Business and IT Alignment with SEAM

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Abstract

Aligning business with IT requires understanding goals, strategies and needs. To be able to express them, an enterprise model can be developed. We present some of the traditional techniques used for the development of an enterprise model (value system, BPMN, UML) and compare them with a systemic method (SEAM). This comparison is done by presenting a real project done at the Swiss Federal Statistical Office. We also show that the concepts of goals, strategies and needs correspond to interpretations of the stakeholders of the enterprise model.

1 Introduction

Business / IT alignment is important for enterprises. It is believed that if this alignment can be maintained over time, it will contribute to the long term success of the enterprise.

Alignment or fit can be seen as the correspondence between a set of components [11]. This set of components can be defined in multiple ways. For example, Luftman & McLean define business-IT alignment as the correspondence between the strategies, goals, and needs of the business and the requirements of the IT system [7].

Knoll and Jarvenpaa [6] identify multiple dimensions of alignment, one of them being "external vs. internal" [11]. The strategies, goals and needs of the enterprise are most often related to external alignment. They seek to align the enterprise with its environment. Internal alignment addresses the way the enterprise implements its goals and strategies.

Enterprises maintain their alignment (external and internal) with respect to the constraints imposed on them by the environment and constraints, they impose on the environment. These constraints are often contradictory to one another, which forces enterprises to seek compromises between them [3]. This is the essence of strategic management [8].

Methods for business – IT alignment frequently analyze the alignment in terms of relations between a system, typically the IT system, and its immediate environment (e.g. group of users). This is especially true for the requirement engineering methods based on goals and scenarios [18].

However, considering the immediate environment of the envisioned IT system is not enough. The IT system and its users have themselves an environment (e.g. the rest of the enterprise). The enterprise has also an environment (e.g. the market in which it exists). For a complete alignment, all these environments must be considered.

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Traditionally, each level (e.g. market, enterprise, IT system) is analyzed with its specific method. So, reasoning about alignment requires using different methods. In this paper we present the use of SEAM ("Systemic Enterprise Architecture Method"). SEAM is designed to reason in a systematic and systemic manner about all these levels [20]. The goal is to be able to design SEAMless alignment between these levels.

This paper is based on an example taken from a concrete project of the Swiss Federal Statistical Office (OFS[1]). The OFS is a governmental organization providing statistics about Switzerland. The OFS collects data from multiple sources such as individuals, states and enterprises, computes statistics and publishes its findings to the public at large. OFS publishes data and statistics on a large range of subjects. They are valuable instruments in government decisions and many governmental and non governmental organizations rely on them for policy making. The project we describe was triggered by the efforts to optimize the use of the OFS IT resources. In this paper, we describe the SEAM enterprise model used by the OFS CIO in his decision process.

In Section 2, we define the key concepts of SEAM and, in particular, the concept of alignment. In Section 3, we compare SEAM to traditional modeling techniques in the context of the OFS project; we conclude the section with a discussion on how a SEAM enterprise model supports reasoning about business goals, needs and strategies. In Section 4, we present some related work. In Section 5, we conclude with a discussion of the impact of using SEAM and an outlook on future possible research.

2 Alignment and the SEAM Paradigm

SEAM defines a systemic (or holistic) paradigm for analyzing enterprises and their IT systems. It defines a method, modeling principles, and theories useful to model and reason about enterprises, their IT systems and the changes they go through [20]. In this Section, we define the key concepts of SEAM. We then define what we mean by alignment.

Enterprise model: In SEAM, the perceived enterprise reality is represented in a hierarchical enterprise model that typically describes the markets of an enterprise, the enterprise itself and its IT systems.

As-is and to-be: An enterprise model represents two situations: the "as-is" and the "to-be". These two situations are useful to describe a project. The "as-is" is the situation at the beginning of the project. The "to-be" is the situation at the end of the project. Moving from a situation as-is to a situation to-be in which the business - IT alignment has been analyzed, designed and verified contributes to increasing the business-IT alignment of the enterprise.

Organizational level: Each organizational level represents a partial enterprise reality. Each organizational level contains systems. A SEAM enterprise model typically has three or more organizational levels. In the OFS example, we have three levels: business organizational level representing the OFS and its partners (i.e. data providers, customers etc); the operation org level representing some of the OFS organizational units (e.g. sections and divisions); the IT organizational level representing the OFS employee and the IT systems. Additional levels could be added to describe either the market or the IT architecture.

