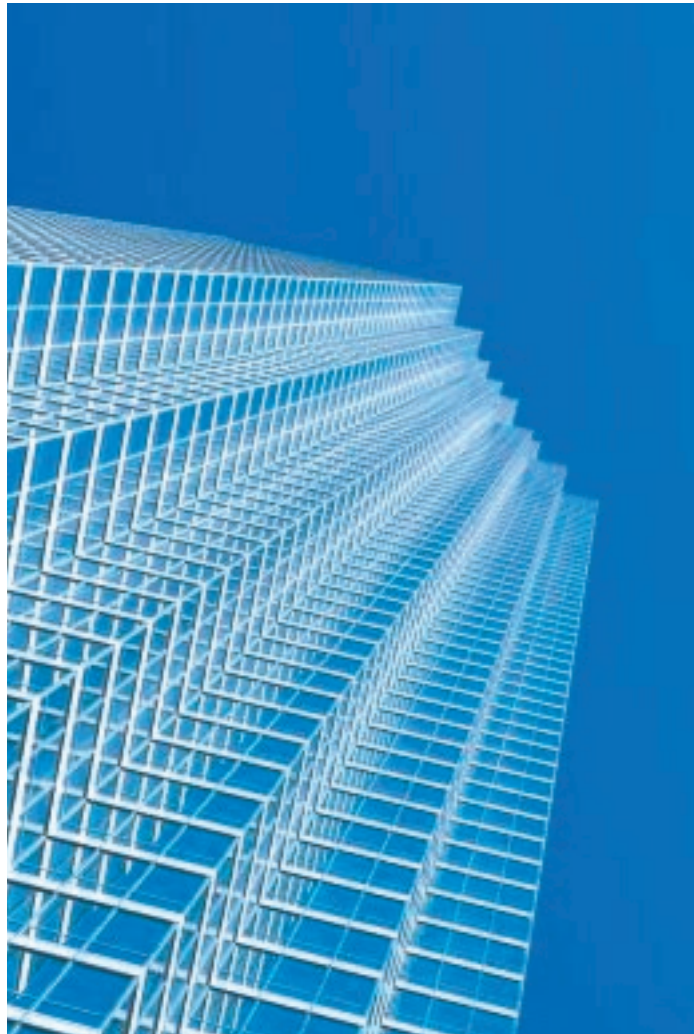


Implementing Enterprise Architecture

ACTION RESEARCH AT AIR FRANCE CARGO - KLM CARGO



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I. Management Summary

The prescriptive notion of Enterprise Architecture explains that an Enterprise Architecture provides normative restriction of design freedom [1]. In practice, this restriction is presented in a set of consistent and coherent principles. This notion is also supported by AF-KL Cargo. However, only principles regarding IT development have been made. To complete the Enterprise Architecture, principles have to be developed for other domains.

The thesis project concerns the development of an Enterprise Architecture for AF-KL Cargo based on its strategy and best practices. The project is defined by the following question:

"How can the AF-KL Cargo strategy and best practices be captured correctly in an Enterprise Architecture?"

The following results of the project provide an answer to the question stated by the project definition:

- Guidelines to formulate principles,
- The business architecture framework to help organizing the principles,
- The methods used to raise the Enterprise Architecture awareness,
- The methods used to develop principles,
- A Group Support System supporting the process of developing principles

II. Preface

This report is the result of the 8 month thesis project I have carried out at AF-KL Cargo. Although I have studied the topic of Enterprise Architecture for more than 2 years, there are still a lot of issues regarding this topic unclear to me. The thesis project gave me the opportunity to clarify some of these issues and to gain practical experience in working in a large enterprise such as AF-KL Cargo.

The purpose of the report is to present an overview of what I have done and what I have found. The title shows that this project has been carried out as an action research, which can be defined as a method to intentionally learn by experience. These experiences are considered to be the main source for this report.

I would like to thank the following people:

My thesis supervisors, Professor Jan Dietz and Hans Zwitter, who have given me the opportunity to carry out such a project at AF-KL Cargo and who ensured the project is carried out successfully by steering me into the right direction.

During the project I have met a lot of individuals at AF-KL Cargo who helped me by having interesting discussions.

Furthermore, during the project another student from Delft University of Technology, Man-Kit Lee, was carrying out a project at AF-KL Cargo regarding the same topic. The endless discussions with him have improved the results of the project significantly.

Finally, I would like to thank my family and friends for supporting me for the past 8 months. I owe a great deal of gratitude to especially Vicky Cheung, who was kind enough to endure the stress I brought home from work and who also helped with the visual presentation of this report.

October 2006,
Andrew Go

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1. Introduction

1.1 PROJECT DEFINITION

1.2 PROJECT APPROACH

The term Enterprise Architecture (EA) has been around since the eighties when Zachman introduced a method to capture the fundamental structure of an enterprise by using a set of models [2]. However, the prescriptive notion of architecture has only appeared recently. This notion defines EA as the normative restriction of design freedom [1]. In practice, an EA consists of a coherent and consistent set of principles instead of a set of models.

Much has been written about how EA should be developed using architecture frameworks and other tools [2, 3, 4]. However, it still takes years of experience in this field to become a good enterprise architect. This thesis project is considered to be an opportunity to gain practical experience in developing an EA.

1.1 PROJECT DEFINITION

Little is known about developing an EA as a set of principles, but it is trivial that the EA must be based on the strategy [5]. Besides an enterprise's strategy, best practices are used to make decisions regarding the implementation of the strategy. The focus of the thesis project should therefore be on the methods and tools that are necessary to develop an EA.

The need for an EA that has been developed beyond the IT domain is growing [6]. At AF-KL Cargo, the merger between Air France and KLM has also created an additional incentive to pick up the pace in developing such an EA.

Taking above mentioned issues into account the definition of the thesis project is formulated in the following question:

"How can the AF-KL Cargo strategy and best practices be captured correctly in an Enterprise Architecture?"

To answer this question the following sub-problems have been defined:

- How can the enterprise objectives be retrieved?
- How are best practices extracted from the enterprise?
- How should principles be formulated such that they are applicable for designers?
- How should principles be organized such that they can be managed?

Parallel to this thesis project, another intern at AF-KL Cargo was carrying out a similar project [7]. That project also concerns the implementation of an EA. The findings on the development of principles have been shared, resulting in a common part in this thesis report on this topic.

1.2 PROJECT APPROACH

The project followed the generic project approach consisting of:

- analysis,
- development and
- evaluation.

The analysis part of the project focuses on getting familiarized with AF-KL Cargo and the air cargo business. Also the awareness regarding EA is studied. During this phase, documents have been consulted and interviews were held with members from the Business Development Office, which is responsible for the translating business needs into solutions.

The development phase includes three aspects:

- study the development of principles in general,
- examine the methods to raise the awareness for enterprise architecture and
- test methods to determine architecture principles for AF-KL Cargo.

The first aspect of the development phase was tackled by studying literature and interviewing enterprise architects at AF-KL Cargo. Principles that have already been developed were also examined. Dealing with the third aspect concerns meetings with people at AF-KL Cargo outside the BDO. For the final aspect, together with the people at AF-KL Cargo several methods have been tested to find the most effective way to discover and discuss architecture principles.

The final phase of the project involves reviewing the quality of the principles that have been developed and the effectiveness of the methods that have been used. This evaluation is based on the feedback given by the participants of the development process.

The project proposal, which is presented in appendix B.8, indicates that the project will cover all perspectives of the enterprise. However, due to time constraints, the scope of the project is reduced to focusing on the business of AF-KL Cargo. Nevertheless, results found for this domain can be applied to other domains of the enterprise.

2. Analysis

2.1 STRATEGY IMPLEMENTATION

2.2 THE STEMBAND

2.3 WHAT AND HOW

2.4 ENTERPRISE ARCHITECTURE AWARENESS

As mentioned in the introduction, the project is mainly focused on discovering the main conditions for implementing EA in an enterprise such as AF-KL Cargo. The objective of the analysis is to uncover to what extent AF-KL Cargo is aware of the need for them to make their design principles explicit.

The results from the analysis that has been conducted during the first 2 months are presented in appendix A. The relevant issues that were encountered during the analysis will be described in this chapter.

First the role of strategy within AF-KL Cargo is explained. During the analysis, the architectural efforts of the IT division of Air France KLM were also examined. An interesting issue noticed during the analysis was the way people within AF-KL Cargo explained their role in strategy implementation or project execution. Finally a conclusion regarding the awareness of EA is drawn based on the analysis.

2.1 STRATEGY IMPLEMENTATION

Although AF-KL Cargo developed a business strategy which should point the enterprise in the right direction for the next couple of years, the enterprise is also steered by an ICT strategy developed for Air France KLM to which AF-KL Cargo belongs. These two strategies should be the starting point from which eventually concrete plans and projects are devised.

The business strategy is concerned with setting a road map that should guide AF-KL Cargo towards its vision. This road map focuses on the priorities that are set for a long period and contains a lot of statements regarding what the enterprise goals are. One might wonder how this strategy can be translated into the desired plans and projects, which indicate how those enterprise goals are to be achieved.

Another issue which has to be taken into consideration is that besides the business strategy the ICT strategy should also be translated into plans and projects. The KLM ICT strategy regards all divisions of the KLM branch of Air France KLM, because all ICT developments for KLM are carried out by a central Information Services (IS) division. This ICT strategy presents a clear and detailed picture of the next steps in what should be done with ICT.

Everybody in the enterprise shares the thought that just because the ICT strategy is more clear and detailed than the business strategy, it doesn't mean that it should be leading in enterprise developments. Rather, the business should clearly define how to develop the enterprise.

In theory the strategy should be the starting point from which the BDO should develop concrete projects. However, the strategy is not described in such detail to perform this translation in one single step. Additional steps are necessary to present more structure in the process, but so far only one of these additional steps has been implemented, the Information Economics workshop. The IE workshops are carried out to rank proposed projects on business added value and risk. Although this clarifies the importance of the projects, it remains unclear whether or not there are other projects that should be taken into consideration.

At the time of the analysis, the BDO is looking for new ways of structuring the discovery and development of projects.

2.2 THE STEM BAND

EA is not an unknown phenomenon within AF-KL Cargo. The IS division of the KLM branch of Air France KLM uses an Enterprise Wide Technical Architecture to guide the development of their projects. The EWTA, of which the framework is depicted in figure 1, consists of a number of domains, each of which containing design principles relevant to that domain. Architects ensure that all ICT developments comply with these principles by issuing permits for projects. These permits are part of the formal project execution process, the Stemband.

