A Visual Approach to Business IT Alignment between Business Model and Enterprise Architecture

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ABSTRACT

In this paper, we put forward an intermediary model that can support the transition between a business model and an IT infrastructure, then provide an example of how the approach can be used. The model is based on a combination of existing models: enterprise architecture and the Business Model Canvas. We show how the proposed intermediary model, which has a strong focus on a business model strategy, can help IT alignment. The intermediary model can help alignment from either a business model focus or an IT infrastructure focus because of the correspondence between the two paradigms. The focus on visualization within the intermediary model aids in quickly illustrating the common ground held by the parties involved in the alignment.

Keywords: Business Model, IT Alignment, Enterprise Architecture, ArchiMate, Business Model Canvas

INTRODUCTION

Information technology (IT) is becoming ubiquitous, changing the way people exchange information and extending the realm of possibilities. Changes are occurring not only in information technology itself but also in all the domains that interact with it. Faster computation, together with increased storage capability and bandwidth, make it possible for new services to be introduced; in turn, this offers the potential for new business models, lower barriers of entry, and more competition. Whether dealing with an existing business or a start-up, the key is to design and iterate around its business model so as to not only outperform competitors but also create new markets by offering differentiated products. New services, such as cloud computing, offer opportunities to experiment with new business models without having to make huge investments in IT infrastructure, but a business model strategy still must be aligned with its processes and any supporting IT applications, regardless of whether IT infrastructure is virtual or physical.

As stated by Van Buuren et al. (2005):

> *Enterprise architecture and business modeling methodologies meet in service offering and realization. In general, business models focus on the service value generated by a business, whereas enterprise architecture models show how a business realizes these services. Linking these approaches results in a powerful modeling tool that couples the value exchange between businesses and the costs that are required to realize these services. (p .2)*

A number of studies have shown that strategic alignment between IT and the business strategy plays a significant role in explaining business performance (Chan & Reich, 2007a). These studies define alignment as the extent to which IT activities and capabilities support business strategy (Chan & Reich, 2007b). From the different points of view on alignment, we agree most closely with Chan and Reich (2007b), and we take as given the view that alignment is inherently of value and contributes to organizational success. Like them, we do not take a position regarding whether alignment is a static end goal or instead a dynamic process occurring over time. We believe that alignment should be a joint responsibility of IT and business executives. With that in mind, it is essential that business executives and IT managers communicate on common ground.

Connecting IT activities to a firm's business model not only provides the potential for linking costs to the strategic objectives but also offers a means of identifying key activities and resources that support the business model strategy in question. It also can highlight underutilization of assets, which in turn can provide opportunities for adopting a new business model strategy.

This paper proposes an intermediary model that will assist in transitioning between a business model and an enterprise architecture model. This intermediary model is based on shared knowledge from business model modeling and enterprise architecture. We suggest that for the transition between models to be as clear as possible, it should have a clearly defined visual representation. Our research question therefore is this:

Could a visual intermediary model support IT alignment by helping to transition between a business model and an enterprise architecture?

This paper is structured according to the guidelines of design science research proposed by Gregor and Jones (2007). In the following section, we describe related studies on transitioning between business models and enterprise architecture. We then describe how our research fits into design science methodology. After that, we describe how we constructed the visual intermediary model, which is based on a combination of different models proposed in the literature. We then describe a case study and show how the model can support a discussion on alignment. That description is followed by our observations concerning an evaluation done with students. We conclude with a discussion of how the proposed model could be used in practice and how it could be extended.

RELATED WORK

In this section, we describe the frameworks and models that individually address parts of the solution: Enterprise Architecture and Business Model. For each, we provide a definition and take into consideration studies that use them as starting points for a transformation or alignment to the other model. When moving from IT resources to a business model, this represents a bottom-up approach, whereas when aligning from a strategic business model to the IT resources used to support it, it represents a top-down approach.

Enterprise Architecture

"Enterprise Architecture (EA) is a coherent whole consisting of principles, methods, and models that are used in the design and realization of an enterprise's organizational structure, business processes, information systems, and infrastructure" (Lankhorst, 2009, p. 3)

We identified three approaches that can be used to introduce a greater strategic aspect to enterprise architecture: (a) adding new components to the meta-model of existing enterprise architecture frameworks, (b) defining a direct correspondence between enterprise architecture components and elements of a business model, and (c) using a transition model that helps connect the two models.