System: Systems are defined as sets of collaborating entities. A system can be an IT system, a department, an enterprise, a network of enterprises, or even a market. Systems can be modeled as wholes (useful to represent roles of systems) or as composite (useful to represent the system's components and their collaborations). In our example, we consider the OFS as a whole (to analyze/design its roles relative to its partners) and as a composite (to analyze/design the collaborations between the OFS organizational units – such as sections, divisions).

Role: Systems represented as wholes have roles[2]. A role is defined as a behavior that changes the properties of the system fulfilling the role and of its environment. The changes are described in terms of pre and post-conditions. In our example, the OFS (as a whole) has the role "product generation" and the role's post-condition is the set of new products generated by the role.

Collaboration: Collaborations are defined in terms of simultaneous changes of the participants to the collaboration. Collaborations can also be understood as the "joint-roles" of the participants to the collaboration. Collaborations, as roles, are behaviors

[1] In this paper we designate the office with the French acronym OFS, for "Office Fédéral de la Statistique" (http://www.bfs.admin.ch/bfs/)

[2] The term role can be considered as a synonym for "service". SEAM can be used to analyze and design services provided by systems.

that change the properties of the systems that participate to the collaboration. The difference is that, in a role, only one system changes. In the collaboration, all participating systems do change. Collaborations are useful to describe the results of an action without detailing who does what and how things are done. In the OFS example, the OFS (as a composite made of sections and divisions) has the collaboration "product generation" that express the fact that all the participants need to achieve, together, a product generation. This collaboration is then mapped in the role of each participant to the collaboration. For example, the sections need to collect data.

Functional level: Both the collaborations and the roles can be represented at different levels of details. We call these levels "functional levels". In our OFS example, the interaction between the OFS sections and the divisions of interest will be analyzed at two functional levels. The first functional level describes the collaboration "product generation". The second functional level refines this collaboration into the specific roles of the participants that are necessary to create the product (e.g. "data collection", "transformation", etc…).

In SEAM, we define the alignment as:

System alignment between organizational levels: Two representations of a system in two (adjacent) organizational levels are aligned if it is possible to identify the behavior (i.e. role) described in the higher organizational level in the behavior (i.e. collaboration) described in the lower organizational level.

System alignment between functional levels (in the same organizational level)*:* Two representations of a system at two functional levels are aligned when it is possible to identify the behavior (i.e. role or collaboration) described in the higher functional levels in the behavior (i.e. role or collaboration) described in the lower functional level.

Business and IT alignment: To have a business - IT alignment requires having system alignment between organizational levels (from business down to IT) and system alignment between functions levels (within the same organizational levels). Section 3 illustrates this concretely. A more detailed discussion on the techniques for comparing behaviors (collaborations and roles) is available in [21].

3 Enterprise Models and Business / IT Alignment

In this Section, we first present the business and IT needs of the OFS (Section 3.1).

Next, we compare how an OFS enterprise model can be constructed using traditional modeling techniques and using SEAM. We present the relevant diagrams that represent the business (Section 3.2), the operation (Section 3.3) and the IT (Section 3.4) of the OFS. These three levels are traditionally analyzed in enterprise architecture methods. For each level, we present an "as-is" and a "to-be" situation. For each one (business as-is/to-be, operation as-is/to-be, and IT as-is/to-be), we present two modeling notations: a "traditional" one (that changes from level to level) and SEAM (which is the same from level to level). In SEAM, the differences between the levels lie in the heuristics used to reason about the content of the diagrams and not in the notation.

We conclude (Section 3.5) by a discussion on how an enterprise model developed with SEAM can be used to reason about business / IT alignment as defined by Luftman and McLean [7].

3.1 The Needs of the OFS

The OFS is part of the Federal Department of Home Affairs. The OFS issues statistics in different domains (e.g. agriculture, industry, education, etc). It manages more than 125 statistical products that are available in multiple forms (paper, online, off-line). The OFS is composed of seven divisions totaling more than thirty sections. Approx. 25 of them are responsible of producing statistics. Each of these sections is responsible for a domain of expertise, such as agriculture, education, etc. In this paper, we analyze, in a generic manner, the role of these sections. We ignore the role of the divisions at the exception of one of them: the division "infrastructure". This division has initially two roles. Firstly, it manages the data registries (e.g. list of all commercial enterprises and of all people in Switzerland). Secondly, it operates a data warehouse that holds the statistical data ready for publishing. The section "publishing" use this warehouse to deliver the statistics to the OFS customers. In this example, we will illustrate how a third role is identified for the division "infrastructure": the management of the geographical meta-data (e.g. definition of cities and states boundaries).