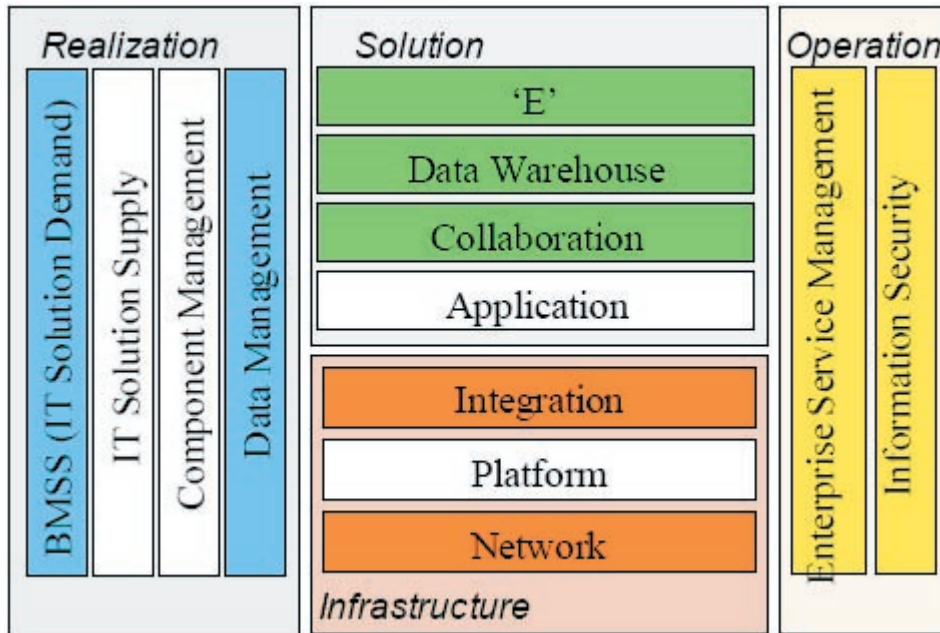


Figure 1: The EWTA Framework.

Each project must be carried out according to the phases and steps described in the Stemband. To safeguard the consistency between all ICT projects, enterprise and project architects are involved in all projects. The project architect makes sure that design principles are taken into account during the project and the enterprise architect double checks the compliance with the EWTA before granting the permit.

The enterprise architects are also responsible for managing exceptions. Although some projects are allowed to be inconsistent with the principles, they have to, however, comply with other rules. For example, all exceptions have an end date after which the exception is no longer valid. Next to this end date, a formal agreement must be made that ensures an appropriate solution for the exception.

With the Stemband and the use of the EWTA through permits, the IS division has shown that a structured project execution works. However, some members from the BDO argue that the permits slow down projects, because it creates too much bureaucracy.

Working under architecture entails the introduction of a system or process with which compliance to the architecture can be managed. However, members from the BDO are reluctant to introduce permits similar to the ones described in the Stemband to govern this compliance. A different way of architecture governance is necessary for the BDO.

2.3 WHAT AND HOW

The terms WHAT and HOW are often used at AF-KL Cargo to delineate who is responsible for what. The BDO

and IS have agreed that the BDO is responsible for developing the WHAT requirements, IS is responsible for the HOW requirements. However, what has also been mentioned is that it is not clear WHAT projects should be carried out. This indicates that there are several levels of WHATs and HOWs, which makes the use of these terms evermore confusing. What has often been left out is what these WHATs and HOWs are actually for. The WHAT requirements devised by the BDO are actually requirements for IT systems. The WHAT projects determined by the BDO are actually regarding the enterprise as a whole. The use of these terms actually depends on the system being developed.

Clearly, the BDO is responsible for carrying out three roles:

- Determining WHAT should be done for the enterprise,
- Determining HOW this has to be achieved and
- Determining WHAT has to be done for IT systems.

To make this issue less complex and confusing, the terms WHAT and HOW should be replaced by the terms FUNCTIONAL and CONSTRUCTIONAL respectively. It also takes away the problem of the possibility to phrase a WHAT requirement using a "how" and vice versa. These terms are also consistent with the terms used in literature regarding system design, enterprise engineering and EA [1, 8, 9].

2.4 ENTERPRISE ARCHITECTURE AWARENESS

The main conclusion of analysis is that within the BDO, people are aware of the fact that a structured method is necessary to translate the strategy into concrete plans and projects. EA is identified as a promising concept that can be used for this purpose.

IS has shown that design principles are able to guide the development of IT systems. However, the BDO must be careful when adopting an architectural approach. The IS way of working is perceived to be too structured and bureaucratic. Either a different approach of architecture governance has to be adopted or the permit system has to be introduced carefully.

Confusion surrounding the division of responsibilities using the terms WHAT and HOW must be solved by clarifying and focusing on the context in which these terms are used. This also explains the scope of the BDO, which is obviously more than the IT domain. The terms FUNCTIONAL and CONSTRUCTIONAL stimulate people to think about this context. It also ensures that the role of EA within the design process is made clear.

During the analysis, the awareness of the BDO has been captured. What is still unclear is to what extent people outside the BDO are aware of EA and specifically the sense of urgency to adopt this concept.

3. Development

3.1 PRINCIPLE DEFINITION

3.1.1 ELEMENTS OF A PRINCIPLE

3.1.2 PRINCIPLE FORMULATION

3.2 PRINCIPLE ORGANIZATION

3.2.1 ENTERPRISE ARCHITECTURE PERSPECTIVES

3.2.2 THE BUSINESS ARCHITECTURE FRAMEWORK

3.2.3 DOMAIN DEFINITIONS

3.2.4 PRINCIPLES IN THE EWTA

3.3 RAISING ENTERPRISE ARCHITECTURE AWARENESS

3.3.1 MEETINGS

3.4 DEVELOPING AF-KL CARGO ARCHITECTURE

3.4.1 ANALYZING LITERATURE

3.4.2 INTERVIEWS

3.4.3 GROUP DISCUSSIONS

The development phase of the project involves four aspects:

- The definition of principle,
- The organization of principles
- Raising the EA awareness and
- The development process of the AF-KL Cargo architecture.

Each of these aspects will be described below.

3.1 PRINCIPLE DEFINITION

An EA purely based on principles is something that hasn't been developed before [10]. There are, however, a number of examples of principle-based IT Architectures, including the Enterprise Wide Technical Architecture adopted by Air France KLM. Unfortunately, there is no set of guidelines that can be found in literature and used to develop principles for the other domains (business, organization and information). In order to develop principles of a similar level of quality for the other domains, these guidelines would have been very useful.

The guidelines regarding the development of principles presented in this thesis are based on the experiences of developing principles during the project and best practices from enterprise architects at the Information Services division of Air France KLM.

This part of the development phase of the project focuses on creating a starting point from which an EA can be developed. First a clear understanding should be made of what a principle is and what it consists of. Next, a number of suggestions on how to formulate principles are provided. Finally the organization of principles is tackled to examine how the principles should be managed.

3.1.1 ELEMENTS OF A PRINCIPLE

Before developing principles for the enterprise, it is imperative to clarify what a principle is. In order to determine this, a definition of the term principle is presented below:

“A belief that is accepted as a reason for action or thinking in a particular way” [11]

Because of the possible misconception that the term refers to moral values, additional terms such as rules and guidelines are used to explain how these principles should be used [12]. However, these terms can't be interchanged. The definition shows that principles are more than rules and guidelines. They represent a shared understanding on what needs to happen if an enterprise wants to execute its strategy successfully [13].

There are issues that have to be kept in mind when dealing with principles. First of all, principles are developed to be applied for a long period of time. Therefore principles should address a class of systems, for instance cars in Europe, instead of a specific system, for example the Toyota in the garage [1].

Also, the difference between a principle and a requirement has to be made clearly [1]. This can be done by considering principles as general requirements, because they concern a class of systems. Requirements are devised for a specific system and can be regarded as special requirements. This distinction is necessary to avoid requirements from finding their way into the architecture.

In order to define a principle clearly, each principle must consist of the following elements [6]:

- A principle statement,
- The rationale for the principle,
- The implications of the principle and
- The key actions for enabling the principle.

The definition of these elements used by KLM Cargo is presented below [14]. Based on this, definitions of these elements have been established that are used to develop principles during the project.

Principle statement

The principle statement ensures that the principle is recognizable. Because a principle consists of more than just the statement, it is difficult for a principle statement to represent the entire principle. Nevertheless, an important aspect of a principle statement is that it captures and is able to communicate the intentions of the principle.

Rationale

Principles represent decisions that have been made on which designers can base their decisions. All decisions should reflect the enterprise strategy or best practices, which means that it should be possible to trace a principle back to them. The rationale provides this traceability and explains why applying this principle contributes to realizing enterprise objectives.

Implications

Principles represent a further elaboration of the enterprise strategy and therefore reflect decisions made by (senior) management. The principle statement alone isn't sufficient to apply the principle, because it is usually a generic statement that has to be applicable enterprise-wide. Implications specify how this design principle will impact the business and IT Community. Next to the rationale, the implications also provide a good way to help designers understand the principle.

Key Actions

The key actions specify what actions need to be taken to ensure that the design principle is followed. After an architecture domain is introduced and “stable”, the key actions can be removed from the document.

3.1.2 PRINCIPLE FORMULATION

As mentioned earlier, principles should represent a shared understanding on how the enterprise should develop itself. Formulating these principles to represent this shared understanding is difficult because these principles reflect many people's minds and every person uses different words to express their mind.

Nevertheless, there are many issues regarding syntax and semantics that have to be taken into consideration when it comes to formulating principles [13]. During the project, two main issues are examined:

- The acceptance of principles and
- The correctness of principles.

Acceptance of principles

In order to have people working with principles, the principles have to be accepted [15]. There are a number of factors that can be used to influence the level of acceptance. Below, the factors are described and also what role the architect has in influencing these factors:

- Involvement of users,
- Relevance of principles,
- Applicability of principles and
- Compliance with principles.

First of all, forcing people to work with principles while they don't support them isn't the right strategy to implement the principles. Support for principles is best gained if the users of the principles are actually involved during the development. It is the architect's task to stimulate these persons to become involved by explaining the value of principles.

Another factor that has to be taken into consideration is the relevance of the principles. The principles have to regard topics that are relevant during the design process. By involving users of the principles in deciding what topics the principles should cover, the principles become more relevant to them. An architect should provide suggestions and examples which assist the users in determining the topics.

Applicability also plays a role in the acceptance of principles. By definition, the architecture to which the principles belong should be developed such that it limits the design freedom and in doing so, guides the design process. This has to be taken into account when formulating the principles. The architect's role here is to ensure that the principle is formulated such that its meaning is unambiguous to the users.

The strictness in compliance to the principles is also a factor that can influence the acceptance of the principles. In order to effectively limit the design freedom of designers, the compliance to principles has to be guarded strictly. Principles are the starting point from which other decisions are made. Not complying with them is the very reason why most strategy implementations fail [6]. However, managing this compliance too strictly might have an adverse effect on the acceptance of principles and in some situations, e.g. reacting on a business opportunity, it might be grounded to deviate from the principles. To enable non-compliance in these situations, a process to allow exceptions should be introduced. Exceptions must be approved and managed by the architect. To approve an exception, the non-compliance has to be justified and made explicit.

Correctness of principles

During the project, the following tasks have to be carried out to safeguard the correctness of the principles:

- Verification of the principles,
- Unambiguous interpretation of the principles and
- Ensuring the consistency between principles.

To check whether or not the principles are true, they have to be verified. Verification is done by those who are part of the enterprise and experts in their domain. For example, when verifying a principle regarding the relationship with a customer, an employee who is responsible for the customer relationship has to be consulted. The architect is responsible for facilitating the verification process by presenting the principles to these domain-experts and pointing out suggestions for improvements. The architect should prepare in advance by

gathering information regarding the strategy of the enterprise and check whether or not the principles are consistent with what has been found concerning the strategy.

An architect should also ensure that the principles are interpreted correctly. Asking various persons to explain a principle might reveal the many different interpretations of a principle. This gives the architect an impression of how well a principle is formulated and enables the architect and those involved in the development of the principle to improve the principle.