In their book *Enterprise Architecture as Strategy*, Ross et al. (2006) presented a way of modeling strategy with a high level abstraction of EA components. Their modeling focused on business process, data, technology, and customer types. Although their strategy was similar to a business model, its focus was still largely on *how* value is provided to the customer rather than *why*. Additionally, having a different layout for each example makes it difficult to compare them.

One explorative study (Yu et al., 2006) added an intentional dimension of motivations, rationales, and goals into enterprise architecture. This was done using the i* model. In a similar approach, goals and requirements were added as components of enterprise architecture as a way to introduce ARMOR (Quartel et al., 2009) as an extension to ArchiMate. In this study, "Goals are refined into (alternative sets of) sub-goals, via goal trees. Low-level goals (requirements) are related to the services, processes and applications that implement the requirements" (p. 12).

Using goals helps to relate the reason for a service (why) to its implementation (how). This linkage opens the way for an iterative process, as highlighted when moving from an as-is architecture to a to-be architecture (Yu et al., 2006). In this process, iteration from the reason for a process to its execution is carried out inside the enterprise architecture model until an adequate "to-be" solution is found. Alignment with the starting business vision, which defined the initial reason for the change, has been left for future research.

Chen (2008) used a Service Oriented Architecture (SOA) perspective to present BITAM-SOA, a framework that has the same layers and interface between layers as ArchiMate (infrastructure, applications, process) but directly adds business model elements, customers, value proposition, and cost into the architecture. In our opinion, this direct connection to the service process works in specific cases for SOA services; however, the business elements are more or less requirements and potential consumers of a given service offering rather than being part of a global business model strategy.

In their study, Iacob, Meertens, and Jonkers (2011) offer a direct correspondence between elements of ArchiMate and the Business Model Canvas (BMC) without using an intermediary model. Nonetheless, they did use an augmented model of ArchiMate, having additional quantitative cost information. Their process aggregates components of ArchiMate into all elements of BMC to reason on the business model strategy supported by the architecture. After we modified the architecture to fulfill new opportunities, and having regenerated a corresponding business model view, a second step allows for a comparison between the business models supported by both an as-is and a to-be architecture. This example provides a good argument for the value of connecting enterprise architecture to a more complete business model visualization in order to rethink architectural changes.

Business Model

Among the many definition of a business model that exist, we use the one by Osterwalder, Pigneur and Tucci (2005):

> A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a

> description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams. (pp. 17-18).

We want a visual representation; therefore, we limited the scope to a model that falls into our definition and has a visual representation, such as the Business Model Canvas or e3-value, the latter of which was used in several articles as a starting point for adopting a process model.

For example, Andersson et al. (2006) described a method to go from an e3-value model to a process model by augmenting the e3-value model with additional information. In a second step, they made use of a pattern library at the process level to construct the resulting processes. A similar transformation has been illustrated (Pijpers & Gordijn, 2007) that augments the e3-value but then goes on to focus on creating a transition model called e3-transition, which forgoes the need to look up a process in a pattern library.

Another study (Andersson et al., 2007) sought to extend the syntax of e3-value in the form of annotations, so as to capture the relationship between goal models and business models. The authors highlighted an open question that arose from their experiment: the difficulty of finding a compromise between keeping the clutter introduced by additional information at an acceptable level, but still having the right amount of (or enough) information. From this perspective, another approach to transforming an e3-value model directly into a coordination model (Fatemi, Sinderen, & Wieringa, 2010) argued that there is a need for a less complicated method, one that does not introduce additional concepts such as ownership rights, custody, or physical delivery, or that makes it hard for others to use these methods in practice.

There is also an object-oriented enterprise architecture method, called SEAM (Wegmann, 2003). We include it here in the discussion of business models because the method has a hierarchical top-down decomposition to go from business down to IT. This model, with its UML-like structure and hierarchical encapsulation, is well adapted to technically skilled people. However, we are looking for something that has a simpler visual appearance and that can be used easily with businesspeople without any specific advanced training. When a diagram has too many arrows or boxes within boxes, it tends to discourage people lacking modeling experience, from understanding them.