The partners of the OFS are the Data Providers and an IT Service Provider (another office of the Federal Department of Home Affairs).

To make its products, the OFS uses both commercially available statistical tools and proprietary tools developed within the OFS. It so happens that for historical reasons the different sections use different tools. The latest trend for commercial statistical tool makers is to provide suites. They develop a price scheme that encourages customers to purchase full suites (very expensive single modules, advantageous price for overall suite). As a consequence, the OFS is forced to purchase complete suites multiple times, which is not a financially acceptable solution. The custom OFS tools are also expensive, as they require maintenance which has to be done by each section.

To control these costs, the OFS has launched a major project called the "90 degree rotation" project. It is a major undertaking as it involves the whole OFS organization (several hundred people). One of the goals is to standardize the commercial tools: i.e. to reduce the number of commercial tools used within the OFS. Another goal is to standardize the custom tools: i.e. to maximize the reuse of the custom tools between sections. An extra benefit expected is the simplification of the data exchanges between sections.

In parallel, the OFS products and services need to evolve. We can illustrate this with two examples. First of all, customers require that more and more statistical data be represented on maps (e.g. statistical map with number of students per city). The OFS needs to improve the integration between geographically referenced data and regular statistical data. This requires a close partnership with the Swiss Federal Office of Topography (SwissTopo) [15] which defines the geographical meta-data for the Swiss government. In addition, (and last for this article), the OFS customers expect to get their data as OLAP cubes. An OLAP (On-Line Analytical Processing) cube is a form of data structure that enables interactive multi-dimensional analysis. This new need is the consequence of the new capabilities provided by the commercial statistical suites used by both the OFS and its customers. This illustrates that a change in IT capabilities can drive customer needs. It represents an additional challenge for the OFS.

In summary, it appears that the strategy of the IT tool vendors and the business strategy of the OFS influence each other. It also appears that, even if the standardization of the statistical tools is the largest project, this project is an opportunity for multiple smaller projects to be launched. This justifies the overall effort of explicitly analyzing and designing the business – IT alignment. The SEAM diagrams in Section 3.2 to 3.4 represent the result of this effort. When reading the paper, it appears as if the project follows a top-down approach. In practice these diagrams were developed through multiple iterations. In some cases, the business requirement was identified first and the goal was to implement this requirement. In other cases, the implementation was identified first and the goal was to understand the business requirements. As our goal in this paper is only to illustrate how a SEAM enterprise model can be used to support reasoning about business and IT alignment, we present the final OFS model and we do not present how it was developed. The benefits of using an approach such as SEAM are discussed in the conclusion.

3.2 Business: Modeling Business Relations

Modeling the environment of an enterprise requires the modeling of the enterprise's relations with other enterprises and individuals. Aspects such as relationships with customers, suppliers, regulators etc. are modeled and analyzed. We therefore present the way the OFS business relations would be modeled with a traditional technique, i.e. Porter diagrams, followed by the same relations modeled with SEAM.

3.2.1 Traditional Business Relation Modeling

Probably the most popular business modeling tools for understanding the situation of an organization in its environment is the value system [10]. We can use this tool to represent the OFS and its current environment (as-is), and the desired OFS in its desired environment (to-be).

Figure 1 represents the OFS value system, as-is. Each "arrowed rectangle" (shape defined by Porter in [10]) represents an enterprise, e.g. the OFS, the OFS customer etc. The "product" flow goes from left to right. The diagram hints that the OFS aggregates and analyzes data coming from its data providers and delivers it to its customers.

Figure 1: Porter's Value System as-is of the OFS

Figure 2 represents the OFS value system, to-be.

In Figure 2, SwissTopo, provider of standardized geographic meta-data, is added.

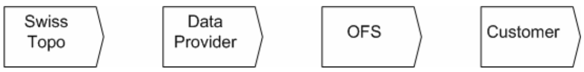

Figure 2: Porter's Value System to-be of the OFS

The advantage of the Porter notation is its simplicity. However, this simplicity creates some challenges. First, the sequence of the enterprises is not always obvious (e.g. unclear whether the meta-data provider needs to appear before or after the data provider). This is a consequence of the linear nature of the diagram. Second, the value system diagram doesn't convey why the cooperation with the partner enterprises is necessary (e.g. why are the meta-data necessary). Third, the diagram does not show the other needs of the enterprises, in particular, the needs not directly related to the structure of the value system (e.g. what is exchanged between companies or the need to develop new products).

3.2.2 The SEAM Business Organizational Level

The SEAM Business Organizational Level is a richer representation of the Porter's Value System.

