A Return on Our Experience of Using Services as a Unifying Concept for Business and IT Alignment in a University

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Abstract

We describe the use of the concept of service for aligning the business activities of an organization and its IT resources. This work is set in the context of a longitudinal action-research project between our research unit and our university's IT department. We use one concrete and real example to illustrate the many projects we worked on. The research outcomes of this collaboration are two business/IT alignment and architecture recommendations that are relevant for practitioners.

1. Introduction

In this paper, we present the practical results from our collaboration in a seven year action-research [1] project that our research unit led with the IT department of our university, École Polytechnique Fédérale de Lausanne (EPFL). EPFL is a technical university with approximately 15'000 students and employees. From 2011 to 2017, our research unit accompanied the IT department in its transition to a service-oriented organization as envisioned by the IT Infrastructure Library (ITIL) [2]. The reasons for this transition were to improve the efficiency and effectiveness of the department, by reducing cost and increasing business value.

Transitioning to a service-oriented organization is a long and arduous task. Most often IT managers receive help from seasonal ITIL consultants. The newly hired operational manager of EPFL's IT department hired consultants but also sought help internally from our research unit. For many years, we have been researching aspects of service science, service management and service modeling. We represented, exceptionally, both the business (the users of the services offered by the IT department) and the consultants, helping with the formulation of the service strategy, modeling and implementation.

For our research unit, this project represented a unique opportunity to test our tools and methods. Even though we have been involved in many industry projects, this one was special in its length and proximity. Our involvement was on two levels. The first author used this project as the main data source for PhD thesis [3]. This project included the conceptualization of what a service is, the development of cartography tools to represent the IT services and the definition of criteria for the evaluation of alignment between services. In modeling in detail over 20 services, she worked in close collaboration with the lead architect of the IT department. The second author, who is the head of the laboratory, acted as consultant to the IT department operational manager and, later, as strategy consultant to the chief information officer (CIO). He wrote the first version of the EPFL's IT strategy: this strategy explained how a service-oriented organization can federate all EPFL's IT resources.

The results we present show how a service can be modeled from the bottom-up as an aggregation of smaller services that provide value to its stakeholders. One of the examples we worked on during this project is Desktop Virtualization for students. A student in mechanical engineering might need to use a Computer Aided Design (CAD) tool on computers in separate computer-classrooms (i.e., rooms with approx. 50 computers). Desktop Virtualization is used to provide the student access to the tool without installing it on each computer. We see providing this kind of access, without the student knowing all the resources this requires, as a service; as a way of providing value while hiding the complexity involved in this provision. At EPFL, with its multiple IT units distributed across its campuses, explaining this service-oriented view within the IT department proved to be a non-trivial example. We closely collaborated with the IT department in order to create a set of models that described the Desktop Virtualization service in a way that all IT units could see their part in its provision and the value to students and faculty.

We will illustrate in this example how we described four service levels: the IT infrastructure, the teaching infrastructure, the teaching resources coordination and the mission of EPFL. In each level, hiding the complexity of delivering the service enables us to clearly describe the value provision to the stakeholders of that level. We formulate two recommendations for the development of a comprehensive model for a service-oriented organization: (1) validating service offerings across levels by understanding viewpoints, and (2) optimizing by reusing the implementations for different services.

This paper has the following structure. In Section 2, we describe the context and motivation of our work. Then in Section 3, we describe, step-by-step, the development of the service model of our example and its levels. In Section 4, we give our recommendations and in Section 5, we discuss the related work. The future work is presented in Section 6. Finally, we give our conclusions in Section 7.

2. Context and Motivation

The EPFL main campus is in Lausanne, Switzerland. In the last few years, EPFL has established teaching and research units in several major cities in Switzerland. EPFL is composed of five schools and two colleges that comprise a total of 350 research units. EPFL has approximately 5'000 employees, 2'000 doctoral students and 8'000 BSc and MSc students [4]. EPFL also provides web-based courses, e.g., Massive Open Online Courses (MOOCs). It has five support departments: IT, logistics (including finance and human resources), teaching, research and technology transfer. These departments are considered to be "central" to the EPFL as they provide supports to all the schools.