Identified Opportunity for a Visual Model

As stated in the introduction to this paper, our goal is to propose a visual model construct that helps to bridge business models and enterprise architecture models. The related work discussed above makes it clear that there are still opportunities to provide a visual and high-level intermediary model between the business model and enterprise architecture. The methods presented above either try to provide a mechanical transformation from one model to the other or focus their attention on business processes.

Enterprise Architecture frameworks like TOGAF (VHP, 2009) defines a Business Architecture layer, but as shown by Winter and Fischer (Winter & Fischer, 2007), they do not always differentiate between business processes and activities. That differentiation is important for a vision of a business model. The same is true for the proprietary method ARIS

(IDS Scheer 2005), which has Organizational Architecture and Business Process Architecture but no real business model layer.

Our intent is not to provide a method for transforming a business model into a process model; instead, our objective is to create a way to focus on the strategy while having a better grounding in the activities and IT resources required to support it without going into too many technical details. This should be achieved while keeping a connection with some lower-level elements, in order to be able to take alignment into consideration. Therefore, it is important to be able to identify key components for alignment in relation to the strategy, but not in every step of its adopted execution. Furthermore, compared to the methods used in a goal-based approach, we prefer to be more general, not tracking every single step to the implementation of a specific goal but instead linking the key infrastructure components to a global business vision.

According to Fatemi, Sindersen, and Wieringa (2010), the approach should be as simple as possible; thus, a model should not be augmented with complicated additions if it aims to be useful in practice. We agree with this in principle, but we argue that an intermediary model is still necessary. It seems extremely unlikely that high-level elements can be mapped directly to detailed process level elements, especially when business model and enterprise architecture have different languages and abstraction levels.

We feel there is still a place for a model that is simple and helps in the transition between the very high-level strategic vision of a business model and the processes implementing it. We show how one such model can be constructed later in this paper, following a presentation of our methodology.

RESEARCH METHODOLOGY

We chose to perform our research under the Design Science Research paradigm, focusing on an artifact that is at the center of a three-cycle framework (Hevner et al., 2004). These cycles are relevance, rigor, and design:

> *The Relevance Cycle bridges the contextual environment of the research project with the design science activities. The Rigor Cycle connects the design science activities with the knowledge base of scientific foundations, experience, and expertise that informs the research project. The central Design Cycle iterates between the core activities of building and evaluating the design artifacts and processes of the research... These three cycles must be present and clearly identifiable in a design science research project. (Hevner, 2007, p. 88)*

We used a design cycle for the development, iterating through different versions of our visualization and adapting it after each evaluation. The models used to build our visualization come from publications that are well regarded by scholars. Therefore, the grounding of our artifact in the common knowledge base respects the rigor cycle. The relevance of our work also can be supported: A need remains for better solutions to help with the alignment between business models and IT. This need is increasingly relevant in the light of new opportunities offered by cloud computing, in which business models change quickly and IT implementation can evolve much more rapidly than before. The fact that software developers such as Software AG are beginning to include business model tooling on top of their enterprise architecture modeling stacks (ARIS 2012) shows the interest of practitioners in such a connection. To complete the relevance cycle, the artifact should be evaluated in the real environment. We addressed this topic in the evaluation section.

We also remain cognizant of the necessary components for a design theory in information systems, as proposed by Gregor and Jones (2007). In the introduction to this paper, we stated its purpose and scope. Our constructs came from the description of the frameworks and models from which we composed our new visualization of the enterprise architecture. We present our artifact (both form and function) and describe the principles of implementation in the following section. This is followed by a case study that illustrates the artifact through an expository instantiation. The model's mutability, as well as its eventual extension beyond what is presented here, is discussed in the conclusion. The final component, that of testable propositions, is covered in the evaluation section.

AN INTERMEDIARY MODEL CONSTRUCTION

To design the intermediary model, we had to choose one of the existing business model and enterprise architecture methods as a starting point. This choice was guided by our criterion that the intermediary model be visual and easily understandable.

