tr> <tr> <td>No opinion</td> <td>10</td> </tr> </tbody> </table>	Rating	Percentage (%)	1: Not at all	0	2	0	3	25	4	50	5: A lot	10	No opinion	10
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2b	<p>If you need to explain your answer, please do so</p>	<p>Please present the framework first in a presentation before presenting these questions.</p>														
3	<p>In general; do you think that using the SO-ALM framework</p>															

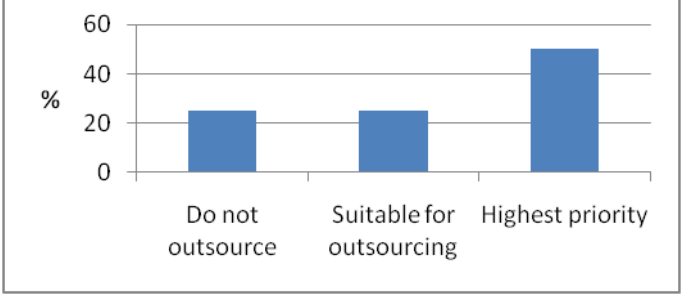
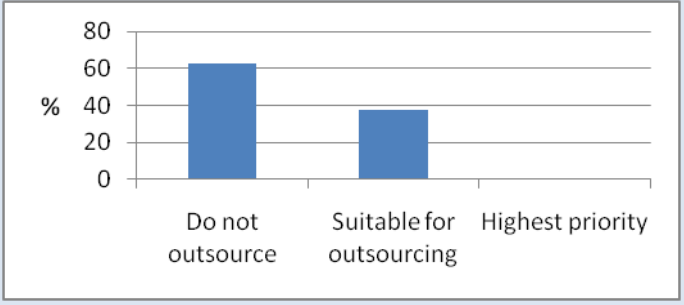
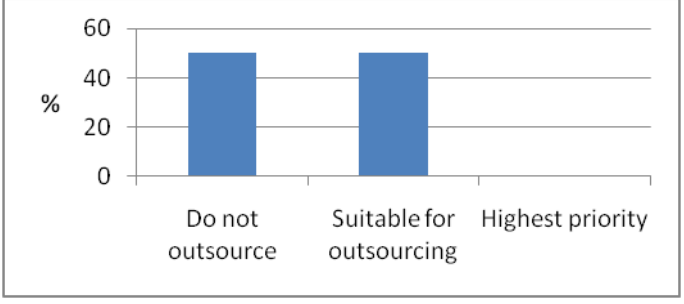
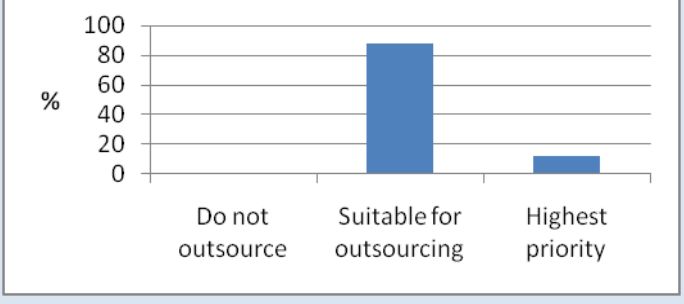
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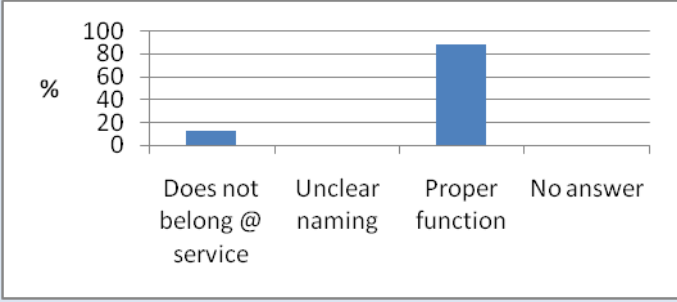
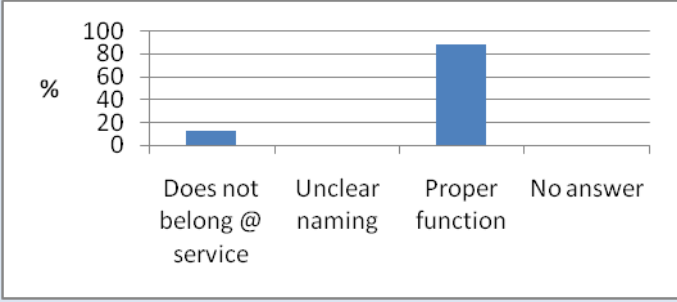
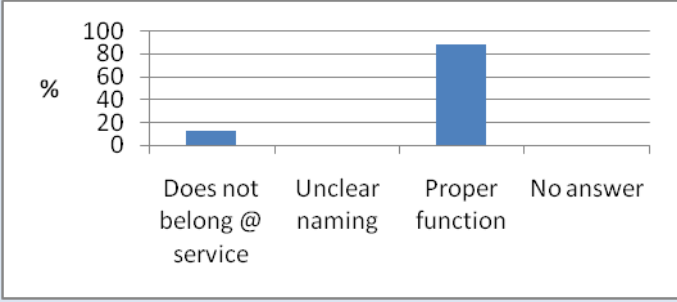
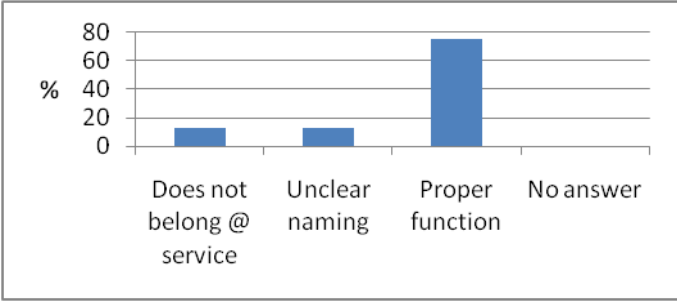
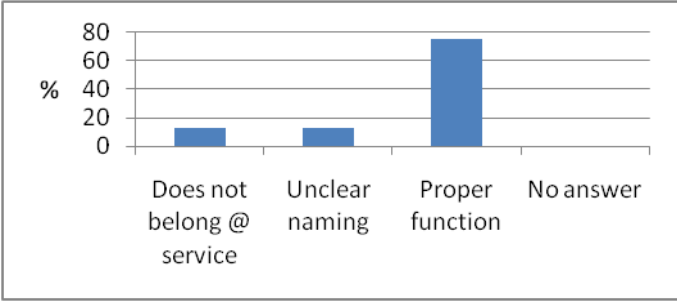
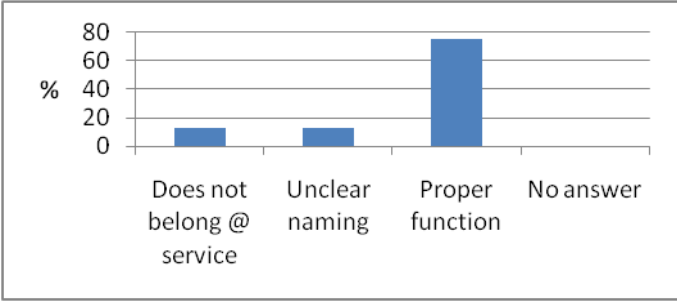
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5a	<p>Do you think the application of different types of functions makes a service better understandable?</p>	<table border="1"> <thead> <tr> <th>Response</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>1: Not at all</td> <td>0</td> </tr> <tr> <td>2</td> <td>0</td> </tr> <tr> <td>3</td> <td>38</td> </tr> <tr> <td>4</td> <td>48</td> </tr> <tr> <td>5: A lot</td> <td>12</td> </tr> <tr> <td>No opinion</td> <td>0</td> </tr> </tbody> </table>	Response	Percentage (%)	1: Not at all	0	2	0	3	38	4	48	5: A lot	12	No opinion	0
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5b	<p>Do you think the four function types that are defined provide sufficient distinction?</p>	<table border="1"> <thead> <tr> <th>Response</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>90</td> </tr> <tr> <td>No</td> <td>10</td> </tr> </tbody> </table>	Response	Percentage (%)	Yes	90	No	10								