The EPFL IT department includes approximately 120 full-time equivalents (FTEs). The other four support departments have smaller IT units providing specialized services such as human resource management, financial management, and teaching resources management. These IT units have a global headcount of approximately 30 FTEs. Each school has a dedicated IT unit that develops and operates specific IT services for the school, manages the school's collective resources and associated infrastructure, such as computer classrooms. Each research unit has a part-time IT person who provides local support and contributes to the teaching and research of the research unit. Sometimes several research units bring together their part-time IT resources into a team of two or three people that act as a proximity IT unit. The total number of the IT resources dedicated to the schools, colleges and research units is approximately 150 FTEs. They do not belong to the same department, school, or lab. Despite this, our goal with the service approach is to coordinate all the IT resources in a way that we can optimize service delivery while bringing a maximum of value.

In the example of the CAD tool for mechanical engineering students, such distribution of responsibilities resulted in the following issues. Each school's IT unit assigned one computer-classroom administrator who was responsible for the management and maintenance of the infrastructure of one or more classrooms. But, due to seating constraints in the computer classrooms, more than one had to be used by a same student taking the course that required the CAD tool. The students could be asked to use a classroom that was not maintained by their respective school. In such cases, the CAD tool was no longer accessible (or was accessible differently, e.g., with a different login procedure). The purpose of the project was to develop a common way to use applications for the students and professors, regardless in which computer classroom these applications were used.

As this project was a success and was known by most IT people at EPFL, we based our communication strategy for the service approach on this example. Our involvement in this project was to show to the IT people in the IT department how a service model can help them federate (bring together) their resources across all the schools' IT units so that they can provide the value that their end users need: for example, the ability for students to run the CAD tool in different classrooms.

Fig. 1 illustrates the starting point of this project: 25 classrooms split among six[1] schools (cardinality *), with at least one infrastructure environment per school (cardinality * in the model, i.e., single digit quantity) and six administrators from the schools' IT units. We assume that, for each course, a different desktop environment is needed, hence the diagram shows the images to load on the virtual machines (cardinality **) for the number of courses per school. The figure represents the situation before we introduced the service conceptualization of the organization. It illustrates the challenges of managing distributed resources (especially with students using resources from different schools). The VM image contains the executable code of the applications to be used by the students in the courses. The infrastructure for computer classroom contains servers that run the VMware virtualization software. The virtualization software can dynamically install and run the VM images. Note that the diagram does not represent the students or the professors, as it focuses on the managed IT resources (and on the IT people in

[1]Five schools and one college have a dedicated IT unit. For simplicity, we call all of them schools.

charge of this infrastructure).

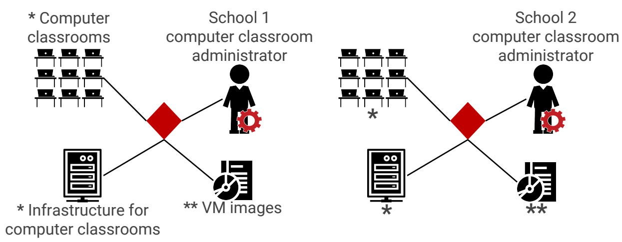

Figure 1. Scope of the example: a model of the computer classroom initial situation, showing two out of all schools and colleges.

The central IT department created a project for the management and maintenance of the infrastructure for computer classrooms, which resulted in the decision to implement one infrastructure by using virtualization to support all classrooms. Fig. 2 sketches how this shared infrastructure could be used by all the schools.

In Fig. 2, we also show our choice of the boundary that encompasses the virtualization service-system. Before choosing this boundary, we asked questions: Are the classrooms part of the virtualization infrastructure? Does the central IT department manage the images to be loaded on the virtual machines?

Boundary identification is often blurred and depends on what the user needs and on the management's decisions. Non-conformance of service systems to the organizational structures poses another difficulty in identifying the boundary. In our example, the decision was to provide the users only the virtualization infrastructure (both hardware and software) and the support for it.