It is crucial to reduce complexity by using a standardized layout. Such standardization leads to quicker identification of the elements in the model. It also facilitates comparisons between different alternatives because the same kinds of elements will be in the same spatial positions. Having set this requirement, we opted for the Business Model Canvas (BMC) as our business model representation and ArchiMate for the enterprise architecture model reference. Before describing how we connected them, we provide an overview of the models and explain why we choose them.

ArchiMate

The aspect of enterprise architecture that interested us for our intermediary model is the layers, which can be used to align the business model with it. Winter and Fischer (2007) provide an essential list of layers, aggregated from use cases and three Enterprise Architecture (EA) frameworks (TOGAF 8.1, FEAF 1.1, ARIS): Business Architecture, Process Architecture, Integration Architecture, Software Architecture, and Infrastructure Architecture (Winter & Fischer 2007). What is interesting is their clear distinction between Business Architecture and Process Architecture. If there is such a clear distinction, a business model method could be used directly to create a view for the business architecture layer. The drawback is that, as is the case when using TOGAF, there is no guidance regarding the modeling language to use to represent the elements in the specific architecture.

ArchiMate is another EA framework (Lankhorst, 2004). It separates the domains into three layers: business, application, and technology. This offers a welcome simplification for the high-level analysis we want to create. The drawback is that the business layer is more process focused than is a real business architecture. In reality, each layer has sub-layers that split the internal representation from the external by exposing its services to the upper layer as interfaces. The topmost business layer exposes the enterprise services to an additional layer containing external roles and actors.

As can be seen in figure 1, ArchiMate is open to visual representation, which makes it particularly attractive. In particular, it encourages the use of visual cues, such as colors, to highlight the different modeling layers (Lankhorst, 2005). Moreover, ArchiMate opts for a unique language (UML) to model every layer of the architecture, thus supporting communication when teams responsible for the different layers need to collaborate.

Even though ArchiMate goes above the business processes layer to expose external business services, it is missing components, such as revenue, costs, channels, and custom relationships, that are used in business modeling to carry out strategic analysis. Furthermore, it is relevant to note that ArchiMate has a focus on infrastructure, with a bottom-up construction. This shortfall in business modeling strategy can be address with the Business Model Canvas (BMC).

[[INSERT FIGURE 1 HERE]]

Figure 1: ArchiMate

Business Model Canvas

We use the Business Model Ontology (Osterwalder & Pigneur, 2002) and its more popular visualization template, the BMC, because it is aligned with our definition of a business model. The fixed and visual layout perfectly matches the requirements we set for a visual intermediary model. Alternatively, e3-value could have been considered, but as shown above, use of e3-value as a starting model already has been tried, with varying levels of success. The value network of e3-value is one of its strong points and a major reason for its use, but the IT alignment focus we examine covers the internal aspects of a company and does not require the value network of e3-value. A more complex e3-value diagram has a lot of arrows and boxes inside boxes which is something that we are trying to avoid.

The Business Model Canvas (BMC) is a representation of an enterprise's business model that consists of nine building blocks. These elements were derived from an in-depth literature review of numerous conceptualizations of business models (Osterwalder & Pigneur, 2002). In this depiction, the business model of a company is a simplified representation of its business logic, viewed from a strategic standpoint (i.e., on top of Business Process Modeling), as shown in figure 2.

[[INSERT FIGURE 2 HERE]]

Figure 2: Business Model Canvas (businessmodelgeneration.com Creative Commons Attribution-Share Alike 3.0)

The main component, which is at the center, is the *Value Propositions*; these describe which customers' problems are solved and why this business's solutions to those problems (products, services) is more valuable than similar ones from competitors. The customers themselves are analyzed in *Customer Segments*. This separation into groups helps to address their common needs, desires, and ambitions (e.g., how single people are similar to each other but different from members of families). *Channels* illustrates how customers want to be reached and by whom they are addressed (Internet, store).

In addition, *Customer Relationships* specifies the types of relationship expected by customers and how they are established and maintained (promotion, support, individual, or mass). In order to be able to deliver the value propositions, the business must have *Key Resources* (staff, machines, proprietary knowledge). These resources are transformed through *Key Activities* into the final product or service (development, production, proprietary

process). In most cases, a business also depends on one or more external *Key Partners* (logistics, financial), either for resources or for activities.