Response	Percentage (%)															
Yes	90															
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5c	<p>How could this function distinction be done better?</p>	<p>Not clear what is the difference between Do and Deliver functions.</p>														
6	<p>In the SO-ALM framework a service is linked to processes that could be used to implement a service.</p>															
6a	<p>Do you judge the integration with existing process models sufficient for a transition from process organization to service organization?</p>	<table border="1"> <thead> <tr> <th>Response</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>1: Not at all</td> <td>0</td> </tr> <tr> <td>2</td> <td>38</td> </tr> <tr> <td>3</td> <td>12</td> </tr> <tr> <td>4</td> <td>25</td> </tr> <tr> <td>5: A lot</td> <td>25</td> </tr> <tr> <td>No opinion</td> <td>0</td> </tr> </tbody> </table>	Response	Percentage (%)	1: Not at all	0	2	38	3	12	4	25	5: A lot	25	No opinion	0
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No opinion	0															

6b	If you need to explain you answer, please do so	<ul style="list-style-type: none"> • Changing from Process to Service means that the governance must change. I do not see that the framework is the enabler to do so. • There's more than process 								
<p>The SO-ALM framework has to have an owner in order to keep the framework alive and make decisions when intervention is needed. Who should be the owner of the SO-ALM framework.</p>										
7	Who should be the owner of the SO-ALM framework?	 <table border="1"> <caption>Owner of the SO-ALM framework</caption> <thead> <tr> <th>Owner</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Capgemini</td> <td>12</td> </tr> <tr> <td>Open source</td> <td>75</td> </tr> <tr> <td>other</td> <td>13</td> </tr> </tbody> </table>	Owner	Percentage (%)	Capgemini	12	Open source	75	other	13
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Open source	75									
other	13									
Other:		<ul style="list-style-type: none"> • Can be CG, can be a person/function 								
8	What opportunities do you see for the framework?	<ul style="list-style-type: none"> • End of 'Tower of Babel' 								
9 Usage:										
9.1	Would you use the framework?	 <table border="1"> <caption>Usage of the framework</caption> <thead> <tr> <th>Response</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>No</td> <td>0</td> </tr> <tr> <td>Uncertain</td> <td>75</td> </tr> <tr> <td>Yes</td> <td>25</td> </tr> </tbody> </table>	Response	Percentage (%)	No	0	Uncertain	75	Yes	25
Response	Percentage (%)									
No	0									
Uncertain	75									
Yes	25									

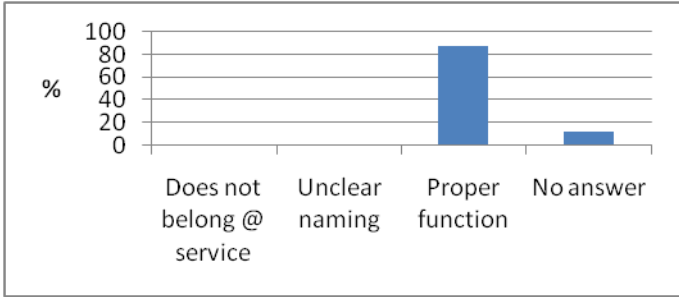
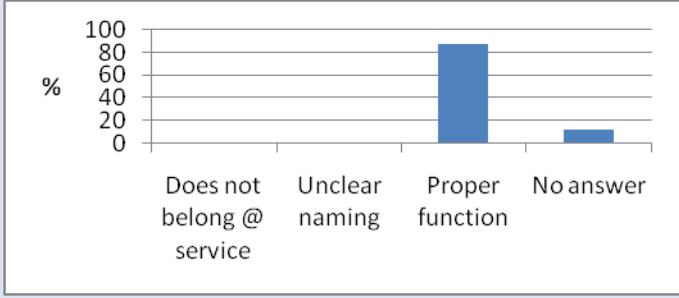
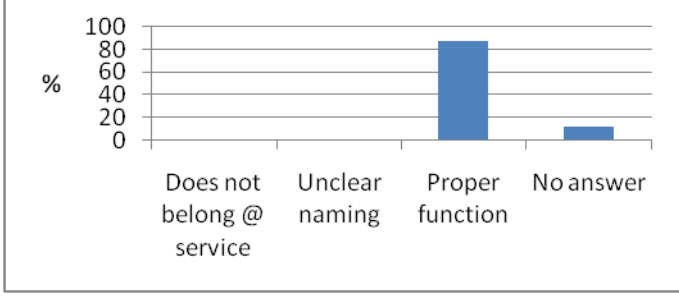
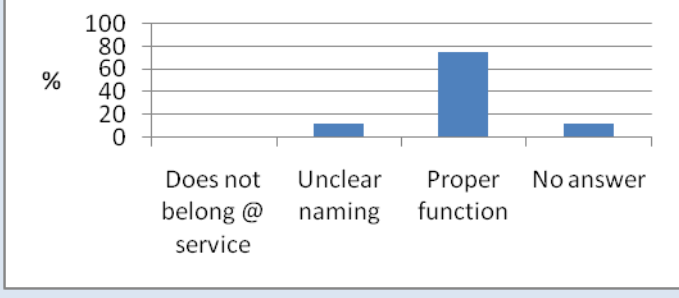
9.1	Would you recommend it to someone else?	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>No</td> <td>0</td> </tr> <tr> <td>Uncertain</td> <td>75</td> </tr> <tr> <td>Yes</td> <td>25</td> </tr> </tbody> </table>	Response	Percentage (%)	No	0	Uncertain	75	Yes	25
Response	Percentage (%)									
No	0									
Uncertain	75									
Yes	25									
	Services									
In this section we would like to ask you some questions about the services.										