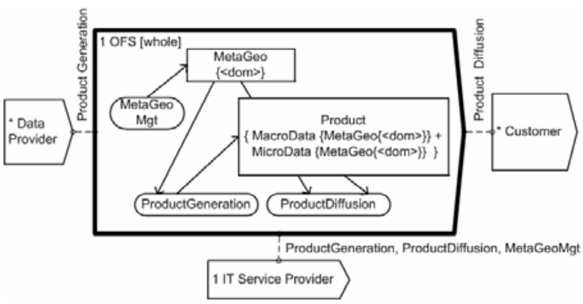

Figure 3: SEAM Business Org Level, as-is

Figure 3 represents the business org level as-is. Figure 3 is the SEAM equivalent of Figure 1: the value system as-is.

Figure 3 represents the OFS as the central system and its partners are around it. On the associations between the partners and the OFS, it is possible to see in which role the partners participate. For example, Data Provider participates to ProductGeneration, Customer to ProductDiffusion and IT Service Provider to all.

Within the OFS, we represent the main roles: ProductGeneration which creates the Product and ProductDiffusion which distributes the Product to the Customer. Each role is described in terms of the system properties involved in the role. For example, Product Generation creates Product and uses MetaGeo data. ProductDiffusion uses Product and MetaGeo.

In SEAM it is possible to describe the Product characteristics. For example, the Product contains MacroData (technical term for the statistics) and MicroData (processed raw data). Both depend of the MetaGeo (geographical meta-data). These meta-data vary within the OFS as indicated by the parameter <dom>. <dom> represents a domain of statistics. This reflects an internal OFS issue that will be discussed in Section 3.3. This variation of meta-data is actually a business issue that has to be addressed by the OFS project.

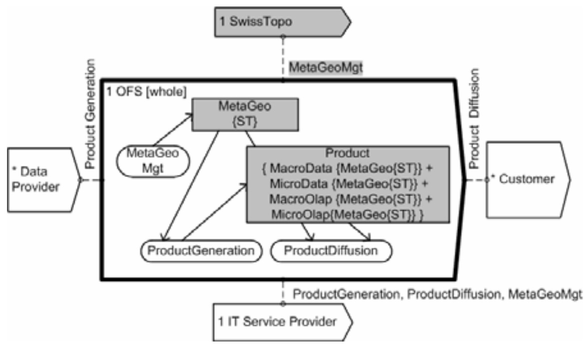

Figure 4: SEAM Business Org Level, to-be

Figure 4 represents the business org level to-be. Figure 4 is the SEAM equivalent of Figure 2: the value system to-be. Within the SEAM enterprise model, it is related by an as-is / to-be relationship to Figure 3.

Figure 4 shows the OFS goals at the business level. The graphical elements in gray put an emphasis on what is important. We can see a new partner, SwissTopo (ST). It is involved in the management of the geographical meta-data. Thanks to this partner, the geographical meta-data can be standardized. This is illustrated by the change of state of MetaGeo from {<dom>} in Figure 3 to {ST} in Figure 4. Finally, two new products have also appeared (MicroOLAP and MacroOLAP).

The SEAM diagrams provide more information than the Value System diagrams. In particular, they make explicit the role of the enterprise and when are its partners involved. The drawback of the SEAM notation is its relative complexity compared to the Porter's notation (Figure 1 and 2).

3.3 Operation: Modeling Business Processes

In this Section we show an operational model of the OFS. It describes the OFS business processes.

3.3.1 Traditional Operations Modeling

We analyze the OFS product generation business process: i.e. the activities needed to develop a new statistical product. The notation is the Business Process Modeling Notation (BPMN) [2]. Note that other notations (such as UML [17], IDEF [5], UEML [16], etc) could be used to represent the business process.

Figure 5: BPMN Business Process of OFS (as-is)

Figure 5 represents the operations as-is of the OFS. The diagram is implicitly aligned to the as-is value system shown in Figure 1. The alignment can be guessed as Collection (Figure 5) is performed because the OFS has DataProvider as a predecessor in the value system (Figure 1).

Figure 6: BPMN Business Process of OFS (to-be)

Figure 6 shows the operations to-be of the OFS. The diagram is implicitly aligned to the to-be value system shown in Figure 2. In the new business process, the management of the geographical meta-data is made explicit (although it is not visible that the generation of the meta-data is done asynchronously to the generation of the statistics).