Because any business model would not be complete without financial information, the final two building blocks focus on cost and revenue. The *Cost Structure* should be aligned with the core ideas of the business model (key resources, key activities), and *Revenue Streams* must mirror the values assigned by customers in terms of how much they are willing to pay and how they will perform the transaction (one-off fee, subscription).

Correspondence between ArchiMate and BMC

The concepts from ArchiMate and BMC can be combined to provide an intermediary model. Figure 3 shows the correspondence between them. The main objective in creating an intermediary model is to have a layered structure, similar to that of the enterprise architecture framework as found in ArchiMate. This correspondence enables transitions between the intermediary model and the enterprise architecture. Additional, aim is to provide elements from BMC that are missing in the enterprise architecture, so as to strengthen the model with regard to business model considerations. Inclusion of elements from the BMC facilitates transition between the intermediary model and the business model.

The matching of elements has been done at a high level, using the general definitions given to the elements in their theoretical work.

[[INSERT FIGURE 3 HERE]]

Figure 3: Correspondence between models' elements

In ArchiMate, the topmost layer concerns external actors, which in the case of the BMC are its customers segments and key partners. ArchiMate does not have a distinct layer for financial considerations such as cost and revenue. The BMC describes business models, so it is no surprise that most of its elements can be compared to elements of ArchiMate's business layer. The activity element of BMC can be considered similar to the external application services, which the application layer exposes to the business layer; however, BMC does not go into much detail about how the activities are implemented. High-level processes can sometimes be considered key activities, but not the complete list of processes. Some of the key resources of ArchiMate's technical layer might emerge in the BMC's resource element, but in general these key resources are at too high a level of abstraction to provide good identification of technical components.

It is important to emphasize that the correspondences are only loose ones; for the most part, elements cannot be mapped directly between the two models. The BMC is meant only to show the key elements that are necessary to explain the business strategy. The lists of key activities and key resources do not contain all the activities necessary to generate a value proposition, only the ones that are most important for the strategy. Important activities that are necessary to create the service itself but are considered of an operational value might not show up. This might be the case even if they are considered essential when looking at value creation from an enterprise architecture point of view. Another key point is that the BMC includes, in its key resources, items that are not necessarily physical in nature, such as brands, patents, and know-how. Because of their intangible nature, they are not necessarily visible in the infrastructure portion of an enterprise architecture perspective. These considerations mean

that a direct mapping of all elements is not possible because there will always be some filtering or aggregation, depending on the perspective.

The building blocks of the BMC can also be grouped into three more general perspectives: a *financial perspective*, including cost and revenue, that cannot be found in the basic ArchiMate; a *customer perspective*, including value propositions, channels, relationships, and customers, that can be compared to the higher sub-layers of ArchiMate's business model layer; and an *activity perspective*, including partners, resources, and activities, which share common element with the business process layer, but not at the same level of detail. ArchiMate also includes internal actors, which is not the case with BMC. If an actor is to be added to the intermediary model, it might be possible to capture his or her impact on the element affected by his or her behavior. Although this is sufficient at the strategy level, it may be necessary at the architecture level to know who has the right and the ability to affect which components, rather than only observing the result.

ArchiMate's additional distinction of infrastructure, information, and behavior can be related to the BMC in the following ways. Infrastructure can be related loosely to a resource. Information can be either a resource or a combination of a resource and an activity in the BMC. Behaviors, like actors, are not directly captured in BMC; all that is captured is their impact on an activity.

Application Portfolio and IT Capabilities

To complement the weak matching of the BMC's key activities and key resources with the application and IT infrastructure layers of ArchiMate, we chose to use a classification scheme to structure the matching. A classification helps in structuring elements by forcing decomposition of each element to fit the classification and assists in identifying missing elements; when an element is missing, there will be unused categories. Having fixed categories at each layer forces connections to be made to them, and in modeling, active choices will need to be made when adding connected elements from one layer to the other. Implementing a classification scheme thus forces the modeler to make choices about abstraction and decomposition.