For part of the implementation of the ITIL [2] framework, the central IT department created a service catalog that initially contained approximately 100 services, including the Desktop Virtualization service. A single point of contact was created to provide support to the users who had issues with the services referenced in the catalog. We were not directly involved in this ITIL implementation, but we leveraged its results. We became involved when there were considerations to extend ITIL to the entire IT department and the other IT units. We estimated that this extended catalog would contain close to 400 services. These services were recursive because low-level technical services could frequently use high-level services. For example, managing a data center requires a web site that is hosted in the data center. This lead us to the following research question: *How can services be used, developed and aligned across the whole university, including all IT resources?*

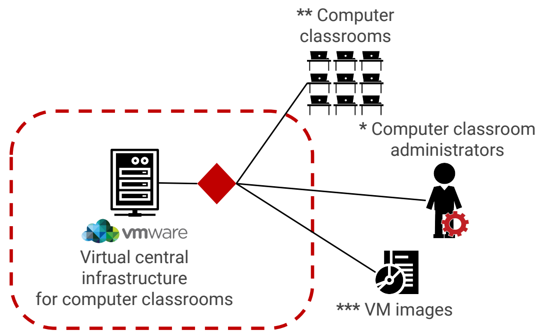

Figure 2. Identification of components for a shared virtualization infrastructure service. This service design was a result from a study carried out by the central IT department. The dashed line defines the boundary of the service system being designed.

3. The Service Model

To answer the research question, we worked with the CIO and the lead IT architect to create a set of service models that bring together the three main missions of EPFL: teaching, research, and technology transfer. The model we discuss in this section corresponds to the teaching mission of EPFL and represents the example of the CAD tool for mechanical engineering students. The complete model is shown in Fig. 3. It is based on a project that was initiated to design an implementation for the Desktop Virtualization service. This service enabled students to run on their personal computers the same software that their professors used for teaching in the classrooms. This example was a successful project that showed how all the services relate to each other and to the teaching mission. We chose this example to present the strategy of the IT department to all IT people in June 2016 and to make the service model as concrete as possible. The positive feedback in the survey done after the presentation showed that the service model was well received.

Models of service systems are flexible and group everything that is needed for the implementation of a service, regardless of the organizational structure. Services have two perspectives: (1) the user perspective, in which the user sees only the abstraction of a *service offering*, and (2) the service manager perspective, showing the *service implementation*, in which people involved in the service see the components and organize them in a specific way in order to realize the value brought to users. A service is implemented by a *service system*, where all the resources (people, technology, infrastructure, suppliers) necessary to implement the service are grouped together.

After establishing the service-system boundary, a person responsible and accountable for the service lifecycle is determined. This person is called a *service manager* and he (1) ensures the management and evolution of services in relation with the project leaders associated with projects related to a service, (2) understands the value brought to the user, and (3) collaborates with the governance bodies to identify the compromises between the added value and the simplicity of the service implementation. The Desktop Virtualization project leader from the central IT department was assigned to be the Desktop Virtualization service manager.

We continue with the bottom-up service modeling, by modeling in different levels the solution for the example of the CAD tool for the mechanical engineering students. Every level presents in detail one service system[2] from the perspective of the service manager and the service user. This is done to show the various viewpoints, i.e., perspectives, without being constrained by the organizational structure.

3.1. Desktop Virtualization Service

The technical implementation of the Desktop Virtualization service, provided by the central IT department, is depicted in Fig. 3, level *(a)*. This level shows the viewpoint of the Desktop Virtualization service manager who manages and coordinates the Desktop Virtualization infrastructure (hardware and software, e.g. VMWare) for the "external" users. The Desktop Virtualization service manager perceives as external the administrators of the computer classroom, the professors, and the students. Despite using the same infrastructure for providing the Desktop Virtualization service, each school needs a different configuration. Conceptually and practically, this yields six instances of the Desktop Virtualization service. The role of a service manager is to manage and coordinate the service implementation, with respect to all the possible contexts in which his service instances would be used. In this case, the Desktop Virtualization service manager has to understand, configure, and to customize the Desktop Virtualization offering for each of the instances. To do so, he has to understand the needs of the classroom administrators and the workflow between them and the professors. An implementation is designed to anticipate such customization, showing that the project/service manager understands well the context (social reality) of the users and the administrators of the computer classrooms. In this setting, customization means that service systems need to be adapted to the particular context and the customer's problems [6].