In order to develop an enterprise within which everything is consistent with one another, the principles themselves have to be consistent with each other as well. Considering the number of principles in an EA and the fact that a principle represents something that isn't easy to grasp using words, checking an EA on consistency is an enormous challenge. Nevertheless it is important considering the fact that inconsistency within an enterprise is the cause of many strategic and operational problems [6]. Architects are responsible for architecture governance, which means that they are responsible for checking the consistency among principles.

Guidelines for principle formulation

The project allowed me to gain hands-on experience in developing principles. No strict rules have been found during the project that could have made formulating principles easier. Nevertheless a number of best practices have been discovered, which are described below.

The principle statement is the element that stands out from the other parts of the principle. Bear in mind that most people will probably only read the statement to understand the principle. Therefore in the principle statement the focus of the principle should be clear to everyone. It is also important that the formulation of the principle statement is recognizable and easy to remember. Analogies with scientific laws can be made here. Often laws are stated in a shorthand manner [16]. For example, the First Law of Thermodynamics: Total energy in a system is constant. Surely one must understand that this statement has some conditions attached to it in order for it to be true. One such condition is for example that the energy in the concerned system is neither brought nor taken away. However, if we were to elaborate the statement with all the conditions incorporated, it will be harder to remember and certainly harder to recognize. The same things can be said about the principle statements. Instead of making the statements more precise by including all the qualifying conditions, they should be made more memorable by clever and catchy phrasing. The principle elements rationale and implications can then be used to put all the conditions in. This way the principle will be easier recognized and remembered which ultimately will contribute to the acceptance and the use of the principle. This is reflected back in the EWTA. The most well-known technical architecture principle is: Reuse before Buy before Build. One cannot find a catchier principle than this one in the EWTA.

A principle represents a decision that has been taken regarding a non-trivial choice. This is how design freedom is limited in practice. This is a key issue to keep in mind when formulating the statement; a principle must represent a choice made in advance. An example of a trivial choice is:

"We must work efficiently."

The principles that are developed should be considered as the starting point from which the enterprise should be operated and developed. Therefore, these principles should not be taken lightly and considered to be best practices. Such a high priority must also be reflected in the statement. In stead of using terms like "have to" or "should", the term "must" is better suited to convey the right message.

The rationale of a principle consists of a set of statements reflecting the issues for which this principle provides an answer. Similar to the statement, it should also be as clear and unambiguous as possible. The rationale helps in understanding where the principle comes from and also gives the reason why it is a principle the organization wants to comply to.

Implications present effects of a principle if it is applied. This is achieved by formulating statements that are similar to a principle statement. There is a thin line between an implication and a principle. During the development of a principle, it is possible to discover that an implication should be upgraded to become a principle or the other way around where a principle is actually an implication for another principle. Two differences between an implication and a principle can be identified:

- An implication clearly concerns a specific area within the area determined by the principle, for instance in case of a principle regarding the area of customer relationships, an implication can concern the specific area of sales or claims handling.
- An implication has less priority than a principle and the compliance with an implication is managed less strict.

Besides considering implications to be an effect of the application of the principles, implications can also be regarded as conditions. These conditions can be seen as requirements for the truthfulness of a principle and are necessary in order to comply with the principle. These two ways of interpretations implications have to be made clear to those who are involved in the development of the principle. A suggestion to make this distinction explicitly could be to consider the effects of the application of the principle as sub-principles. However, by having sub-principles and perhaps even sub-sub-principles, it becomes a greater challenge to maintain an overview of all principles. Taking into consideration the status of the EA awareness at AF-KL Cargo, this distinction is left out of the scope in the EA development. Nevertheless, it remains an interesting topic for future discussion.

As mentioned before, the key actions of a principle can be regarded as actions that have to be done in order to comply with the principle. In essence, the key actions of all the principles combined together are able to form projects that have to be carried out. Because of this, the key actions can be considered equal to the high level business cases that are used by the BDO. Thus we could associate key actions more with the actual realization side and because EA is about guiding the realization process, we could argue whether or not key actions should be an element of an EA. It is also arguable what the added value of stating the key actions are if they are equivalent to the project portfolio. Nevertheless, key actions are good to have in order to show the practical meaning of complying with a principle.

3.2 PRINCIPLE ORGANIZATION

Next to formulating principles properly, these principles should be organized such that they are manageable. The principles in this project are developed having a certain notion of an enterprise in mind [5]. The relevance of this enterprise notion in organizing principles will be explained below. Also, the framework that forms the starting point for the business principles will be presented.

3.2.1 ENTERPRISE ARCHITECTURE PERSPECTIVES

An EA should take a holistic view on an enterprise [17]. To accomplish this, an enterprise can be viewed from a number of different perspectives [5]. The figure below depicts the perspectives that form an enterprise:

- The business perspective regards those enterprise activities that are purposeful and gainful. Examples of issues that matter from a business perspective is the customer relationship, the enterprise offerings, etc.
- The organization perspective regards the manner by which the here fore mentioned activities are arranged. Issues such as processes, performance and employee behaviour are the part of this perspective.
- The information perspective regards the information necessary to perform the business and organizational activities. This perspective includes aspects such as gathering and presenting information.
- The technology perspective regards the specific use of knowledge, methods, human and physical resources that are needed to implement the enterprise. In AF-KL Cargo's case, the technology perspective focuses on topics such as airplanes, pallets, IT, etc.

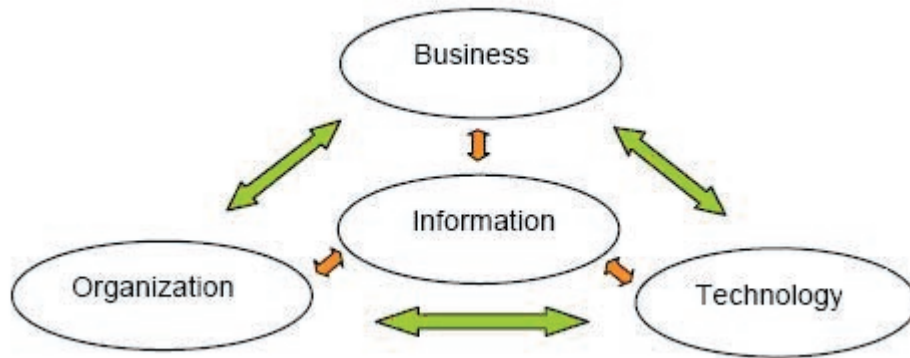


Figure 2: Different perspectives on an enterprise.

3.2.2 THE BUSINESS ARCHITECTURE FRAMEWORK

The principles in the business architecture should be managed properly in order to improve its applicability. This can be done by organizing the principles in domains for which they are relevant.

Business Domain Definition

To justify the need for an architecture in the business domain, the overall enterprise view has to be taken as a starting point. The enterprise can be seen as a system which can be viewed from two distinct perspectives, the functional and constructional perspective [18]. The functional perspective of an enterprise can be seen as a “black-box” model of the enterprise and is perfectly suitable for managing and using the enterprise. In the context of enterprises, the functional perspective is usually called the business perspective. In order to develop the functions or business of the enterprise properly, the EA should cover this perspective.

The business of an enterprise can be seen as carrying out the goal- and externally-oriented and revenue generating activities. From a business perspective the question should be raised regarding how such a business should be exploited, explored and developed. The business architecture answers this question and can be defined as:

“A logical consistent and coherent set of principles prescribing how a certain field of (commercial) endeavour should be exploited, explored and developed.” [6]

In other words, the business principles should guide the design of the functions of the enterprise. Such a functional design is usually presented in a business model, which describes the business by breaking it down into several key elements. These elements are used to specify the business domains.

The business architecture framework presents the business domains that have to be taken into account when developing the business architecture. Besides providing a checklist for architects, a framework also improves the manageability of the principles by presenting the context in which the business principles must be used.

The business domains in the business architecture framework are based on research on the business model concept in [19] and the suggested framework in [5, 6].

Hedman and Kalling business model concept

The business model concept of Hedman and Kalling is presented in figure 3. This concept shows components of a generic business model that represent four key levels:

- The market level,
- The offering level,
- The resource level and
- The activities and organization level.

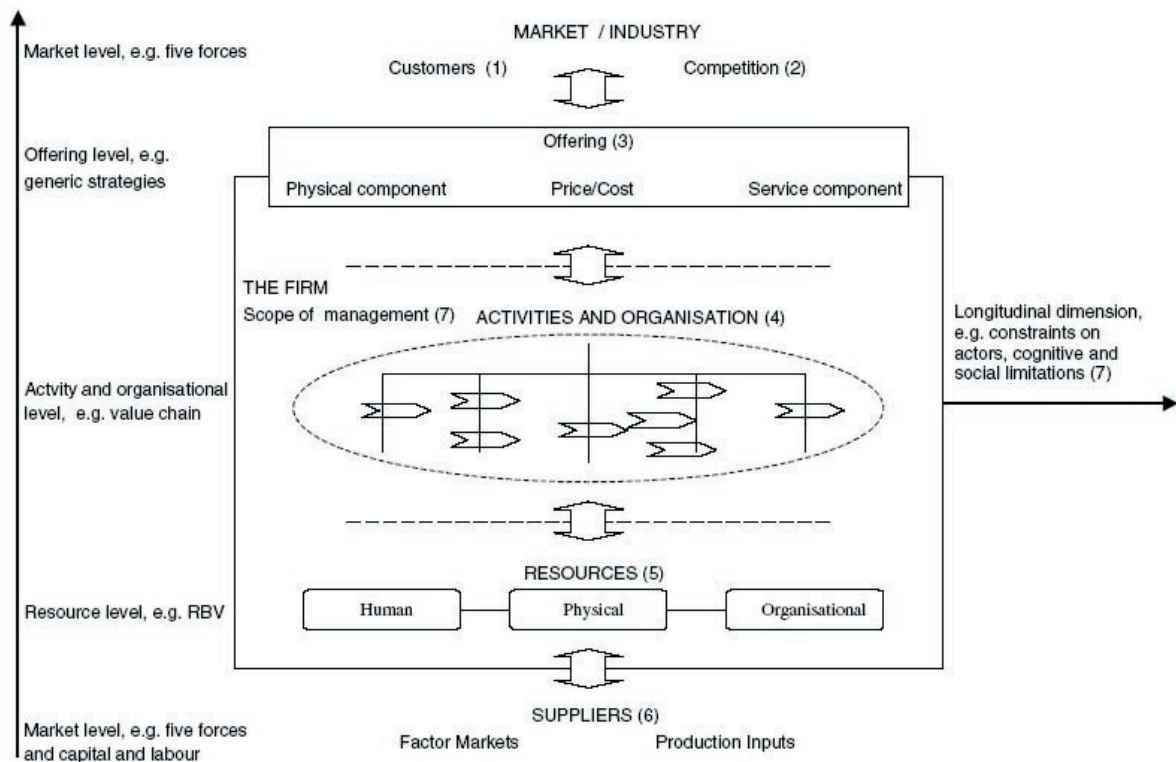


Figure 3: Hedman and Kalling business model concept.

The first level consists of components that present information regarding the market, such as customers, competitors and suppliers. The offering level includes components such as products and services offered by the enterprise to the market. The economic model that is used for these offerings also belongs to this level. Important resources within the enterprise are part of the resource level.