3.3.2 The SEAM Operation Organizational Level

The SEAM operation level also describes the OFS business processes. We represent two functional levels. The first functional level is useful to make explicit the alignment between the business org level (Section 3.2.2) and the operation org level (current section). The second functional level is useful to make explicit the alignment between the operation org level (current section) and the IT org level (Section 3.4.2). In both cases, an as-is and a to-be are developed.

All diagrams in this Section represent the OFS system as a composite. The OFS sections and the OFS division infrastructure are visible together with their roles and the collaborations between them.

First functional level:

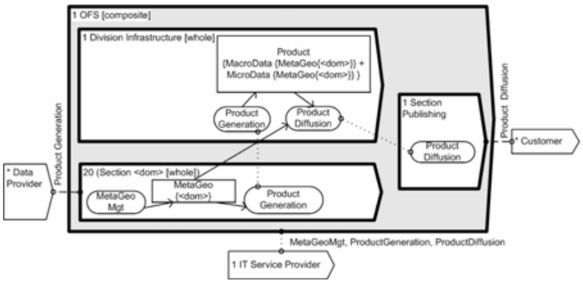

Figure 7: SEAM Operation Org Level; first functional level, as-is

Figure 7 shows the as-is of the first functional level of the operation org level. It is not equivalent with Figure 5 as the process is not shown at the same level of details. Within the SEAM enterprise model, it is *organizationally* aligned with Figure 3 which shows the responsibilities of the OFS.

This diagram makes explicit which OFS organizational units fulfill the OFS responsibilities. For example, the role ProductGeneration of the OFS in Figure 3 corresponds to the collaboration ProductGeneration happening between Section <dom> and Division Infrastructure in Figure 7. We also make explicit who is in charge of storing information.

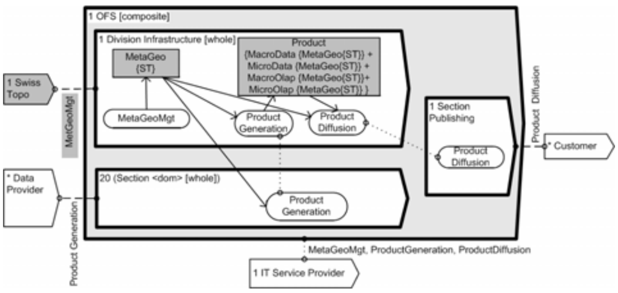

Figure 8: SEAM Operation Org Level, first functional level; to-be

Figure 8 shows the to-be of the first functional level of the operation org level. It is not equivalent to Figure 6 (not the same level of details). Within the SEAM, enterprise model, it is *organizationally* aligned with Figure 4. In addition, it is related by an as-is / to-be relationship to Figure 7.

The comparison between Figure 7 and Figure 8 highlights the impact of the described project. We can see in the as-is diagram that the geographical meta-data is managed by each of the domain-related sections. As the goal of the OFS is to get a better standardization of these geographical meta-data, the OFS needs to transfer the responsibility to manage these meta-data from each section to one entity that will manage it centrally, in collaboration with SwissTopo. This is visible in Figure 8: the geographical meta-data are managed by the Division Infrastructure. Figure 8 also shows the appearance of the "OLAP" products at the operation level (as it did appear in the business org level to-be).

Second functional level:

In the second functional level, the specific sub-roles that need to be executed by the sections and by the Division Infrastructure are identified. This more detailed description of the business process is useful to establish the alignment between operation and IT. As more details are required to describe the situation, we focus on the "ProductGeneration" to keep the diagrams simples.

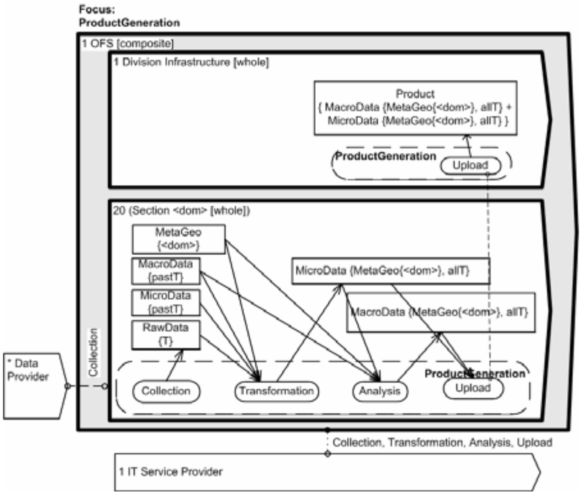

Figure 9: Operation Org Level; second functional level; as-is

Figure 9 shows the as-is of the second functional level of the operation org level. It is equivalent to Figure 5. Within the SEAM enterprise model, it is *functionally* aligned with Figure 7.