10	The SO-ALM framework defines a list of ALM services. These ALM services could be outsourced or be offered by the internal IT organisation. For each ALM service indicate whether you think whether that service should; not be outsourced, is suitable for outsourcing, or is one of the services you would outsource with the highest priority. An overview of the services and their goal could be found here.									
10.1	Development	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>0</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>35</td> </tr> <tr> <td>Highest priority</td> <td>60</td> </tr> </tbody> </table>	Response	Percentage (%)	Do not outsource	0	Suitable for outsourcing	35	Highest priority	60
Response	Percentage (%)									
Do not outsource	0									
Suitable for outsourcing	35									
Highest priority	60									
10.2	Business analysis	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>50</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>50</td> </tr> <tr> <td>Highest priority</td> <td>0</td> </tr> </tbody> </table>	Response	Percentage (%)	Do not outsource	50	Suitable for outsourcing	50	Highest priority	0
Response	Percentage (%)									
Do not outsource	50									
Suitable for outsourcing	50									
Highest priority	0									
10.3	Enterprise architecture	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>50</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>50</td> </tr> <tr> <td>Highest priority</td> <td>0</td> </tr> </tbody> </table>	Response	Percentage (%)	Do not outsource	50	Suitable for outsourcing	50	Highest priority	0
Response	Percentage (%)									
Do not outsource	50									
Suitable for outsourcing	50									
Highest priority	0									

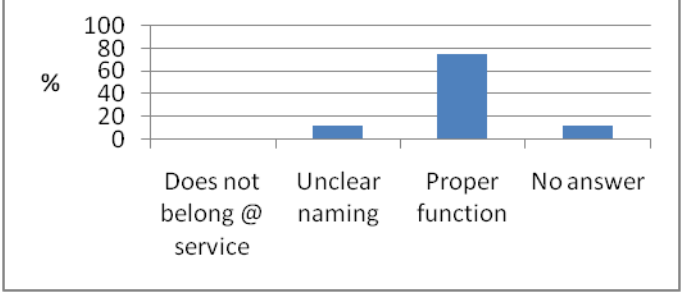
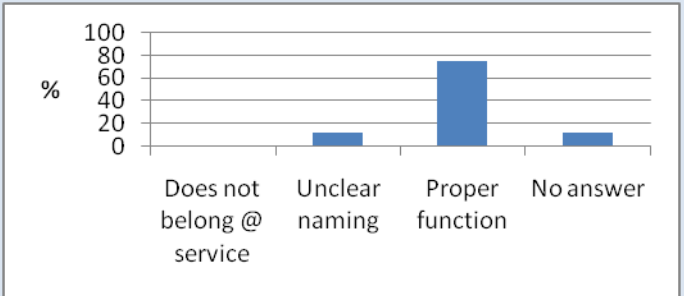
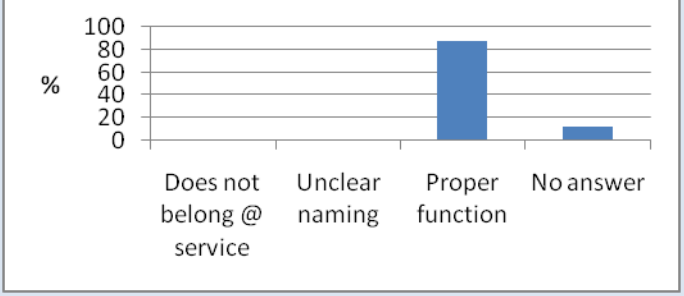
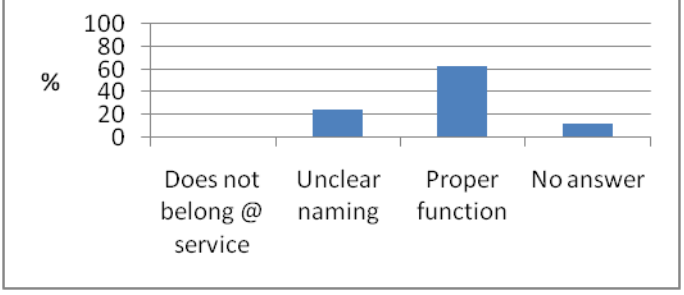
10.4	Testing	<p>A bar chart showing the percentage of responses for 'Testing'. The y-axis is labeled '%' and ranges from 0 to 60. The x-axis has three categories: 'Do not outsource', 'Suitable for outsourcing', and 'Highest priority'. The bars show 0% for 'Do not outsource', 50% for 'Suitable for outsourcing', and 50% for 'Highest priority'.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>0</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>50</td> </tr> <tr> <td>Highest priority</td> <td>50</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	0	Suitable for outsourcing	50	Highest priority	50
Category	Percentage (%)									
Do not outsource	0									
Suitable for outsourcing	50									
Highest priority	50									
10.5	Training	<p>A bar chart showing the percentage of responses for 'Training'. The y-axis is labeled '%' and ranges from 0 to 60. The x-axis has three categories: 'Do not outsource', 'Suitable for outsourcing', and 'Highest priority'. The bars show 38% for 'Do not outsource', 50% for 'Suitable for outsourcing', and 12% for 'Highest priority'.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>38</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>50</td> </tr> <tr> <td>Highest priority</td> <td>12</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	38	Suitable for outsourcing	50	Highest priority	12
Category	Percentage (%)									
Do not outsource	38									
Suitable for outsourcing	50									
Highest priority	12									
10.6	Use management	<p>A bar chart showing the percentage of responses for 'Use management'. The y-axis is labeled '%' and ranges from 0 to 80. The x-axis has three categories: 'Do not outsource', 'Suitable for outsourcing', and 'Highest priority'. The bars show 12% for 'Do not outsource', 62% for 'Suitable for outsourcing', and 26% for 'Highest priority'.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>12</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>62</td> </tr> <tr> <td>Highest priority</td> <td>26</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	12	Suitable for outsourcing	62	Highest priority	26