When the Desktop Virtualization service was released, because it was provided by the central IT department, it was included in the service catalog. The service catalog did not include all six Desktop Virtualization service instances, rather only an abstraction that captures the usage of the same infrastructure.

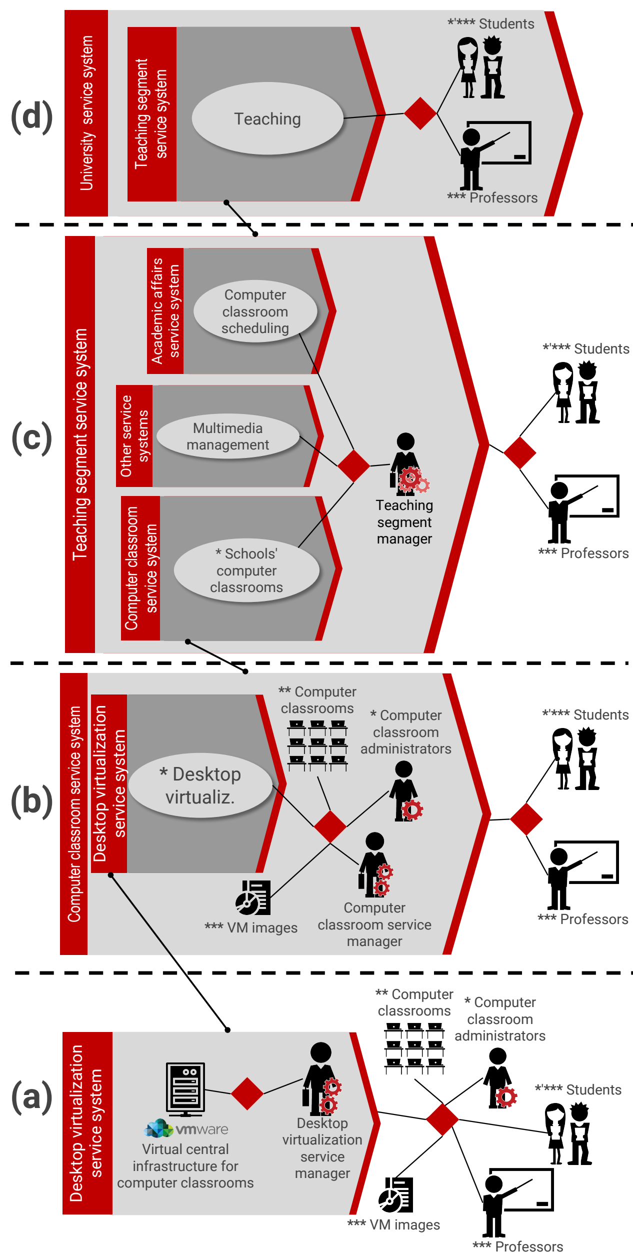

Figure 3. Simplified model of the services presented in the example.

[2]In systems thinking, every system shows the viewpoint of some observer [5].

3.2. Computer Classroom Service

The direct users of this new Desktop Virtualization service were the administrators of the computer classrooms. For them, the Desktop Virtualization service replaced the infrastructure they previously managed in each school. The outcome of this technical service perfectly illustrates the separation of concerns into (1) service offering – the value of the Desktop Virtualization service to the computer classrooms administrators and (2) service implementation – managing the infrastructure of the Desktop Virtualization service by the central IT department. The viewpoint of the direct Desktop Virtualization's users, i.e., the IT administrators, is illustrated in Fig. 3, level *(b)*.

At this level, the central IT department provides a component service (Desktop Virtualization) to the computer-classroom service that is fully operated by the school's IT units. To achieve a fully operational computer classroom, services such as printing have to be added. For simplicity, these additional services are not shown in the figure. Adding all services needed for a fully operational classroom enables us to make explicit how IT and non-IT resources work together.