The activities and organization level regards how the enterprise is organized. The components on this level don't belong in the business architecture framework, because they don't address the question how the business should be exploited, explored and developed. The question how the business should be organized is raised in the organizational domain and answered by principles in the Enterprise Organizational Architecture.

As already mentioned before, the functional or business perspective of an enterprise is similar to a "black-box" view of the enterprise, which shows the functions of an enterprise. In other words, it presents what you can do with the enterprise and what it will provide to its environment. The components in the generic business model described in the market, offering and resource level can be regarded as aspects that have to be taken into account when developing these functions of an enterprise.

Hoogervorst Business Architecture Framework

The business architecture framework suggested by Hoogervorst is depicted in figure 4. The framework consists of two parts. The left side shows the mission and strategy from which principles should be derived (or the principles should be consistent with mission and strategy). The right side presents domains for which principles have to be devised. These domains are the starting point for developing the business architecture framework that will be used in the project.

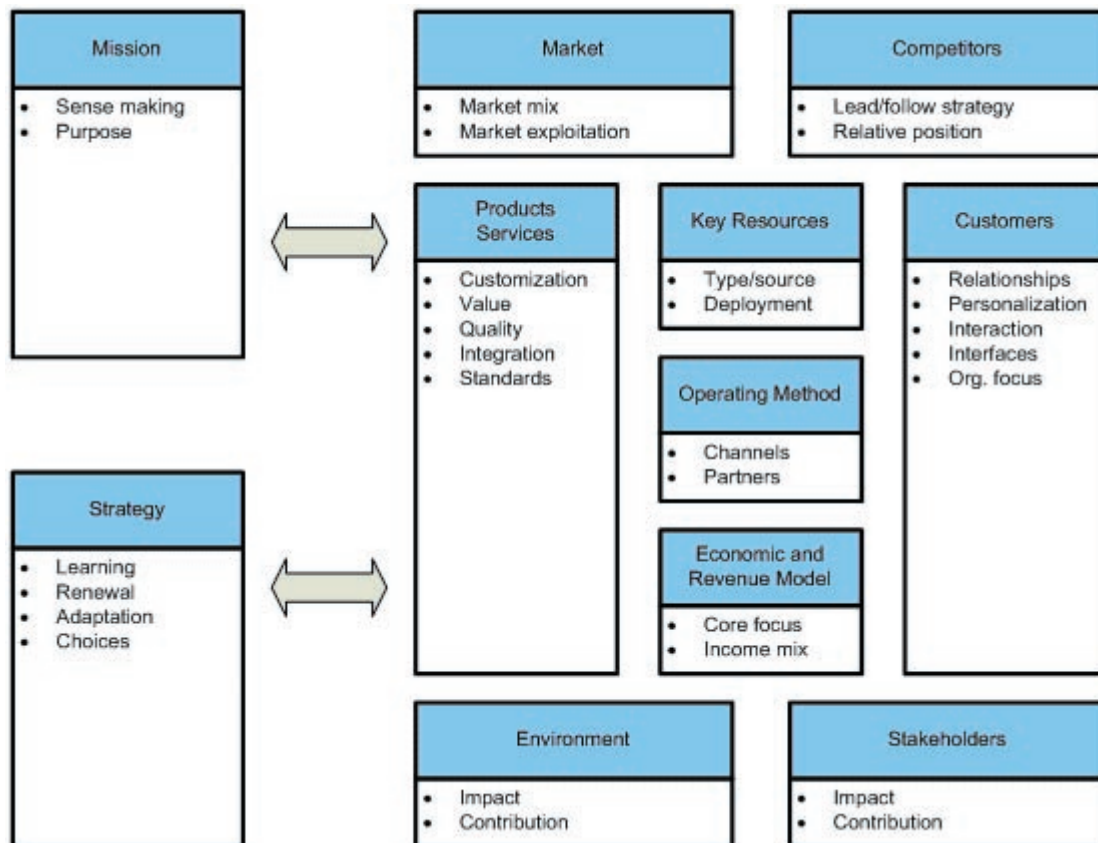


Figure 4: Hoogervorst Business Architecture Framework.

According to Hoogervorst, the Market domain contains principles that guide how the market should be exploited and explored. Examples of principles provided by Hoogervorst are:

- Marketing should move from mass marketing to one-on-one marketing,
- At least x% of the market share must come from recently (< 5 years) introduced products and services.

The examples presented above have a strong relation with other domains beside the Market domain, such as the Competitors and Customers domain. The market domain focuses on the area in which three entities come together, the competitors, the customers and the enterprise itself. The question remains whether or not this area is essential enough to have its own domain in the framework. To keep the framework as concise as possible, the Market domain will be left out from the business architecture framework. The other domains together should be sufficient to cover the market area.

The Products and Services domain focuses on the development of products and services and principles in the Economic and Revenue Model domain guides how the enterprise should earn its money. These two domains are similar to the components presented by Hedman and Kalling on the Offering level. Both the business model concept and the suggested business architecture framework of Hoogervorst present these two domains as essential to a business view on an enterprise and will therefore be included in the business architecture framework for this project.

The Key Resources domain in Hoogervorst's framework focuses on how important resources should be deployed. These resources are more than just funds and people; it also includes, in case of AF-KL Cargo, the AF-KL Cargo network, the planes and the fact that AF-KL operates with two hubs. This might not be clear if the term "resources" is used. Therefore this domain is renamed to Key Resources and Assets.

According to Hoogervorst, the way products and services are delivered to the customers is defined in the Operating Method domain. The use of channels and partners are part of this domain. However, the interaction and interface with the customers have already been handled in the Customers domain, which renders this domain obsolete. Nevertheless, this domain puts light on some business components that haven't been included in

Hoogervorst’s framework, which are partners and suppliers of the enterprise. Instead of having the Operating Method domain, a Partners and Suppliers domain is included in the business architecture framework.

Although the aspects Environment and Stakeholders should be on the agenda of every member of the senior management, it doesn’t belong to the business architecture framework as a separate domain. The Environment aspect should be regarded as an area of concern that has to be taken into account during the development of the business architecture. Stakeholders and their wishes should also be represented in the business architecture by means of areas of concern.

Although the business architecture framework should only consist of domains representing the essential aspects of an enterprise, developing this framework unavoidably includes subjective choices. The business architecture framework suggested by Hoogervorst presents his choices, whereas the framework which is used in this project reflects mine. In practice, the domains of the business architecture framework should be the result of discussions between the architect and senior management regarding the relevant aspects of the enterprise.

The Business Architecture Framework

The models developed by Hedman and Kalling and Hoogervorst show their interpretation of what is important for an enterprise from a business perspective. From their interpretation, a view of enterprise from the business perspective has been developed that is used during the project.

With this view on an enterprise’s business in mind, the business architecture framework within which the business principles will be organized is developed and illustrated in the figure below. The figure shows that the framework is based on a number of sources, such as the strategy, vision, etc.

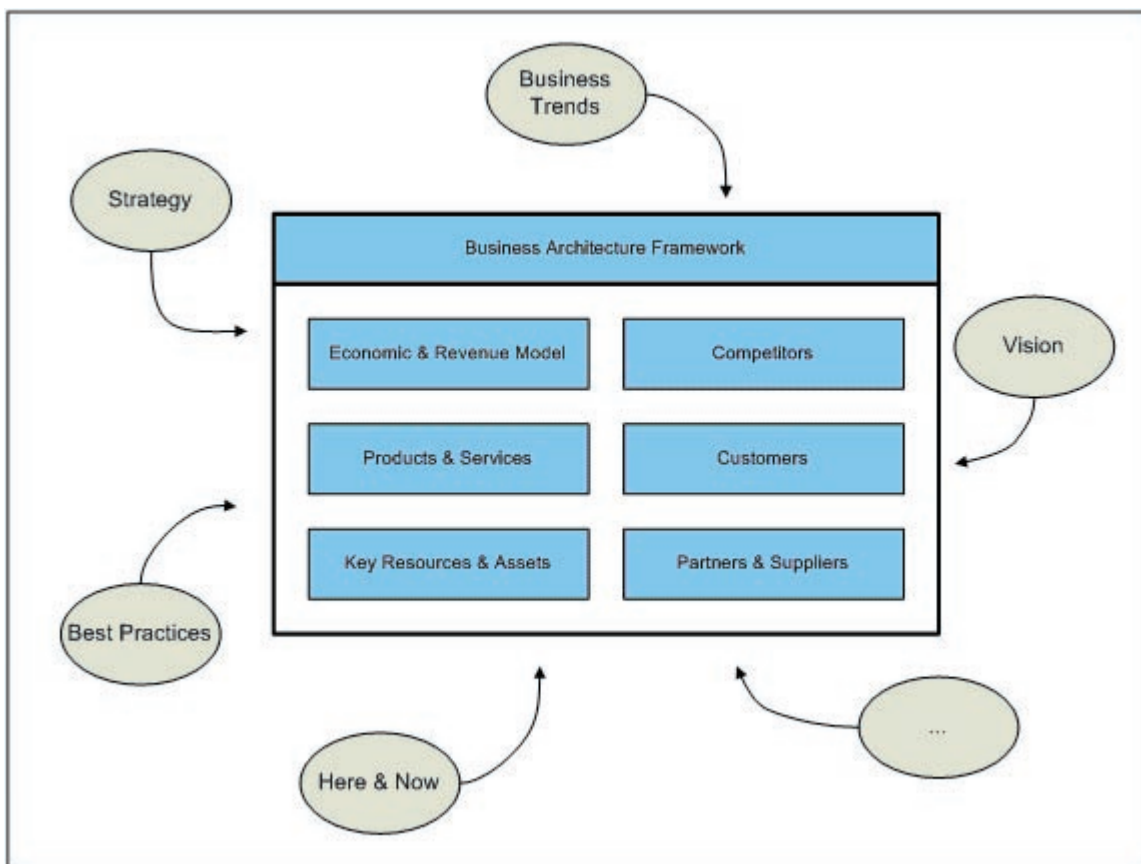


Figure 5: The Business Architecture Framework.

3.2.3 DOMAIN DEFINITIONS

Below each domain in the business architecture framework will be defined.

Customers

Definition

The Customers domain regards the design and development of the relationship between AF-KL Cargo and the customers.

Rationale

Customers are an important factor on which AF-KL Cargo business should focus on. This customer relationship includes e.g. how Cargo should select its customers, the interaction between Cargo and customers, etc.

Competitors

Definition

The Competitors domain deals with the relative positioning of AF-KL Cargo to the competitors.

Rationale

Next to customers, the focus on the market should cover the competitors. The competitors are also a key element of the AF-KL Cargo business. For example, decisions have to be made regarding the relationship with the competitors in order to react properly to changes in the competitors' stances.

Products and services

Definition

The Products and Services domain considers the design and development of products and services for the market.

Rationale

Products and services represent the offering of AF-KL Cargo to its customers. Decisions that are relevant for the development of the products and services of AF-KL Cargo must be considered as an important component of the business. Development also includes design, marketing, implementing, etc.

Economic & Revenue Model

Definition

The Economic & Revenue Model Domain concerns the financial gain that can be achieved from the activities that are involved in the AF-KL Cargo business.

Rationale

The prices of the products and services also belong to the offering of AF-KL Cargo. This element in the business puts emphasis on the financial aspect of the business of AF-KL Cargo. Focusing on this aspect enables the AF-KL Cargo business to sustain and grow.