Category	Percentage (%)									
Do not outsource	12									
Suitable for outsourcing	62									
Highest priority	26									
10.7	Configuration change & release management	<p>A bar chart showing the percentage of responses for 'Configuration change & release management'. The y-axis is labeled '%' and ranges from 0 to 100. The x-axis has three categories: 'Do not outsource', 'Suitable for outsourcing', and 'Highest priority'. The bars show 0% for 'Do not outsource', 88% for 'Suitable for outsourcing', and 12% for 'Highest priority'.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>0</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>88</td> </tr> <tr> <td>Highest priority</td> <td>12</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	0	Suitable for outsourcing	88	Highest priority	12
Category	Percentage (%)									
Do not outsource	0									
Suitable for outsourcing	88									
Highest priority	12									
10.8	Infrastructure management	<p>A bar chart showing the percentage of responses for 'Infrastructure management'. The y-axis is labeled '%' and ranges from 0 to 60. The x-axis has three categories: 'Do not outsource', 'Suitable for outsourcing', and 'Highest priority'. The bars show 0% for 'Do not outsource', 50% for 'Suitable for outsourcing', and 50% for 'Highest priority'.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>0</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>50</td> </tr> <tr> <td>Highest priority</td> <td>50</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	0	Suitable for outsourcing	50	Highest priority	50
Category	Percentage (%)									
Do not outsource	0									
Suitable for outsourcing	50									
Highest priority	50									

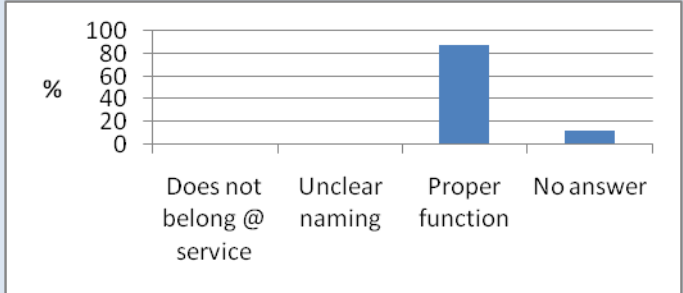
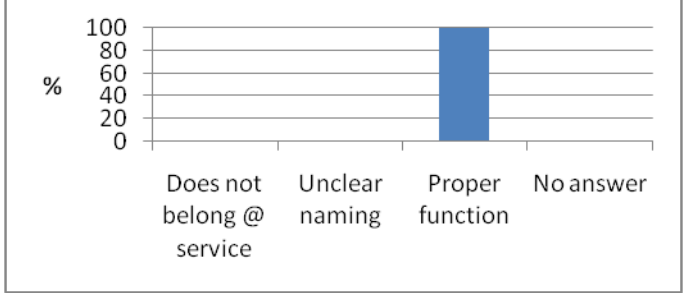
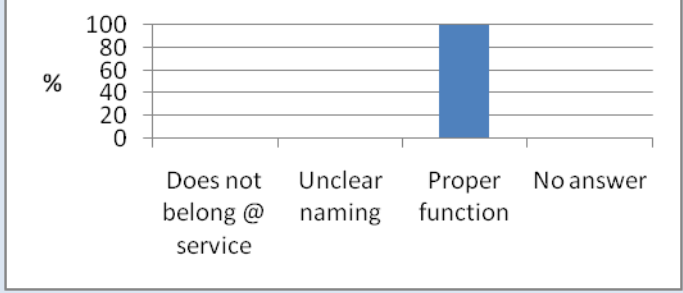
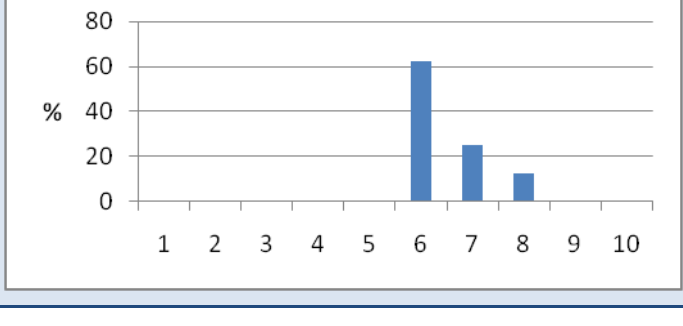
10.9	Application management	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>25</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>25</td> </tr> <tr> <td>Highest priority</td> <td>50</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	25	Suitable for outsourcing	25	Highest priority	50
Category	Percentage (%)									
Do not outsource	25									
Suitable for outsourcing	25									
Highest priority	50									
10.10	Project & program management	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>65</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>40</td> </tr> <tr> <td>Highest priority</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	65	Suitable for outsourcing	40	Highest priority	0
Category	Percentage (%)									
Do not outsource	65									
Suitable for outsourcing	40									
Highest priority	0									
10.11	Business analysis	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>50</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>50</td> </tr> <tr> <td>Highest priority</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	50	Suitable for outsourcing	50	Highest priority	0
Category	Percentage (%)									
Do not outsource	50									
Suitable for outsourcing	50									
Highest priority	0									
10.12	Retirement	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Do not outsource</td> <td>0</td> </tr> <tr> <td>Suitable for outsourcing</td> <td>90</td> </tr> <tr> <td>Highest priority</td> <td>10</td> </tr> </tbody> </table>	Category	Percentage (%)	Do not outsource	0	Suitable for outsourcing	90	Highest priority	10
Category	Percentage (%)									
Do not outsource	0									
Suitable for outsourcing	90									
Highest priority	10									
11	If you miss any service please explain which and what their goal would be	Not clear what retirement means. My answer does not mean anything since I have to choose something								
	Development									