Approaching IT services from a managerial top-down view, Weill and colleagues (Weill & Broadbent, 1998; Weill & Vitale, 2002) define such a classification. They defined four types of objectives for an IT application portfolio: infrastructure, transactional, informational, and strategic. Infrastructure is the basic component that is used by all the other categories. Transactional applications are basic systems that focus on cutting costs and increasing throughput. They can be used by informational or strategic applications. Informational applications provide ways to increase control, have access to better information, and improve quality. Strategic applications are intended to provide innovative services and help generate a competitive advantage.

Decomposing applications into one or more of these categories will help in mapping parts of the applications with the IT resources that support each category. From a managerial perspective, it is difficult to evaluate the role of IT infrastructure when its description is too technical. What is of importance is the capabilities that the infrastructure provides. To further assist in making the connection between the application layer and the infrastructure layer, there is a classification for IT resources.

Weill and Vitale (2002) describe and compare IT resources by providing a classification of IT capabilities: application infrastructure, communication, data management, IT management, security, architecture and standards, channel management, IT research and

development, and IT education. This list is based on a comprehensive survey they carried out, and each item has a set of sub-items to aid in assessing the importance of the capability.

Our focus is to offer a high-level perspective on IT infrastructure and applications, suitable for a managerial focus. We use the classification developed by Weill and colleagues (Weill & Broadbent, 1998; Weill & Vitale, 2002), as it suits our needs. It should be recognized that it would be possible to use a more technically focused classification for IT infrastructure.

In the application layer, to facilitate the association of IT applications with the activities they support, it is helpful to classify them first by process activity type. One such classification is carried out in the internal perspective of a strategy map (Kaplan & Norton, 1996, 2004). A strategy map is an evolution of the Balanced Scorecard created by Kaplan and Norton. It provides an alternate view but is very similar to the BMC's description of a business model. The four processes are operations management, customer management, innovation, and regulatory and social activities. This classification helps to group the BMC's activities more easily and connect them to ArchiMate's business processes.

In the next section, we illustrate how this classification can be arranged visually into a matrix to facilitate showing the alignment between layers.

VISUAL INTERMEDIARY MODEL

We structured the visualization using the same layers found in the ArchiMate framework. To facilitate visual comparison, we adopted a fixed layout, with each element having its own position. Being an intermediary model, it includes elements of both the BMC and ArchiMate, adding more details to some elements of the former and aggregating information from the latter. In our opinion, it is important to be able to transition between the two models and the intermediary model. This ability to transition facilitates examination of the strategic vision of the business model in relation to the intermediary model, as well as linking the intermediary model to the enterprise architecture. Enterprise architecture, which in turn might be linked to a low-level process implementation. The ability to transition between models thus expands the range of issue that can be examined, adding abilities to connect higher level strategic attributes with the lower levels attributes of the implementing process. Furthermore, enterprise architecture modeling should offer the ability to leverage the knowledge of transformation and alignment that has already been developed in this field.

[[INSERT FIGURE 4 HERE]]

Figure 4: Intermediary model inspired by existing studies (Kaplan & Norton, 1996; Lankhorst, 2004; Osterwalder & Pigneur, 2002; Weill & Vitale, 2002)

Figure 4, based on the correspondences described above, shows the proposed visualization for integrating all the components mentioned. The intermediary model is described from the bottom up. At the base is the technology layer of IT infrastructure, which is decomposed into the nine IT capabilities identified by Weill et al. (Weill & Vitale, 2002). In the middle, the applications found in the application layer make up the enterprise's application portfolio. The connection of IT capabilities to activities is through applications. To assist in identifying these connections, there is a classification into a 3 × 3 matrix. The rows of the portfolio distinguish between transactional, informational, and strategic applications, and the columns state the processes that the application supports in the business layer, either: operations

management, customer management, or innovation. The transactional applications usually are combined to form informational or strategic applications before being used by an activity; thus, it is not necessary to classify them into these three categories (as illustrated in figure 4 by the absence of separation of the row for transactional applications). It is not always the case that a strategic or informational application requires a transactional one, since these applications can also directly depend on one or more IT infrastructure services. Additionally, with the emergence of a cloud computing, infrastructure or even application can be replaced by external services such as Platform as a Service or Software as a Service.