Key Resources and Assets

Definition

The Key Resources and Assets Domain takes care of the management and development of resources and assets that are important for realizing the business.

Rationale

Enterprise resources and assets have to be leveraged in order to create competitive advantage. By focusing on the core competences it can be made clear how the enterprise should develop itself to achieve its objectives.

Partners & Suppliers

Definition

The Partners and Suppliers Domain regards the development of the relationship with partners and suppliers.

Rationale

A good relationship with partners, with whom you cooperate, and suppliers, that deliver key resources, is essential in doing business. This key component of the AF-KL Cargo business has to be exploited, explored and developed correctly as well as the other components.

3.2.4 PRINCIPLES IN THE EWTA

The principles in the EWTA have provided insight in how a principle should look like. Unfortunately, the development of these principles didn't result in a set of guidelines which can be used for this project. Still, lessons can be learned from how these principles were developed and the differences between the development of principles in the EWTA and in the Business Architecture.

The EWTA is based on the theory of architecture presented by the META Group [20]. Many enterprises have adopted this view of architecture and the META Group has provided the best practices in IT in the form of a set of IT principles. Together with the results from a meeting within KLM regarding the best practices in IT, these principles form the basis for the development of the Conceptual Architecture. This Conceptual Architecture contains conceptual principles regarding the overall IT developments within Air France KLM.

Within the EWTA, domains are defined which represents a specific area of IT development, such as E-business, Infrastructure, etc. These domains contain domain principles, each of which is related to or derived from one or more conceptual principles. This mechanism with the conceptual and domain architectures ensures that all principles are consistent with each other and the essential goal of IT, which is reflected in the conceptual principles.

The same mechanism should be implemented for the EA. However, in stead of having conceptual architectures for each enterprise perspective, the Business Architecture should be considered as the same role as the conceptual architecture. The business architecture is based on the enterprise objectives and in order to ensure the consistency between all principles and the enterprise objectives, all principles in the other enterprise perspectives should be traceable to one or more business principles.

3.3 RAISING ENTERPRISE ARCHITECTURE AWARENESS

Analyzing AF-KL Cargo revealed that much has to be done to improve the awareness for EA. The term Enterprise Architecture was only known to a few people within the BDO and in order to develop a proper Business Architecture, the notion of architecture had to be explained outside the BDO to those who are involved with the development of the EA of AF-KL Cargo.

From the first meetings, it became clear that the concept of EA that is used by AF-KL Cargo isn't known outside the BDO. In order to raise the awareness, contact must be made and maintained with people in the business. During the project a lot of meetings were held for this purpose. Besides the meetings, a website has been developed for the business architecture. This website enabled those who were part of the development of the business architecture to stay involved.

3.3.1 MEETINGS

The meetings that were held during the project can be roughly divided into two categories:

- Introduction meetings and
- Discussion meetings.

During the meetings, various ways of creating awareness for EA has been tested. Below, the experiences of creating awareness gained from these meetings are described.

Introduction meetings

The introduction meetings were held to make a first contact with people from the business. Each person was approached individually for such a meeting. Proper preparation for an introduction meeting ensures that the meeting can be steered towards the right direction. Part of the preparation is gathering information regarding the person that will be interviewed. Information that is of interest includes the role within the organization and the person's interest in new ways to develop the enterprise. This information forms the starting point from which a plan is made that helps in guiding the meeting.

During an introduction meeting, it is custom to introduce yourself to the other person. Although IT is only related to a part of EA, many persons that were interviewed during the project identified EA as something that belongs to IT. This misconception is only acknowledged by the fact that a Computer Science student carrying out a project at the BDO is working on the AF-KL Cargo EA. An explanation must be provided to show that EA regards much more than IT.

Besides introducing yourself, the other person should be asked to introduce him or herself. This could be the opportunity to shift the meeting to learn more about the business and perhaps even look for signs that indicate principles being used in the business.

With the introduction meetings, two ways of introducing EA has been tried. One way is to explain EA right from the start. By doing so, the purpose of the meeting will be made clear early. This will enable the architect to better steer the meeting. The problem with this method is that EA is not easy to explain. Theories and difficult terms should be avoided to prevent confusion. During the project a presentation has been made for the purpose of introducing the concept of EA to people in the business. This presentation explained EA in terms known in the business and an example of a pizzeria using EA. The example stimulates people to think about enterprises in general instead of AF-KL Cargo. The presentation is presented in appendix B.2.

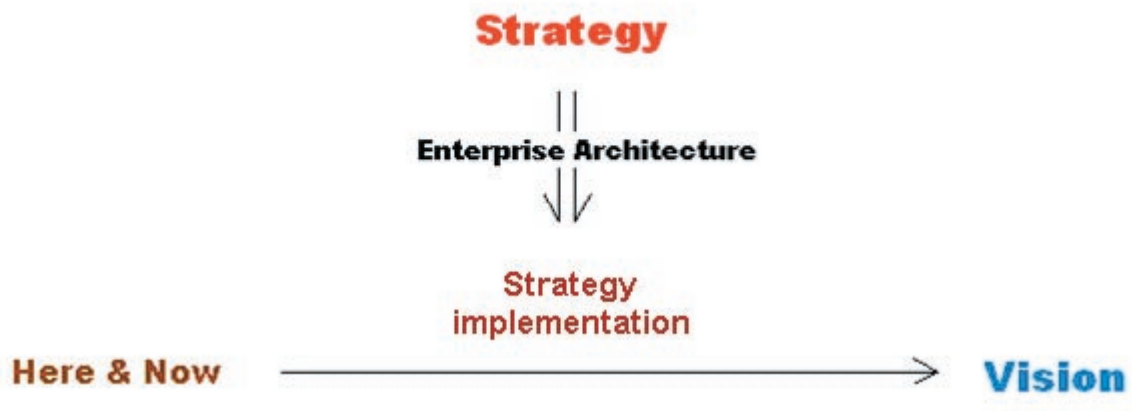


Figure 6: Terms used to explain the role of EA.

Another way is to introduce EA at a later stage of the meeting, after the participants have discussed issues in the business. As mentioned earlier, the architect should look for examples of principles that have been used in the business implicitly. These examples could help in explaining that these principles are part of the EA, which should be made explicitly. This method seems more difficult than the first method, because it depends on the discussion being held before and the ability of the architect to devise and explain examples on the spot.

Introducing EA also entails presenting the value of EA for AF-KL Cargo. Because little is known regarding principle-based enterprise architectures, it is a challenge to prove its value. However, what seems to work effectively is to present examples. Although the pizzeria example doesn't show the full potential of working with principles, it enables the architect to explain what the potential could be if the principles are put into action into a more complex environment, such as AF-KL Cargo. What also helps is the fact that principles are already being used successfully for IT development.

Discussion meetings

After the introduction meetings, several meetings were held to gather and discuss business principles regarding a specific domain in the business architecture framework. Besides the development of the business principles, the meeting could also be seen as another opportunity to raise the awareness for EA.

The awareness that has been created so far has to be taken into consideration in the preparation for the meeting. This helps in preparing the contents and the process of the meeting. The contents of the meeting should be aligned with how much the meeting participants know about the concept of EA. The meeting process should be made clear to the participants to avoid confusion regarding the purpose of the meeting.

Examples were used to convey the value of using principles in designing an enterprise. During the discussions, the participants are able to experience the value of developing principles. By discussing relevant issues and being stimulated to express vague ideas in clearly formulated principles, the participants seem to appreciate the process of developing the business architecture.

Business Architecture Website

After having developed the business principles, these principles have to be published in order for the participants to access them and to provide any feedback. Although the participants were enthusiastic about the principles during the meetings, not much feedback was given outside the meetings.

In order to test whether or not the sense of urgency for the business principles has been raised to a level where they would pro-actively maintain involved in the development of the principles, a website was developed. Similar to the website containing the EWTA, the newly developed website includes the business architecture framework with which the business principles for each domain can be accessed. These principles are also published on the website in separate documents for each domain.

The website has been developed specifically to present a platform with which the participants of the business architecture development are able to discuss issues regarding the principles. Discussions proved to be appreciated by the participants, but it was difficult to schedule these discussion meetings. To stimulate discussion outside the meetings, the website includes commenting functionality. This function allows visitors of the website to comment on the framework, principles and each others comments.

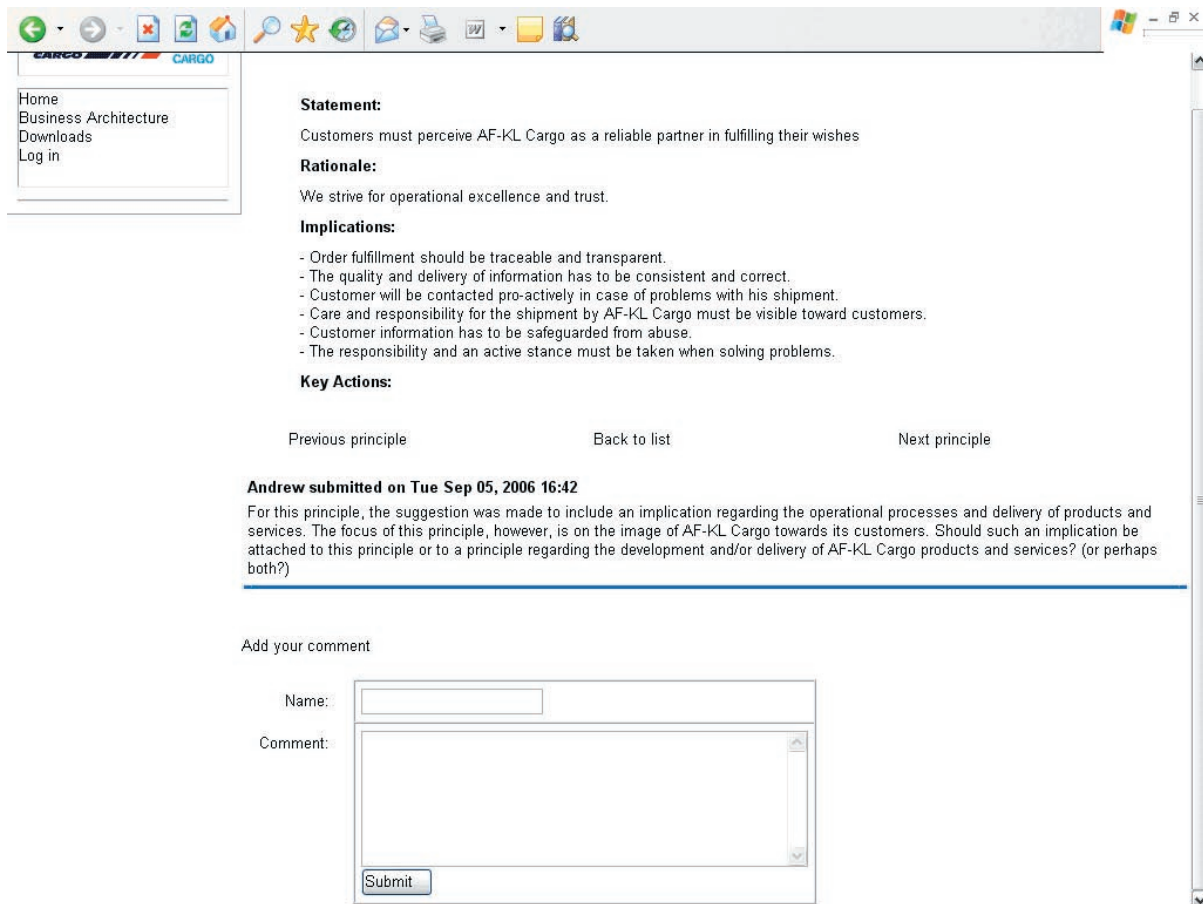


Figure 7: The Business Architecture website.