The diagram in Figure 9 makes the current product generation explicit. The Section <dom> collects the Raw Data at a given time. These Raw Data are then process in Transform (i.e. made anonymous, verified, merged with the MicroData of the previous time periods). The result is a set MicroData for all time periods. The Section <dom> then Analyze these MicroData to produce the MacroData (which are the actual statistics). Both MicroData and MacroData are exported to the Division Infrastructure that stores them till they are used by the Section Publishing upon requests from the Customers.

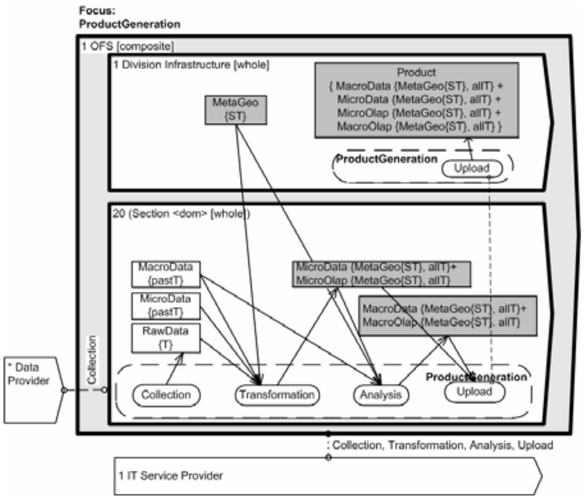

Figure 10: SEAM Operation Org Level; second functional level; to-be

Figure 10 shows the to-be of the second functional level of the operation org level. It is equivalent to Figure 6. Within the SEAM enterprise model, it is *functionally* aligned with Figure 8. It is related by an as-is / to-be relationship to Figure 9.

By comparing this diagram with Figure 9, it is possible to see the new products generated and the change of responsibilities relative to the geographic meta-data.

3.4 IT: Modeling IT Systems' Roles

In this Section we briefly describe how the IT system can be modeled. A more detailed example on how an IT infrastructure can be modeled with SEAM can be found in [20].

3.4.1 Traditional IT Functional Modeling

UML is the industry-wide standard for modeling IT systems. UML can be used to represent software systems in their environment as well as the implementation of these systems. At the level of description relevant for the OFS problem, we would represent the IT system with use case diagrams.

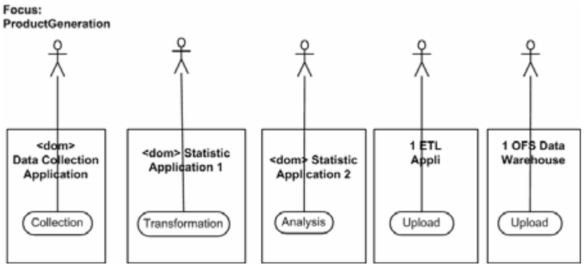

Figure 11: UML use case diagram (as-is)

Figure 11 represents the as-is situation. It is aligned with Figure 5.

Each section uses a specific application, potentially different for each step in the business process. This means that the number of IT applications is at least equal to the number of "domain" multiplied by the number of steps (approx. 75 = 25 "domain" * 3 steps).

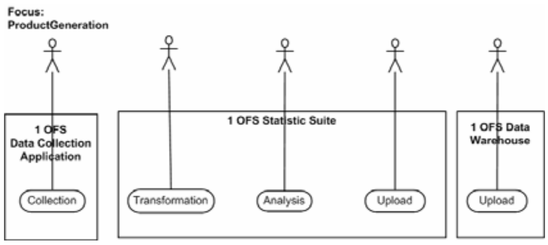

Figure 12: UML use case diagram (to-be)

Figure 12 represents the to-be situation. It is aligned with Figure 6.

It is possible to see that one statistic suite exists for all OFS (which means all sections use the same application as opposed to one per section) and that multiple steps in the statistical analysis are made within the same tool (part of the suites that the statistical tool vendors provide). So the number of applications is drastically reduced.

3.4.2 The SEAM IT Organizational Level

The SEAM IT organizational level describes the roles of the IT systems as well as in which organization the IT systems are managed. This makes explicit the outsourcing strategy of the OFS.