	<p>Each ALM service consists of a number of functions. These functions set the boundaries of an ALM service. We would like to know what you think about the naming of these functions and the completeness of one of the ALM service. For each function please indicate whether it;</p> <ul style="list-style-type: none"> * Does not belong at that service (should thus be at some other service) * Has unclear naming (not directly clear what the goal of that function would be) * Is a proper function (belongs at that service) <p>The service we would like to ask the questions about is the development service. The goal of the development services is defined as: To get a deployable application which has been functionally accepted by 'the customer'.</p>												
12a	Judge each of the following contract functions from the development service												
12a.1	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Develop application</td> <td style="padding: 5px;">  <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse;"> <caption>Survey Results for Develop application</caption> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>10</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>85</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table> </td> </tr> </table>	Develop application	 <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse;"> <caption>Survey Results for Develop application</caption> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>10</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>85</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	10	Unclear naming	0	Proper function	85	No answer	0
Develop application	 <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse;"> <caption>Survey Results for Develop application</caption> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>10</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>85</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	10	Unclear naming	0	Proper function	85	No answer	0		
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12a.1	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Maintain application</td> <td style="padding: 5px;">  <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse;"> <caption>Survey Results for Maintain application</caption> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>10</td> </tr> <tr> <td>Unclear naming</td> <td>10</td> </tr> <tr> <td>Proper function</td> <td>75</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table> </td> </tr> </table>	Maintain application	 <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse;"> <caption>Survey Results for Maintain application</caption> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>10</td> </tr> <tr> <td>Unclear naming</td> <td>10</td> </tr> <tr> <td>Proper function</td> <td>75</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	10	Unclear naming	10	Proper function	75	No answer	0
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Category	Percentage (%)												
Does not belong @ service	10												
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No answer	0												
12b	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%; padding: 5px;"> <p>If you need to comment on your choice or you think a function is missing please let us know via the following textbox.</p> </td> <td style="padding: 5px;"> <ul style="list-style-type: none"> • For me application management covers development and maintenance. During development some maintenance can occur but not significant • I see Development not as a service, maintaint application sounds more the actual maintaining than the contraction function. </td> </tr> </table>	<p>If you need to comment on your choice or you think a function is missing please let us know via the following textbox.</p>	<ul style="list-style-type: none"> • For me application management covers development and maintenance. During development some maintenance can occur but not significant • I see Development not as a service, maintaint application sounds more the actual maintaining than the contraction function. 										