Despite the good intentions of the website, the commenting functions were never used by the participants. Apparently, the threshold for the participants to discuss the principles online was still too high. The main reason given is they have no time, considering the normal day-to-day tasks they have to carry out. Another reason was that it isn't clear what will be done with the principles once it is reviewed. Although it is not explicitly mentioned by the participants, a possible reason could also be the unfamiliarity with the technology.

To encourage the use of a website such as the business architecture website, the sense of urgency for EA has to be raised. This can be achieved by applying the methods described earlier.

3.4 DEVELOPING AF-KL CARGO ARCHITECTURE

In the previous sections, two main prerequisites for developing the AF-KL Cargo business architecture have been covered. First of all, because the business architecture consist of principles, it is necessary to examine how these principles should be formulated. Secondly, a starting point for developing the business architecture is needed. This starting point includes the fact that those who are involved in the development of the business architecture understand the notion and value of architecture.

The development of the business architecture can be carried out using various methods. The methods that have been put into practice in the project include:

- Analyzing literature,
- Interviews and
- Group discussions.

Each of these methods is analyzed on how it could help carry out the process of architecture development as effective and efficient as possible.

3.4.1 ANALYZING LITERATURE

A method that can be done right from the start is gathering and analyzing literature regarding AF-KL Cargo strategy and vision. Most documents related to the AF-KL Cargo strategy were already gathered during the analysis phase of the project. From the analysis it was clear that these documents alone wouldn't provide an overview of the business of AF-KL Cargo. Additional information had to be found to develop the business architecture principles. Such information has been gathered from sources such as AF-KL Cargo public websites and annual sustainability reports.

After the information has been collected, it has to be structured such that the relevant information is retrieved more easily. During the project, this structuring proved to be a challenge, due to the amount of information and the complexity of the information. Nevertheless, an attempt has been made on providing an overview of the AF-KL Cargo strategy and mission. However, it became apparent that the information itself didn't provide much clarity on the AF-KL Cargo business, because the context of the information remained unclear. Although the context can be made clear by examining additional literature, the amount of information could result in added complexity during structuring and analyzing.

Using the business architecture framework described earlier, business principles have been identified from the structured information. However, these principles can't be included in the architecture, simply because they aren't developed by those working with these principles. The architect's perspective on the enterprise is, but shouldn't be incorporated in the principles; although the principle statement can be traced back to the literature, the rationale and implications are mainly devised by the architect.

Nevertheless, the business principles developed from the literature can still be of use in the development of the business architecture. The value of these principles is that they provide topics that can be used in the discussions with participants of the development process. These business principles are presented in appendix B.3.

3.4.2 INTERVIEWS

As explained earlier, raising the awareness for EA can be done by interviewing people within the enterprise. During these introduction meetings, the person being interviewed is also asked to tell a bit about the AF-KL Cargo business. By asking the right questions at the right moments, the principles that are implicitly used by the person can be identified.

Adopting this method is complicated, because it requires the architect to rely on his or her communication skills. To carry out this method, it is necessary to prepare for the interview properly. Having knowledge about the person being interviewed, the department, his or her history, etc can put the architect in a good position to ask the right questions. Knowing which direction the interview should go helps in determining when to ask a certain question.

The interviews that are held in the project were used to examine this method. In most of the interviews this strategy to identify principles worked. However, on some occasions it failed, because the conversation was too abstract and it wasn't clear where the interview is going. This was mainly due to unexpected circumstances and the lack of experience to deal with these situations.

Relating the difficulty of pulling of this method to the principles that are identified eventually, it becomes obvious that the architect should not put too much effort in and expect a lot from this method. Although the principles are from someone in the enterprise, the formulation of the principles boils down to the architect's interpretation of the interview. Therefore, the value of the principles from interviews is similar to the principles from the literature.

3.4.3 GROUP DISCUSSIONS

Earlier in this report, the importance is stressed of involving people from the enterprise in the development of business principles. This evidently means that discussions must be held of which the participants are employees in the enterprise. The discussions that are held can be divided in two formats:

- Brainstorming format, in which the focus lies on devising principles, and
- Reviewing format, in which the focus lies on reviewing developed principles.

Both discussion formats have been tested in the project. All group discussion sessions held for the project have been reviewed and form the basis for the explanation below. The reviews are provided in appendix B.4.

Brainstorming

The brainstorming sessions are held for the participants to discover the business principles by which they do their jobs. The focus in such a session lies on opening the participants' minds and creating an open atmosphere. This is the main task for the facilitator of the session.

The process

The basic process each session is following consists of these phases:

- Introduction
- Discussion examples
- Generate principles
- Discuss the generated principles
- Evaluate session and closure

To explain the purpose of developing principles to the participants, a number of examples of principles are discussed. These examples have already been sent to the participants in order for them to prepare for the session. An example of the preparation material for a session is presented in appendix B.5. The pizzeria example used in the presentation to explain the concept of EA is also used to develop example principles for the session. By focusing on a different enterprise than AF-KL Cargo, the participants are stimulated to think about the purpose of principles in general.

After having discussed the example principles for the pizzeria, the focus of the session shifts to AF-KL Cargo. The participants are asked to generate as much principles as possible within a certain time frame. Each principle that is generated should consist of a statement and a rationale. To provide additional guidance for this part of the session, the main questions that should be answered are presented. An example of such a question would be:

"How should AF-KL Cargo develop its relationship with the customer?"

For some sessions, an alternate technique has also been tested, the reversal method. This method stimulates the participants to think about the opposite of the main question:

"How should AF-KL Cargo NOT develop its relationship with the customer?"

A principle from this question could be:

"All customers are treated the same way"

Because this principle explains the opposite of how AF-KL Cargo should develop the customer relationship, the opposite of this principle, which concerns the differentiation of customers, can be regarded as a proper principle.

Although on paper this reversal method may seem like a good idea, in practice it is difficult to explain to a group that is confronted with developing principles for the first time without confusing them. Also the added value of applying this method isn't significant. These are the reasons why this method isn't recommended for these sessions.

After generating the principles, the principles were discussed to formulate them properly. Before focusing on the formulation of the principles, the principles focusing on the same topic are clustered to speed up the discussion.

Group Support System

Although such a brainstorming session can be done using attributes such as a whiteboard and post-its, the sessions held for the project are carried out using a Group Support System (GSS) [21], which is also known as a Group Decision Tool (GDT). In essence, these systems enable a group to discuss issues more effectively and efficiently, especially when it concerns a large group. Each group member has a workstation with which the member can send messages to a central system. The central system displays the input from all group members on a big screen. The main reason for adopting such a system for the brainstorming session is that it enables electronic logging of all information and quick access to the information.

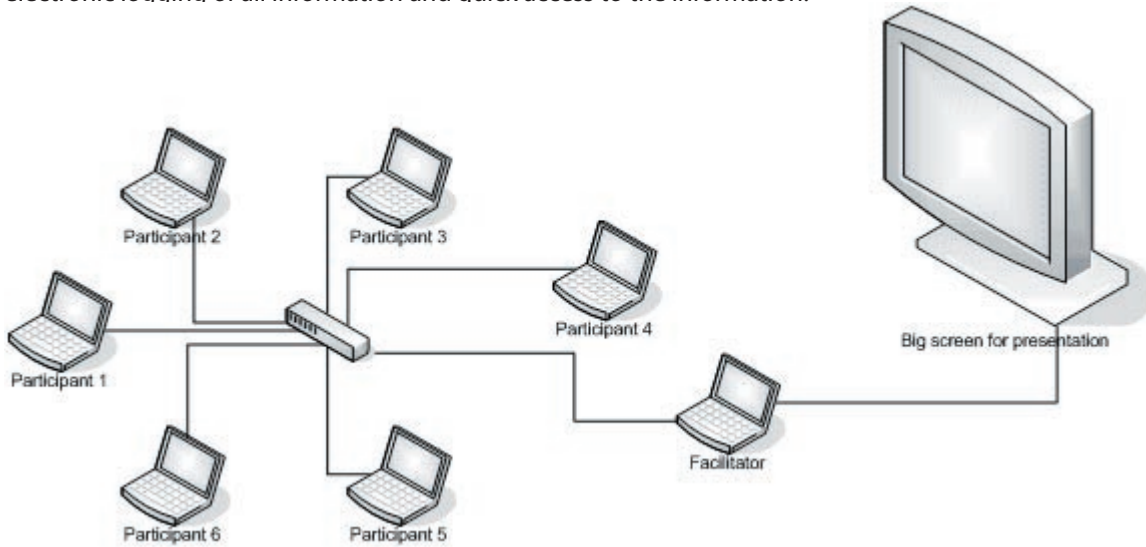


Figure 8: The basic setup for a session using a GSS.

Unfortunately, most GSSs have to be bought and installed on all workstations before it can be used. These tools also often require training in order to use it properly. Because of the limited amount of time for the project, the decision has been made to develop a web-based GSS. This GSS consists of a server running the database and website and the clients, which are standard browsers that can be found on all workstations at AF-KL Cargo.

The website that can be visited by the participants includes several pages of which the "Generate Principles" page is most important. This page is used by the participants to enter a statement and rationale and send it to the server as a principle. This page also enables a participant to see all principles that have been generated by the whole group. Next to the "Generate Principles" page, there are also pages that allow a participant to see all principles and clusters that have been formed for the discussion. The manual that has been created for the participants is presented in appendix B.6.

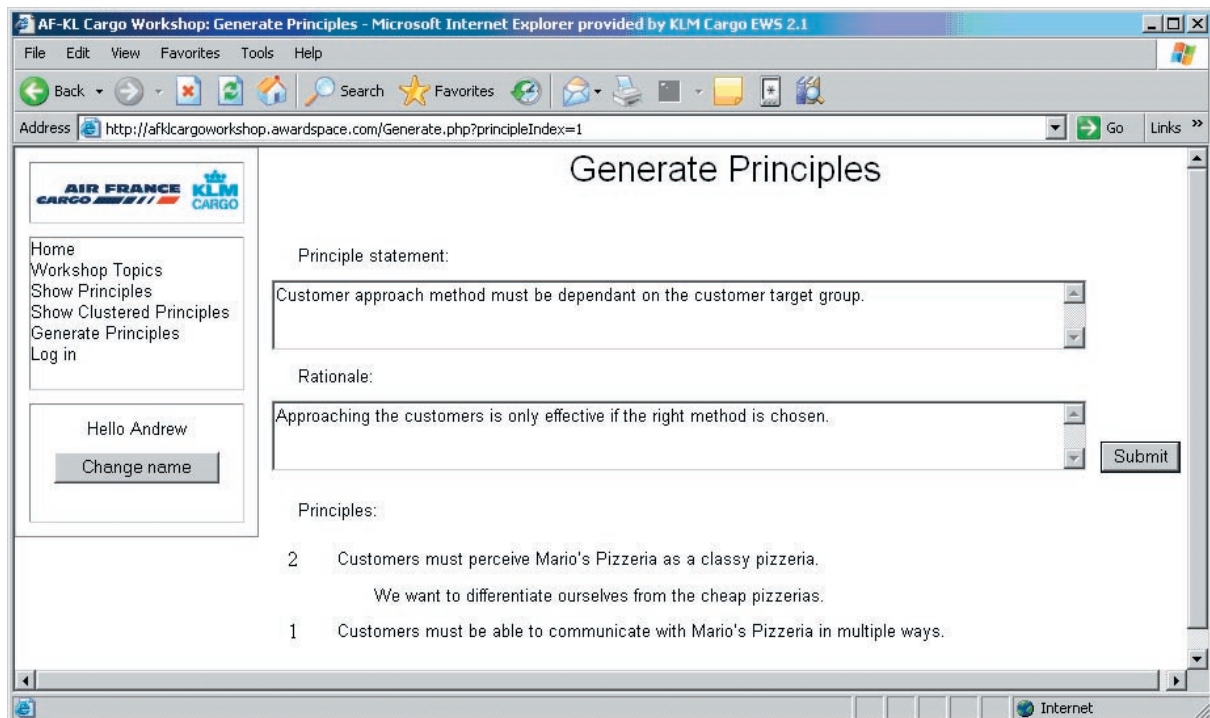


Figure 9: The "Generate Principles" page.