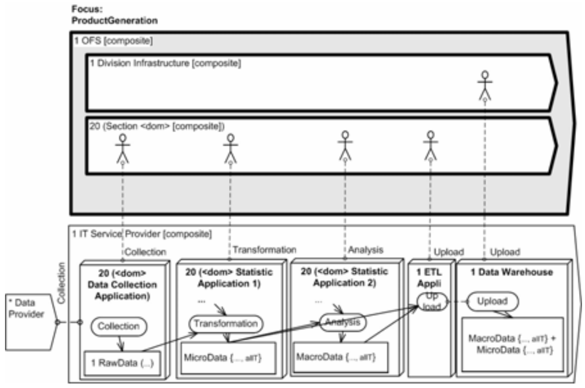

Figure 13: SEAM IT Org Level; as-is

Figure 13 represents the IT org level as-is. It is the SEAM equivalent of Figure 11. Within the SEAM enterprise model, it is *organizationally* aligned with 9. Note that the IT systems are outsourced to the IT Service Provider.

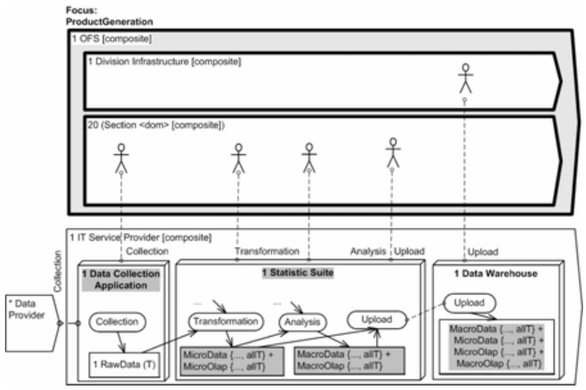

Figure 14: SEAM IT Org Level; to-be

Figure 14 represents the IT org level to-be. It is the SEAM equivalent of Figure 12. Within the SEAM enterprise model, it is *organizationally* aligned with 10. It is related by an as-is / to-be relationship to Figure 13. As for Figure 12, it is possible to see that the number of IT applications is reduced when moving from the as-is to the to-be. The diagram has also the additional benefit to highlight the need to analyze the responsibilities of the employee of the division infrastructure and the ones of the section.

In Summary, in sections 3.2.2, 3.3.2 and 3.4.2 we have illustrated how an enterprise model can be systematically developed. As discussed in the next Section, this model can be used to formalize the goals, strategies and needs of the enterprise.

3.5 Identifying Needs, Goals and Strategies

Luftman and McLean [7] define business/IT alignment as “applying IT in an appropriate and timely way, in harmony with business strategies, goals, and needs.” Even if what appear in the SEAM diagrams do not refer explicitly to the terms “goals”, “needs” and “strategies” proposed by Luftman and Mclean, SEAM is closely related to these terms. In the following paragraphs we make this relationship explicit.

First, let’s analyze the concept of goals. SEAM presents a hierarchical model that describes business, operations and IT. This set of organizational levels constitutes the enterprise model. This enterprise model is used by different specialists to reason about the project. Each specialist will see a different part of the SEAM enterprise model as their goal. For example, Luftman and McLean refer to business goals. Typically, in the OFS, we could consider that Figure 4 (business to-be) represents the business goal of the project as probably defined by the OFS CEO. Figure 8 (Operation, 1st functional level, to-be) represents the goals for the managers of the OFS sections (while being the means for reaching the goals of the CEO). Figure 10 (Operation, 2nd functional level, to-be), can be considered as the means to achieve the goal defined in Figure 8. Figure 10 can itself be considered as the business goal for the IT managers. Hence, the concept of goal is useful to describe what is expected to happen. The goals are contextual and differ for each specialist. In SEAM, the construction of the “to-be” diagrams defines the goals of the project. Each specialist can recognize herself in the SEAM to-be diagrams.

Second, we analyze the concept of strategies. Luftman and McLean do not formally define what a strategy is. In [8], Mintzberg et al define five kinds of strategies: strategy as a plan of actions, strategy as a pattern of realized actions, strategy as position, strategy as perspective, and strategy as a ploy. In SEAM, strategies, just like goals, are not explicitly visible. However, they are captured in the decisions made when a model element as whole is refined as an element as a composite. For example, when the OFS decides to work with SwissTopo to generate geographical maps with statistical data, this is a partnership strategy. Another example is when the OFS as an enterprise is organized into sections and divisions with specific responsibilities; this is an organizational strategy. So, with a SEAM enterprise model it is possible to describe multiple strategies (business, operation, IT) existing in a project.

Last, we need to analyze the needs. The needs are actually not represented in the SEAM diagrams but can be described by the difference between the as-is and to-be diagrams.