Fig. 3, level *(b)* also shows two viewpoints. At this level, a service manager is added to coordinate the work of the Desktop Virtualization service with the schools. This service manager, attached to either the IT department or the schools, has his service-implementation viewpoint of the coordination details for the computer-classroom service for the six schools. The direct users of this computer-classroom service are professors and students, hence they have the service-offering viewpoint in Fig. 3, level *(b)*. Even though professors or students might be in direct contact with the Desktop Virtualization service interface, the content they have access to is managed by the computer-classroom administrators. Therefore, the overall end-user responsibility is with the administrators and the computer-classroom service manager; they align their perspectives of the implementation with the end-users' needs for the computer classrooms in the different schools.

3.3. Teaching Segment

We continue to define new services because the computer-classroom service is not used in a vacuum; it would not exist without the coordination of other services used in teaching. The services related to the computer classrooms should be tailored and harmonized to the needs of professors and students. For example, in relation to the computer-classroom service, we include scheduling computer classrooms for courses, exams, and student revisions, and the provision of technical support in the form of a help desk (user support) to manage Desktop Virtualization and multi-media issues, such as projector failure.

Combining services might affect the service offering of low-level services. For example, when considering exams, the Desktop Virtualization service has to be modified to guarantee business continuity (and local support) for the exams.

These services, targeting professors and students, are in the context of teaching, hence we group them in a segment called "teaching". We use the concept of customer segmentation [7] from marketing to describe the grouping of customers; the grouping is based on perceived similarities with respect to customers' needs, interests, priorities, channel preferences, etc. Our perception of the different communities that exist in a university setting helps us to identify a few more segments, such as industry partners, the university's internal users and administration. Fig. 3, level *(c)* illustrates the services we consider within the teaching segment, with the professors and the students as users.

A segment is similar to a service system; it contains services that need to be coordinated and harmonized for the benefit of the end users. Similarly to the previous two levels, in *(a)* and *(b)*, in the teaching segment there is a service manager who, more specifically, is called a *segment manager*. The segment manager has more specific responsibilities to identify future end-users and to provide user-research data (e.g., survey data) in order to confirm the needs of the end-users for a service within his segment. He also promotes the services to the end-users of his segment, aids users in the obsolescence of services, and manages the relationship with the end-users in his segment (e.g., being in the field, observing, organizing customer-satisfaction surveys, understanding his segment's culture). For simplicity, we show only three services in Fig. 3, level *(c)*, but in practice, there are many more.

In our university, the middle IT management defined the following segments: teaching, research, technology transfer, general public of the university, administration and IT4IT. Each segment corresponds to a specific population, where one person might belong to multiple segments. For example, a student is a "customer" of the teaching segment (for all the courses, projects, exams, student trips, etc.) and belongs to the general public of the university (for where to eat, university-wide social activities, etc.). In their position, the segment manager coordinates the overall experience of the users in the segment, in relation to the information system.

3.4. University's Mission

In Fig. 3, level *(d)*, we depict the university service system. This level is more formal than practical. It enables us to complete the service hierarchy with the teaching mission of EPFL. In more advanced levels, we could use this level to understand the dynamics related to attracting new students and managing the alumni community. In a service view, prospective students and alumni are outside the university service system, the registered students are inside the system.

3.5. Discussion - Practical Impact

Before our action-research project, there was no distinction between the business and the technical services. For example, Desktop Virtualization represented the actual virtualization service (server, software), but it also represented the computer-classroom (including the Desktop Virtualization service, as well as the multimedia services, printing services etc.). Hence, having one service that represents multiple service created tensions, as it was difficult to discuss issues such as coordination between the IT department and the IT units of the schools. Before this project, there was no clear agreement on the role of the schools' IT units in the computer-classroom management. In addition, it was unclear how and what needed to be standardized in the management of the different computer-classrooms of the schools.

With our project, we made explicit the level (b). This level is important as it does not involve the management of the technical infrastructure, yet it enables professors and students to access the Desktop Virtualization service. One of the sub-services is the creation of the virtualization images that are specific for each study program. The virtualization service was managed by the central IT department and the computer classrooms by the schools' IT units. It was crucial to define clearly this interface and this was a major step in the service project. If the interface is not well managed, the students would not be able to move from one classroom of one school to a classroom of another school.