The facilitator has additional pages that can be used for the discussion. First of all, the "Cluster Principles" page is used to group together related principles that have been generated. Next the "Discuss Principles" page enables the facilitator to show all elements of a principle and edit those elements. Finally a "Manage Principles" page is available to delete a principle, a cluster or remove a principle from a cluster.

The use of a database shows the advantage of using a GSS. Principles that have been generated are immediately available for clustering and after clustering the principles, these clusters are also immediately available for discussion in the "Discuss Principles" page. Another advantage is the ease of generating a document with the results of the meeting, which can be sent to the participants.

Results

The results of the brainstorming sessions that are held for the project mainly depended on the participants and the size of the group. Having participants that aren't able to verify the principles will not lead to the right set of principles. This is apparent in the discussion phase of the sessions in which principles are being questioned and tough issues are being discussed. Participants that are able to verify principles will also devise principles that are more relevant for the business. The size of the group is also critical for the success of a brainstorming session. A larger group will provide more input and stimulate the participants to discuss more.

Involving the participants during the session is necessary for the acceptance of the principles. During the sessions that were held, the participants were involved in the discussions, mainly because they were the ones providing the topics for discussions.

The free-format approach for the participants to generate principles also helped in discovering principles. In stead of explaining how a principle statement and rationale should be formulated correctly, the participants are free to formulate statements and rationales in their own way. Formulating the principles correctly is done during the discussion of the principles, during which the participants are stimulated to translate vague statements into clear principles.

Reviewing

This format is mainly applied to review principles that have been generated and discussed during a brain-

storming session. The process is straightforward and clear. The purpose of such a session is to verify and reformulate each principle. Because the principles are already discussed during the brainstorming session, the focus of verification and reformulation lies on clarifying the principles.

Although the GSS could be used for a review session, the sessions held for the project didn't have many participants. The sessions were held in an office instead of a conference room and all participants received the principles that will be discussed during the session on paper.

Reviewing principles in a small group works well, because the session clearly results in a more clarified set of principles. However, despite the risk of not discussing all principles, a larger group could identify more problems with the formulation of a principle than a group consisting of, for example, 3 persons.

A risk of reviewing principles in a small group is that the facilitator of the session is drawn into the discussion. Unless the facilitator is also a participant of the session, the facilitator should only steer the discussion toward the right direction and have the participants discuss about the substance of the matter.

4. Evaluation

4.1 THE BUSINESS ARCHITECTURE VALUE

4.2 THE DEVELOPMENT PROCESS

In the development phase of the project, a number of business principles were developed for the business architecture. These principles are presented in appendix B.7. To examine this architecture, two things must be evaluated:

- The value of the business architecture and
- The process of developing this business architecture.

4.1 THE BUSINESS ARCHITECTURE VALUE

In order to evaluate the value of these business principles, the focus of the evaluation should be on how well the business principles can be applied in practice. For this purpose, a number of projects have been selected and examined to what extent they comply with the business principles regarding the customer relationships.

Projects

The projects that have been analyzed are related to developing the customer relationships. This improves the relevancy of the principles that have been developed. The following projects have been chosen:

- Unique Voice Portal
- Call management
- Customer Information Management

A description will be provided for each project and an analysis concerning the extent to which these projects comply with the principles regarding customer relationships.

Unique Voice Portal

Current booking tools, Webpearl and Visual, are used to book a shipment on either Air France or KLM. Unique Voice Portal (UVP) is a project to realize a common booking tool to provide customers more flights to book their shipments. UVP can be considered as a shell around Webpearl and Visual. Users logging on to the UVP are able to retrieve all basic information regarding all the AF-KL Cargo flights. Combining the booking tools to present this information requires combining other tools as well, such as the customer databases and the pricing tools.

This project can be mainly mapped on the following two principles:

- Effort spent on a customer must be related to the current and potential value of the customer.
- Every customer contact must be handled in the context of an ongoing relationship with that customer.
- Customers must be able to contact AF-KL Cargo in multiple ways.

Without the UVP, a Customer Service employee using Webpearl isn't able to see the Air France flights and therefore can't book a shipment on an Air France flight if no space on a KLM flight is available. The employee has to manually redirect the customer to another employee who is using Visual to check if an Air France flight is available and to book the shipment on an Air France flight. This indicates that the average effort spend on a customer is decreasing, which is in compliance with the first principle.

By combining information from the customer databases, a user of the UVP is able to create a complete overview of the history of the customer with AF-KL Cargo. This information allows a Customer Service employee to communicate with the customer appropriately and improve the relationship with the customer.

By having a joint portal to place a booking on an Air France or a KLM flight, a customer doesn't have to specifically contact a Customer Service office of Air France to book a shipment on an Air France flight. The UVP allows KLM Customer Service offices to function as a channel to the Air France operation and vice versa.

Call Management

The Call Management project focuses on ensuring that a customer calling the Customer Service will be talking to a certain Customer Service office or perhaps even an employee. By connecting the various Customer Service offices around the globe, the customer can be automatically redirected to the right office. To which employee the caller is redirected is predetermined and number recognition is used to identify the caller. This ensures that a customer will usually be dealing with known employees, which improves the relationship with the customer.

This system is also used to redirect calls in case an office is unavailable. Another employee will catch the call and handle the customer request. The strategy behind this decision is that no calls should be missed. Although this implies that sharing customer information is also part of this project, Customer Relation Management is not within scope. Yet, information on all calls is gathered for management purposes in order to deploy Customer Service employees as efficient as possible.

Reviewing this project with the business principles from the Customers domain shows that the project centers on the following principles:

- Effort spent on a customer must be related to the current and potential value of the customer.
- The approach of the customers must be customer specific.
- Every customer contact must be handled in the context of an ongoing relationship with that customer.
- Customers must perceive AF-KL Cargo as a reliable partner in fulfilling their wishes.

By having your Customer Service employees handling calls from already known customers in stead of random customers, the amount of effort for each customer should decrease. Employees have access to the information of these known customers, which makes the handling of the customer request quicker.

Each customer is redirected to a certain Customer Service office that is most capable of handling the customer request. This office has knowledge concerning the customer, its history with AF-KL Cargo, the local situation, etc. Specific knowledge ensures that each customer is approached appropriately.

As mentioned earlier, each time a customer calls, he or she will most likely be dealing with the same Customer Service employees. Such a personal approach help build a firm relationship with the customer.

By implementing the strategy of not missing a single call, AF-KL Cargo ensures that its Customer Service offices will be available for the customers as much as possible. Being reliable is one of the selling points of the AF-KL Cargo brand and this project helps increasing this reliability.

Customer Information Management

Two objectives are given for realizing a project such as the Customer Information Management (CIM):

- To provide all employees dealing with customers with information regarding customers and shippers
- To share knowledge about customers throughout the enterprise.

The CIM enables employees to have access to all information related to customers and shippers such as agreements, performance and history. Having this information available while handling customers will improve the quality of service delivered to the customers as well as the time necessary for handling the customers.

Sharing information throughout the enterprise ensures consistency in the communication towards the cus-

tomers. All contacts with the customer or shipper will be based on the same information, which should avoid problems externally with the customers and shippers and internally between departments.

The project seems to be an implementation of the following principles:

- Effort spent on a customer must be related to the current and potential value of the customer.
- Every customer contact must be handled in the context of an ongoing relationship with that customer.
- Customers must perceive AF-KL Cargo as a reliable partner in fulfilling their wishes.

Having the right information at the right time contributes to an efficient communication with the customer. All AF-KL Cargo employees who are in direct contact with the customers should be able to use this information to take appropriate decisions. The effort of gathering and managing information should be minimized.

Information regarding a customer, his wishes and history with AF-KL Cargo is essential in building a relationship with that customer. The CIM project is aiming to provide this information for this particular purpose.

Being consistent and correct throughout the enterprise regarding customer information ensures that not only the communication with the customers goes smoothly. Consistent and correct information is also critical for a proper execution in the operation. A smooth communication and operation contributes to an improved reliability.

Opportunities

The evaluation of the three projects using the principles shows that the focus clearly is on a number of principles. These principles mainly concern the communication with the customers. Although the other principles are also regarded as proper AF-KL Cargo principles that should guide them in their decisions, no or very little plans have been made to raise the compliance with these principles.

As indicated before in this report, a list of the key actions should be made to determine how to improve or maintain compliance with the principles. However, considering that a project portfolio consisting of projects that address the principles, the key actions for the principles are implicitly included in the projects.

The principles that receive little or no attention can be seen as opportunities for improvement and should also be taken into consideration while determining new projects. The business value of these projects is safeguarded by the business principles that can be mapped on the projects. However, it remains a challenge to translate this business value into financial benefits, which is also used to score projects.

4.2 THE DEVELOPMENT PROCESS

The process of developing the business architecture mainly revolves around raising the support for the architecture and the methods used to develop the principles. Both issues have already been described in the previous chapter and are evaluated below.

Enterprise architecture awareness

Two kinds of meetings that are held to raise the EA awareness have been described earlier, the introduction and discussion meetings.

The introduction meetings that were held had the purpose of raising the awareness such that they are interested to participate in discussions concerning principles with other people from the business.

Regardless of how these introduction meetings went and which methods had been used, all persons that have been interviewed were interested to see whether they could identify principles and discuss these principles with colleagues. However, some have indicated that although the concept of architecture is good, they're not sure whether or not they are the right people to ask about principles. They feel that it is not up to them to come up with principles, but that senior management should determine the principles.

Having experienced the development of business principles during the discussion meetings, the participants were asked how much they would value these business principles. All participants were quick to indicate that the process of the business architecture development is valuable. The discussions showed to them the different perceptions on the enterprise and the importance of having a shared understanding regarding the business of the enterprise.

According to the feedback during the discussion meetings, the business principles themselves could play a role in the enterprise development. However, because senior management wasn't involved in the process, they're not sure about this.

Development methods

Besides raising the awareness for EA, the previous chapter also described methods for developing an EA. Each of these methods has its advantages and disadvantages.