In summary, in SEAM the alignment between business and IT corresponds to the traceability between the business org level, the operation org level and the IT org level (done though the two kinds of alignments defined in Section 2). Making the SEAM enterprise model does capture the needs of the enterprise (the difference between the as-is and the to-be), the goals (to evolve toward the to-be) and the strategies (the structure of what is represented). Luftman and McLean speak more in project terms (goals to reach, needs that drive the project, strategies that constrain the solution). SEAM focuses more on describing the enterprise as it is and as it should be.

4 Related Work

As we have stated in the introduction, all RE methods fundamentally seek to align the properties of an envisioned system with the properties of its environment. In the case of IT systems this environment is the enterprise and the enterprise’s environment. Most RE methods propose to align the IT system with its immediate environment, i.e. the enterprise. RE methods also lack the integration with strategic management and marketing language and methods complicating the alignment with business goals, strategies and needs.

Goal-Oriented RE (GORE) methods [19], [13], for example, use goals and scenarios to perform this alignment from strategic business objectives to detailed IT requirements [18, 19]. However, most GORE methods consider goals to be self contained within the enterprise. They do not provide sufficient tools for linking these goals with the enterprise’s environment. The diagrams and terms used in these methods (goal reduction, and/or diagrams etc.) do not match strategic management and marketing concepts.

SEAM is one of a number of RE methods that take business issues into consideration in order to improve the alignment of business and IT systems. In the following, we briefly describe some of them.

The e^3-value method [4] consists in modeling a set of interrelated enterprises as a network of value exchanging actors. Value flows can be quantified in order to determine whether actors are profitable or not. IT system high-level requirements are defined based on this need for actor profitability and value exchange.

Osterwalder and Pigneur [9] propose an ontology for e-business models in which IT system high-level requirements are explored in terms of the support they can provide to an enterprise's e-business strategy.

Robertson and Robertson [14] propose to use contextual diagrams in order to understand the role of a software based system within an environment constituted by a network of actors.

Alexander [1] explores the requirements for a system by modeling its environment in several layers referred to as the "onion model" Each layer contains a model of the system's stakeholders. Each stakeholder is represented as a whole with their corresponding roles.

The i* method [22] proposes a modeling technique where a network of enterprises are modeled using a strategic relationship diagram. This kind of diagram shows how these enterprises are dependent on each other in the achievement of their goals. Goals can be either (hard) goals for which there are agreed upon criteria for their achievement and soft goals for which these criteria are not well defined. These goals can be refined (maintaining the alignment of lower level goals with higher level goals) until they can be assigned to individual agents, human, machines, IT systems.

The main difference between SEAM and these methods lie in the way SEAM models behavior systematically across organizational levels. The above techniques could be considered as adding additional information to the SEAM models. The SEAM model can be considered as a complementary model that defines the "business-specific terminology" used in the models developed with the above techniques.

A lot of work exists on enterprise modeling based on activity diagram [2], [16], and [17]. SEAM relies also on a kind of activity diagrams. Quite often the SEAM diagrams can be related to regular BPMN or UML diagrams (e.g. activity diagrams). The difference is that, in SEAM, more contextual information is made explicit. This is why they are better suited for multi-disciplinary teams.

5 Conclusions and Future Work

Luftman and McLean claim that business and IT alignment requires taking into consideration needs, goals and strategies. Our goal with this paper was to show that working on such issues can be done when making an enterprise model that represent how business, operation and IT have to evolve. Once such a model is made, each specialist can recognize her needs, goals and strategies in this model. So, developing an enterprise model such as what we illustrate with SEAM can be useful to reason about business and IT alignment.

SEAM is illustrated in this paper on a typical enterprise architecture project. Such project is a large undertaking that includes multiple sub-projects. SEAM has been used successfully on other, smaller, industrial projects (e.g. equipment of a new building, introduction of an MRP system in a manufacturing environment). The observed benefits of making a SEAM enterprise model are:

- Development of a shared understanding (and a glossary) within the project team.
- Better planning of the evolution of the enterprise. In particular: identification of the "unexpected" projects necessary to support the evolution; sizing of the projects; understanding the organizational impacts of the projects.
- Development of better business case to justify the project funding. The SEAM model allows understanding precisely the business impacts of the projects.

The SEAM diagrams are good tools to reason and to support the decision process within the project teams. However, they are in general simplified when used to communicate with people outside of the project.

To be truly practical, SEAM needs to have tool support. A prototype tool does exist. We are currently finalizing the formalization of the notation. This will allow us to provide a tool support for projects such as the one described in this paper.

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