In the project, we also made explicit the level (c). We created the role of a segment manager in order to coordinate the management of all IT applications within one of EPFL's missions: for example, in the teaching segment, the coordination of all IT used for the teaching mission.

The service model is quite "fluid". Service systems contain different components, depending on what the service does. A small change in a service offering might add new suppliers or technology in the service implementation. Also, some people might work in multiple service systems. Similarly, applications can be used in multiple services. Therefore, we put in place management groups that supervise the operation of the service model and the resources used to implement the service, in a way which is independent of the model. These are typical management groups found in an IT organization: people management (e.g., hiring, providing personal development, allocation resources to the services), governance (e.g., managing the business/IT strategy, the service/project portfolio, software purchasing and license management, finances, communication), and architecture and best practices (e.g., developing shared solutions to be used across multiple services, project management, ITIL compliance).

4. Recommendations

Services "align" an offering to an implementation. Hence, the issue is to align all existing services, while developing an efficient information system. Our recommendations capture how we can build an IS that brings value to its users (alignment / first recommendation) and is efficient (architecture to foster technology reuse / second recommendation).

4.1. First Recommendation: Validating Service Offering Across Levels

We recommend to validate the value of the service provided across at least two levels of services. This recommendation can be explained via our service-model example. The Desktop Virtualization service benefits the classroom managers (Fig. 3, level (b)) – for example by simplifying class management such as student registration. It also benefits the people in academic services (Fig. 3, level (c)) who can, for example, organize exams in these classrooms. Professors and students mainly benefit (Fig. 3, level (d)), for example, from moving from classroom to classroom while using the same applications and have coherent information from all actors on these classrooms.

This illustrates the complexity of service modeling. Normally, we would design the Desktop Virtualization service by using a conceptualization close to what is shown in Fig. 3, level (a) – in which all actors are visible in the service environment. However, to understand the value for each user, we need the additional three levels.

The key benefit of such an approach is to develop "transverse" views. By building the model from the customer standpoint, the service implementation needs to factor how the service fits in the user's journey. For example, in level (b), we model the fact that all classrooms, regardless of which school they belong to, should look as similar as possible. In level (c), we analyze the overall experience in the classrooms. Ideally, we should also analyze how the students register at the beginning of their studies and how they lose their access rights when they leave the school. The same kind of reasoning applies at all levels.

This first recommendation shows how we can align services and business and IT "realities". If all service managers understand how their service offering supports their users' service offerings, then they can line up their services and, ultimately, business and IT alignment can be achieved. This illustrates the fact that the terms business and IT are impossible to define if they are considered as broad categories. Indeed, they are defined by the view of the CIO. "IT" is everything the CIO manages, "business" is the rest. If we look at the example again, we can consider that, for the Desktop Virtualization service, the classroom management can be considered as a business. However, for classroom management, the people using the classroom are the business users. Hence, we see that the concept of "business" depends on the viewpoint. Similarly, the concept of infrastructure depends on the viewpoint: for example, the Desktop Virtualization service would be considered as infrastructure, whereas for the teacher, the classroom itself would be considered as infrastructure. Therefore, we recommend using with care the terms "business", "IT" and "infrastructure" when reasoning on business and IT alignment. If such terms are used, it should be understood that they have different meanings according to the background of the people using them.

4.2. Second Recommendation: Reusing Implementations Across Service Systems

We recommend reusing technical solutions, competencies, and resources between service implementations as much as possible.

The definition of service separates the view of the user, for whom the value is created, from the implementation. To maximize the value for the user, it is ideal to have one type of service for every user. This is obviously difficult to implement in a cost-effective manner, if there are many users. Hence, in order to create value to users (first recommendation), we need to think about how to federate service implementations so there are as few implemented services as possible; this is the essence of the second recommendation.