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13a	Judge each of the following do functions from the development service												

13a.1	Accept application	<p>A bar chart with a y-axis labeled '%' ranging from 0 to 80 in increments of 20. The x-axis has four categories: 'Does not belong @ service', 'Unclear naming', 'Proper function', and 'No answer'. The bars show approximately 12% for 'Does not belong @ service', 25% for 'Unclear naming', and 65% for 'Proper function'. The 'No answer' category has no visible bar.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>12</td> </tr> <tr> <td>Unclear naming</td> <td>25</td> </tr> <tr> <td>Proper function</td> <td>65</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	12	Unclear naming	25	Proper function	65	No answer	0
Category	Percentage (%)											
Does not belong @ service	12											
Unclear naming	25											
Proper function	65											
No answer	0											
13a.2	Make application	<p>A bar chart with a y-axis labeled '%' ranging from 0 to 80 in increments of 20. The x-axis has four categories: 'Does not belong @ service', 'Unclear naming', 'Proper function', and 'No answer'. The bars show approximately 12% for 'Does not belong @ service', 25% for 'Unclear naming', and 65% for 'Proper function'. The 'No answer' category has no visible bar.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>12</td> </tr> <tr> <td>Unclear naming</td> <td>25</td> </tr> <tr> <td>Proper function</td> <td>65</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	12	Unclear naming	25	Proper function	65	No answer	0
Category	Percentage (%)											
Does not belong @ service	12											
Unclear naming	25											
Proper function	65											
No answer	0											
13a.3	Give change impact indication	<p>A bar chart with a y-axis labeled '%' ranging from 0 to 80 in increments of 20. The x-axis has four categories: 'Does not belong @ service', 'Unclear naming', 'Proper function', and 'No answer'. The bars show 0% for 'Does not belong @ service', 38% for 'Unclear naming', and 62% for 'Proper function'. The 'No answer' category has no visible bar.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>38</td> </tr> <tr> <td>Proper function</td> <td>62</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	38	Proper function	62	No answer	0
Category	Percentage (%)											
Does not belong @ service	0											
Unclear naming	38											
Proper function	62											
No answer	0											
13a.4	Process change	<p>A bar chart with a y-axis labeled '%' ranging from 0 to 60 in increments of 20. The x-axis has four categories: 'Does not belong @ service', 'Unclear naming', 'Proper function', and 'No answer'. The bars show 0% for 'Does not belong @ service', 50% for 'Unclear naming', and 50% for 'Proper function'. The 'No answer' category has no visible bar.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>50</td> </tr> <tr> <td>Proper function</td> <td>50</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	50	Proper function	50	No answer	0
Category	Percentage (%)											
Does not belong @ service	0											
Unclear naming	50											
Proper function	50											
No answer	0											
13a.5	Give new application impact analysis	<p>A bar chart with a y-axis labeled '%' ranging from 0 to 100 in increments of 20. The x-axis has four categories: 'Does not belong @ service', 'Unclear naming', 'Proper function', and 'No answer'. The bars show 0% for 'Does not belong @ service', 25% for 'Unclear naming', and 75% for 'Proper function'. The 'No answer' category has no visible bar.</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>25</td> </tr> <tr> <td>Proper function</td> <td>75</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	25	Proper function	75	No answer	0
Category	Percentage (%)											
Does not belong @ service	0											
Unclear naming	25											
Proper function	75											
No answer	0											

13b	If you need to comment on your choice or you think a function is missing please let us know via the following textbox	Difference between 'accept application' for development and maintenance is not clear. Not clear why it should be in development.										