Developing principles from literature takes a lot of time compared to the other methods, due the amount and complexity of information. Compared to the outcome of applying this method, the amount of time and effort put into gathering and structuring information is too much. The principles themselves should be regarded as examples and efforts on formulating the principles should be kept to a minimal. Nevertheless, it can provide the architect insight in what the current issues are within the enterprise.

The second method that has been explained was using the interviews with people from the business to subtly discover principles. Similar to using literature to discover principles, using these interviews as a source for principles isn't as effective and efficient as having a group discussion. There's also the risk of failing and creating more confusion. Therefore, these introduction meetings should mainly focus on explaining the concept and value of EA and learning how the business works.

Group discussions should be done with participants who already understand the concept and value of EA. Besides raising the awareness for EA, introduction meetings should also especially be used to prepare the person to participate in a group discussion.

The group discussions held for the project was perceived to be efficient and effective. In about 15 minutes, a group consisting of 8 people was able to come up with more than 50 possible topics for discussion, which eventually were formulated into 10 principles, after discussing them for about 2 hours. This efficiency was also contributed by the use of the GSS, with which the participants were able to come up with ideas simultaneously.

Although generating principles didn't cause any problems, it can be improved considerably. What has been observed was that while the participants generated principles easily, it was difficult for the participants to start generating immediately. In order to improve this part of the workshop, the participants could be asked to devise principles for the Pizzeria example. This could warm them up a little bit before starting generating principles for AF-KL Cargo.

Another difficulty with the group discussion is that it seems as though there never is enough time discuss everything. Developing the principles takes a lot of time. Even after several review sessions, the 9 principles for the Customers domain in the business architecture can be clarified more to avoid ambiguity.

This lack of time is also contributed by the fact that people from the business are very busy with their day-to-day work. Scheduling a group discussion is a challenging task, because finding a 2 to 3 hour time period in which all participants are available is virtually impossible or one has to settle for waiting a couple of months. Another problem of scheduling a meeting is the fact that an organizer of a meeting doesn't know whether a participant is able to move other meetings. A possible solution to this problem is to schedule the next meeting at the end of a group discussion. This enables the organizer to ask all participants whether or not they can reschedule other meetings.

5. Conclusion

The goal of the thesis project is to examine various ways to develop an EA. The project definition was formulated in the following question:

“How can the AF-KL Cargo strategy and best practices be captured correctly in an enterprise architecture?”

First an analysis has been made to gather information regarding the current status of the EA awareness within AF-KL Cargo. This analysis formed the starting point for the development of the EA. The development included the focus on three different aspects of the development process:

- First of all, the formulation and organization of principles has been addressed.
- Secondly, various ways to raise the awareness for EA awareness have been investigated.
- Thirdly, methods to gather and develop principles were tested.

After having studied the methods and tools used to develop an EA, the principles that have been brought about and the methods that were used have been evaluated.

While most parts of the project are based on a trial-and-error approach, the formulation and organization of the principles were mainly based on the little amount of literature that could be found on this topic. Nevertheless, a number of guidelines have been given for the formulation. These guidelines largely focus on how principles should be perceived in stead of describing strict rules concerning aspects such as the structure and words that have to be used.

For the organization of the principles, a business architecture framework has been developed. Although this framework presents essential aspects of an enterprise's business, it isn't safe to say that this framework is complete. For instance, it is not clear how external forces such as the government should fit in the framework.

The guidelines for formulating the principles and the business architecture framework present a starting point for the development of the principles. However, the project showed that most of the decisions regarding the formulation and organization of the principles were taken during the group discussion meetings. The essential lesson learned from these meetings is that ultimately the group decides how to formulate a principle. An architect provides guidance for the formulation when this is needed. Guidance can be provided by using the guidelines presented in this report to suggest a certain principle formulation.

Raising the awareness for EA involves dealing with social issues. It should be made clear that EA is not something very technical or theoretical. To prevent giving the wrong impression of EA, examples should be used. This is considered to be the most effective way to get the right message across. Examples could be given regarding, for instance, what the business of an enterprise is or how principles look.

Gradually during the project the need for an EA became acknowledged. The willingness to spend time and participate in discussions from key persons within the enterprise showed that developing an EA addresses issues that are important for the future development of the enterprise. However, it is noticeable that these persons who were involved in the project fear that senior management is not on the same level regarding the sense of urgency for EA. Support from senior management is critical in order to receive full commitment from the participants of the development of the EA.

It must be stressed that EA is just a tool to help an enterprise implement its strategy properly. Part of the awareness of using an EA for strategy implementation is the awareness of developing the enterprise in general. Participants of the development process should be aware of this need to develop the enterprise and more importantly that they play an important role in this enterprise development. To stress this point, a distinction could be made between EA awareness, focusing on the use of EA for strategy implementation, and enterprise

awareness, focusing on development of the enterprise in general.

Analyzing documents to gather possible principles provides a good preparation for the meetings with the participants of the development process. This helps in learning how the business works. To learn more about the people who are participating, interviews should be used. The main method for developing an EA is the group discussion, which enables a group to take a lot of decisions in a rather short amount of time. Developing principles in a group also raises the commitment from the participants, because participants stimulate each other to join the discussions.

While the participants were brainstorming to discover principles, a GSS has been used to support the process. Besides improving the efficiency of the session significantly, the GSS also functions as a break from the traditional way of carrying out these sessions. Nevertheless, the tool is kept as simple as possible to avoid problems with the usage of the tool.

The evaluation of the projects using the principles from the Customers domain showed that these projects mainly involve developing IT and in particular developing the communication using IT. Therefore it comes as no surprise that those principles addressing the communication with customers and the consequences of developing this communication can be mapped onto these projects. If all the principles are to be tackled in the projects, the project portfolio should include projects that involve areas other than IT.

Evaluating the principles also demonstrates that it can be used to determine the business value of a project. However, a proper analysis of the business value was not possible, because principles from other domains, which haven't been developed, should also be taken into consideration. Including these principles provides a more complete view of how valuable a project really is.

All persons who have participated with the development of the principles have indicated that the process of developing the business architecture is valuable. The effective and efficient methods that were used also contributed to this opinion. Especially the GSS that was used to support the brainstorming session process received a lot of attention. Considering the generic nature of the process, this process and the GSS could also be valuable for other purposes, such as innovation workshops.

Returning to the main question asked at the beginning of the project, an answer to this question has been given in the results of this project, which include the following:

- Guidelines to formulate principles,
- The business architecture framework to help organizing the principles,
- The methods used to raise the EA awareness,
- The methods used to develop principles,
- A GSS supporting the process of developing principles

6. Recommendations & Remarks

In this section of the report, a number of issues are addressed that deserve more attention. They are either recommendations for future research or remarks based on personal opinions.

First of all, it is possible to organize the principles by grouping them into several categories. These categories would indicate how important a principle is and how it should be treated. For instance, principles can be divided into the following three categories:

- Principles that must always be followed,
- Principles that must be followed, unless an exception is granted,
- Principles that should be followed.

This categorization is not good for a proper implementation of an EA. By having principles that must always be followed, the EA becomes rigid and there is the risk of people not committing themselves to the EA, because of these strict principles. Keeping the door open for exceptions is an important method to raise the commitment [22]. Furthermore, it is likely that principles that are put into this category are considered to represent decisions that are trivial, for instance:

“Customers must be treated correctly.”

For each of the principles that have been developed during the project, one can imagine a situation in which it is desirable to request an exception to the principle. For example a principle such as:

“The approach of customer must be customer specific.”

An exception on this principle could be made if a project is involved that has to be carried out rapidly in order to gain significant competitive advantage. The decision can be made to treat all customers the same for the time being and solve this problem at a later stage.

Having principles that are seen as nice to comply with isn't consistent with the purpose of the principles. Principles are not considered to be advices or heuristics, but serve the purpose of restricting the design freedom.

Nevertheless, it is useful to rank principles to indicate where the focus of the enterprise development should be. The projects evaluated in this thesis project showed that at the moment the focus mainly lies on communication; both externally with the customers and internally between departments. This ranking has to be done periodically to cope with change in the environment, strategy, etc.

From this report it remains unclear how a distinction can be made between implications and principles. During the group discussions, it became obvious that more clarity on this topic is needed. Principles were easily converted into implications of other principles and vice versa, without a solid reason why this should be done. Therefore, additional research should be conducted on this distinction and practical ways to put it into practice.

Another issue that was stumbled across concerns the ownership of the principles. In this report, the focus was more on the users of the principles. However, determining the owner of the principles is essential to create an overview of the responsibilities regarding the EA. In case of the Customers domain at AF-KL Cargo this is complicated, because three departments share the responsibility for customer relationship, Customer Service Office, Sales and Marketing & Communication. For a proper development of the EA, these responsibilities (owner, user, etc.) must be investigated more thoroughly.

While studying literature regarding EA and architecture principles, often they pay most attention to what EA

can do to align business and IT [23, 24, 25]. The interviews held during the project also showed that EA is initially associated with IT development, when in fact business-IT alignment is the wrong reason to start with EA. It represents a risk for the development of the EA, because the principles might focus more on IT development in stead of enterprise development. People should be made aware that the primary reason for adopting an EA is develop the enterprise as a whole and not IT in particular. This is especially the case when developing a business architecture, which has little to do with IT at all.

The evaluation showed that by reviewing projects using principles, the business value of the projects can be indicated. However, the lack of principles from the other domains presented an incomplete evaluation of the projects. Another recommendation would be to also focus on other domains and develop principles regarding these domains. This would present a more complete view of how AF-KL Cargo should develop its business.

The conclusion indicated that the role of senior management is to provide support, which is considered critical for adopting EA. The most preferable way to express this support is to have members from senior management participate in the discussions. This stimulates other participants to join the discussions and raises the commitment from the participants to the EA development process.

The most remarkable outcome from the project is the fact that the group discussions are very useful for not only EA development, but the development of the enterprise in general. It makes people aware of the difference in views on the enterprise and the discussions ensure that a shared view is being created. An obvious recommendation from this project is to continue with these discussions and carry them out as much as possible.

To connect the principles to the current way of working at AF-KL Cargo, the relation between principles and the project portfolio has to be defined. The project portfolio consists of high level business cases. To evaluate these business cases, workshops are held. By including the principles in the workshops, the relation between the principles and the current way of working will be established.

The final recommendation from this project concerns the evaluation that has been carried out on the projects. One could notice that some principles were regarded as very important and some were left aside. Two principles that couldn't be mapped onto any of the projects received a lot of attention during the group discussions:

- Customers are actively involved in strategy development.
- Operational and financial reliability of customers must be actively managed.

This evaluation is only based on principles focusing on the customer relationship and it didn't involve evaluating the cost effectiveness of the projects. Nevertheless, it is clear that something has to be done to comply with these two principles, even though it can't be made clear if such an effort is worth investing.

An interesting issue that results from this project is the question whether or not the same methods and tools can be applied successfully in a different environment. The project was carried out as an action research, indicating that the purpose was to learn from experience. A different research approach has to be taken to discover methods and tools for EA development that can be used in general.

The following summarizes the recommendations resulting from the project:

- Rank principles periodically to indicate the current focus,
- Additional research on principle definition,
- Determine responsibilities regarding the development and governance of EA,
- Involve senior management in EA developments,
- Carry out discussions to work on enterprise developments,
- Focus on the business principles as a whole in stead of on a subset of the principles.

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