Our service example provides two examples of this recommendation. The Destkop Virtualization service is provided to multiple classrooms belonging to multiple schools. Does the service change from one classroom to another? Intuitively, we would model only one service, but in practice, only the Desktop Virtualization service can be specified, because the classroom management might be considered as a necessary but uninteresting detail of the complex Desktop Virtualization service implementation. Experience teaches us that local support is important for the user. The classroom manger, as he belongs to a specific school, will build the very specific images necessary for students of the given school. Even if we consider that the service in all classrooms is the same, in practice, the image generation and the constraints due to location might have an influence. If, for example, a classroom is in a remote location, possibly even at a school antenna in a developing country, then the Virtualization service solution could be inadequate. As a result, even if only the Desktop Virtualization service seems to be crucial, some characteristics of the classrooms could greatly impact the service offering or implementation. In such cases, we recommend defining a generic service Computer Classroom in the service catalog, but we specify that this service is instantiated for specific locations. Service costs might involve the specificities of critical location.

A similar problem might exist concerning exams. An exam in a computer room is critical because if the computer crashes, a business-continuity plan needs to be developed. It might very well be that some classrooms are suited to manage exams better than others. This shows that, even if services are supposed to isolate the offering from the implementation, we actually must maintain an explicit relation between them. This is why, sometimes, we call the service system that implements the service a "gray box" (as opposed to a black box). It is a system that implements the service, but we need to make explicit the impact on the user due to the specificities of the service implementation.

Services are defined from a user standpoint. As presented in the example, the Desktop Virtualization service is designed for professors and students. It is also designed to run the personal workstations of the central departments (e.g., fat clients of the enterprise resource planning system). This is where architecture is of primary importance. Designing only with services will lead to technology fragmentation. All services could use different implementations, hence it is critical to share implementation between services.

5. Related Work

"Business-IT alignment refers to applying Information Technology (IT) in an appropriate and timely way, in harmony with business strategies, goals and needs" [8]. Business and IT executives still consider alignment to be an issue, despite the existing literature on this topic during the last thirty years [9]. An impediment in reaching alignment across units and departments is the different vocabularies people use to shape the actions about or within systems. Accordingly, business and IT people use different and unfamiliar languages, thus creating a barrier [10, p. 723]. Connecting people by adopting a common language is one way to achieve alignment. Due to the acceptance of services in many disciplines [11], we adopt the service concept in order to connect the different languages and to structure an entire organization. The use of services for aligning business with IT is not new and has been studied by [12], where the authors elaborate on the alignment concerns that exist in achieving a service-based enterprise.

Fig. 4 depicts the strategic alignment model (SAM) that is a widely accepted description of alignment [13][3]. SAM identifies four fundamental components, represented with rectangles, and two axes of alignment, strategic fit (vertical) and functional integration (horizontal). The work we present in this paper covers the functional integration axis; we use the service concept to organize the internal infrastructure and processes as means to adapt to the evolving strategies, in both business and IT. In our project, we also extend the use services to connect all four quadrants in the SAM; however this is outside the scope of this paper.

Enterprise architecture (EA) covers one line of research for alleviating the gap between business and IT. In [14], EA is defined as "a coherent whole of principles, methods, and models that are used in the design and realisation of an enterprise's organisational structure, business processes, information systems, and infrastructure"; they are guided by the drivers for alignment. The widely accepted EA modeling language that expresses service orientation is ArchiMate [14]. In ArchiMate, services are modeled in the business, application and technology layers. The recent ArchiMate specification includes a strategy and a physical layer [15]. In general, with ArchiMate, high-layer services use and are linked to low-layer services. Contrary to Archimate, our models do not have pre-defined layers (or levels). To address the alignment challenges, we make as many levels as necessary.

[3]As of September 2018, [13] have 4867 citations on Google Scholar `https://scholar.google.com/`

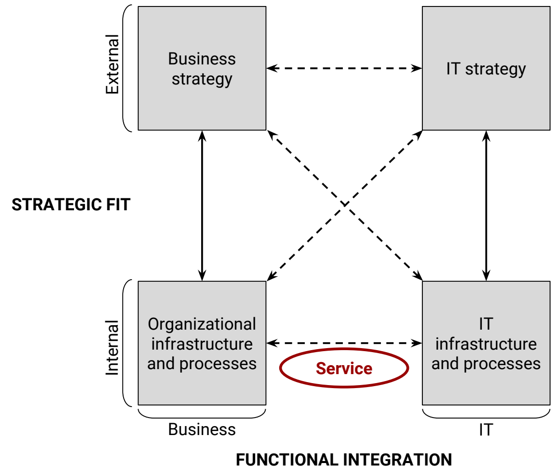

Figure 4. Strategic alignment model (SAM), adapted from [13].