14a	Judge each of the following deliver functions from the development service											
14a.1	Deliver change list	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>85</td> </tr> <tr> <td>No answer</td> <td>10</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	0	Proper function	85	No answer	10
Category	Percentage (%)											
Does not belong @ service	0											
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Proper function	85											
No answer	10											
14a.2	Deliver deployable application	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>85</td> </tr> <tr> <td>No answer</td> <td>10</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	0	Proper function	85	No answer	10
Category	Percentage (%)											
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14a.3	Deliver design	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>85</td> </tr> <tr> <td>No answer</td> <td>10</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	0	Proper function	85	No answer	10
Category	Percentage (%)											
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14a.4	Deliver developer test	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>10</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>75</td> </tr> <tr> <td>No answer</td> <td>10</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	10	Unclear naming	0	Proper function	75	No answer	10
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14a.5	Deliver new application impact analysis	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>10</td> </tr> <tr> <td>Proper function</td> <td>75</td> </tr> <tr> <td>No answer</td> <td>15</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	10	Proper function	75	No answer	15
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Does not belong @ service	0											
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No answer	15											
14a.6	Deliver implementation model	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>10</td> </tr> <tr> <td>Proper function</td> <td>75</td> </tr> <tr> <td>No answer</td> <td>15</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	10	Proper function	75	No answer	15
Category	Percentage (%)											
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14b	If you need to comment on your choice or you think a function is missing please let us know via the following textbox											
15a	Judge each of the following inform about functions from the development service											
15a.1	Inform about change status	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>85</td> </tr> <tr> <td>No answer</td> <td>15</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	0	Proper function	85	No answer	15
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No answer	15											
15a.2	Inform about development escalation	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>20</td> </tr> <tr> <td>Proper function</td> <td>60</td> </tr> <tr> <td>No answer</td> <td>20</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	20	Proper function	60	No answer	20
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Does not belong @ service	0											
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15a.3	Inform about development metrics	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>80</td> </tr> <tr> <td>No answer</td> <td>10</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	0	Proper function	80	No answer	10												
Category	Percentage (%)																							
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15a.4	Inform about development planning	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>100</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	0	Proper function	100	No answer	0												
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15a.5	Inform about development status	 <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Does not belong @ service</td> <td>0</td> </tr> <tr> <td>Unclear naming</td> <td>0</td> </tr> <tr> <td>Proper function</td> <td>100</td> </tr> <tr> <td>No answer</td> <td>0</td> </tr> </tbody> </table>	Category	Percentage (%)	Does not belong @ service	0	Unclear naming	0	Proper function	100	No answer	0												
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15b	If you need to comment on your choice or you think a function is missing please let us know via the following textbox																							
16	Rating																							
	Please give an overall rating to the SO-ALM framework	 <table border="1"> <thead> <tr> <th>Rating</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> </tr> <tr> <td>2</td> <td>0</td> </tr> <tr> <td>3</td> <td>0</td> </tr> <tr> <td>4</td> <td>0</td> </tr> <tr> <td>5</td> <td>0</td> </tr> <tr> <td>6</td> <td>60</td> </tr> <tr> <td>7</td> <td>25</td> </tr> <tr> <td>8</td> <td>10</td> </tr> <tr> <td>9</td> <td>0</td> </tr> <tr> <td>10</td> <td>0</td> </tr> </tbody> </table>	Rating	Percentage (%)	1	0	2	0	3	0	4	0	5	0	6	60	7	25	8	10	9	0	10	0
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8	10																							
9	0																							
10	0																							

17	If you have any final remarks or advise please let us know
	<ul style="list-style-type: none">• Het is nog wat dun en ik zoekende naar bruikbaarheid.Hoe ziet samenhang tussen processen eruit-Hoe wordt de levenscyclus van een applicatieportfolio ondersteund-Hoe helpt het de klant bij zijn business drivers zoals een applicatieportfolio dat goed op business behoefte aansluit, kostenreductie of omzetverhoging-Waar plaats ik portfolio management / analyse en een concept als controlled migration zoals BAS dat noemt-

APPENDIX F SEARCH QUERIES

Queries have been executed using the Scopus search engine.

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TITLE-ABS-KEY((application life cycle management) OR (ALM))
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    LIMIT-TO(EXACTSRCTITLE, "MIS Quarterly Management Information Systems")
    OR
    LIMIT-TO(EXACTSRCTITLE, "Information Systems Research") OR
    LIMIT-TO(EXACTSRCTITLE, "Communications of the ACM") OR
    LIMIT-TO(EXACTSRCTITLE, "Management Science") OR
    LIMIT-TO(EXACTSRCTITLE, "Journal of Management Information Systems") OR
    LIMIT-TO(EXACTSRCTITLE, "Artificial Intelligence") OR
    LIMIT-TO(EXACTSRCTITLE, "Decision Science") OR
    LIMIT-TO(EXACTSRCTITLE, "Harvard Business Review") OR
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