Another facet of alignment is governance. One governance standard is the Control Objectives for Information and Related Technology (COBIT) [16]. Similarly to EA, the primary focus of COBIT is aligning the use of IT with the business goals by implementing the provided set of internal controls. According to COBIT, a good internal control environment depends on a well-defined architecture. As discussed in Section 3.5, we also propose to use governance and architecture.

Our service approach to alignment is complementary to the EA and governance efforts. We use the fundamental principle of services (separating the service offering from the service implementation) to help people perceive what needs to be done in terms of value creation and increased efficiency. As services can be quite "fluid", governance and architecture are needed for the overall coordination.

There exist several service-modeling languages. Based on UML, SoaML [17] is one of them. SoaML is used to model service architectures, as well as to show the encapsulation of interactions between service participants [18]. Usually, people are not represented and the language is not used to model upper "business-related" levels.

The e3service [19] is an approach for generating service bundles, by matching the customer perspective and the supplier perspective. The service blueprint [20] is an approach depicting the physical evidence the user sees, the service interface that abstracts the internal activities and the internal collaborations.

Two approaches inspired by the Business Model Canvas (BMC) [21] are the Service Logic Business Model Canvas (SLBMC) [22] and the Service Business

Model Canvas (SBMC) [23]; they both show the customer and provider viewpoints in one canvas.

None of these service-modeling languages are based explicitly on systems thinking, hence – contrary to our approach – they do not support natively multi-level service modeling.

In our collaboration with the IT department, we used the systemic service-modeling method we have developed in our research unit. The method is called SEAM [24], and we use its models in the domains of service science, business and IT alignment, enterprise architecture, requirements engineering and strategic thinking. SEAM has its roots in systems thinking [5]. SEAM applies a systemic paradigm based on interpretivist and constructivist epistemology. Such an epistemology explains our focus on understanding and modeling different viewpoints. These viewpoints are often modeled in several hierarchical, i.e., abstraction levels. SEAM models have a notation that we adapt, depending on the audience. In this paper, we use the notation similar to the one we communicated with the people of EPFL's IT department.

6. Future Work

One of the challenges that appear in the described organization is the number of service managers necessary for all the services. A possible future work would be to study how multiple services can be aggregated in large service-systems that would require one manager. Such service systems could match "traditional" IT taxonomy such as "technical infrastructure", "application infrastructure", "application". This would enable us to implement services and substantially reduce the number of service managers. This could also help us to develop a flat map of all services. Services are hierarchical and recursive. The tool we developed to represent services [3] is a dynamic map that the user navigates to show each service implementation in its context of use. Hence, it would be useful to have printed flat maps also (as a tool to easily position who does what).

Another idea that we want to explore in our future research is configuring the IT service catalog to show services for which business[4] users pay. As users are able to only understand and pay for services delivering direct value [25], the role of the IT providers extends to showing a measure of this value in terms of transparency of costs, consumption, performance, business continuity, etc. As a consequence, infrastructure services would be allocated to the services directly used by the business and would not appear in the IT service catalog. This improves the perception of the strategic role of IT in the business. Our starting point is a framework called Technology Business Management (TBM) [26], based on a hierarchical taxonomy for describing various cost sources, including hardware, software and services.

[4]By business we mean all users outside the functional organization "managed" by the CIO and the governance bodies.

7. Conclusion

In this paper, we have presented the use of service models for aligning perspectives between "IT" and "business" professionals. The perspectives of the IT people also had to be aligned within IT because these IT professionals belong to different structures (departments, schools, labs). We derive modeling recommendations for alignment and efficiency. These are based on a service model that separates the use of the service from its implementation. We also presented some of the challenges in building such a shared service-model.

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