For our high–level, managerial focused construct, we decided that infrastructure application could be left out, but it might show up in the IT infrastructure capabilities. This absence of infrastructure application is intended to simplify the visualization and avoid some duplication that might occur if users are not experienced in precise enterprise architecture classifications. For another construction, in which the classification chosen for the IT infrastructure layer is more technically focused, it might be necessary to show a fourth row, for infrastructure applications, in the application portfolio.

The business layer uses the same layout as the BMC so as to benefit from the known layout of its components. To better link the activities, we have added a zoomed view under the BMC (Key Activities process zoom in figure 4) that represents a more detailed decomposition of the key activities into processes. This zoomed view is not an exact hierarchical decomposition; it is only conceptual. It can describe an activity with more detailed keywords or split it up into different parts so as to provide a better understanding of the high-level processes involved. In any case, it is not a complete decomposition into sub-processes as they might be understood in a business process model. These high-level processes are categorized into three types: operations management, customer management, and innovation. Because this is only a zoomed view, all the links within the BMC are still valid, and an activity can be connected to the partners and value propositions it supports. In turn, a value proposition is linked to customer segments through the channels by which customers are reached and customer relationships are maintained.

As described earlier, in the section of the paper describing correspondences, key resources can include the physical IT infrastructure and applications. Although not all the resources involved in all the activities will be listed, key resources should at least highlight the resources that are strategic to realization of the main value propositions. Such a list should be aligned with the links established between infrastructure, applications, and activities in the lower part of the visualization.

Partners might be involved or directly provide activities. In that case, a partner is connected through an activity in the BMC and then linked to the lower parts of the model. It might also be the case that a partner, a relationship, or a channel has a direct connection with an application or an infrastructure component. Most of the time, this should operate through an activity, at least when a zoomed view of the activities is available. If this is not the pathway, then a process might be missing in the model, or there may be a misalignment. Finally, the financial layer takes into account cost and revenues in the business model; it is based on the functions used for each value proposition. Costs are derived from the processes they involve, which in turn base their costs on the applications they involve, which themselves are based on costs of IT services.

Using the Visual Intermediary Model

The proposed visualization can be helpful in various situations, whether as a top-down, bottom-up, or mixed approach. A top-down approach can be useful when planning for a new business model without assigning any existing resources. Visualization can help in evaluating the feasibility of the business model by specifying the applications and resources needed to realize it.

In addition to there being variants of the business model, there will also be variations in the way that it is implemented. These can be explored with our construct without having to build a complicated enterprise architecture model, and while still being able to think about IT resources. Moreover, having a strong link to the business model is useful, because thinking about some implementation points may generate new ideas for new business models.

When choosing to extract the business model from an existing architecture, as in a bottom-up approach, it helps to have a proposed visualization that has classifications for the different layers. Such classifications enable the grouping and abstraction that are necessary to arrive at high-level activities, which are then linked to the other components to form a business model representation. Some elements related to strategy will need to be added from outside the architecture, but the model should provide the right conditions to be able to ask the right questions about the missing elements. Additionally, if some of the existing elements match a business model pattern, this can give further insight into which components are key in such a strategy. For example, if there is clearly a central platform component and a specific customer segment using it, it might be worthwhile to check whether there is a second set of customers to which the platform can or does connect. This would then match the double-sided business model pattern and provide direction for a strategy to reach such a model.

In most cases, there is no clear top-down or bottom-up approach; instead, there are some parts of a business model and some kind of architecture model. Bringing the two together will be an iterative process of changing business model components and of adding missing applications and IT resources to the visualization. A new objective, unused components, underutilized resources or a strategic component may emerge and be highlighted during the process. This process of modeling an as-is situation will help to reveal opportunities and threats, which themselves will act as a starting point for model variants of a to-be model. Further analysis then can be performed more thoroughly in an enterprise architecture model. It should be noted that alignment is not a final step: it should not discourage the seeking out of new opportunities, even if these opportunities will require some non-alignment to realize them.

To highlight different opportunities, it is possible to create multiple versions of the construct that focus on specific elements. It also is possible to draw links between elements to underline an alignment story, as illustrated in the example given in the next section.

INSTANTIATION CASE: SWITCHER SA

The proposed visualization was applied to the company Switcher SA in order to highlight the alignment between its business model and enterprise architecture. Figure 5 shows the business model and the intermediary model visualization combined as one. We first describe Switcher SA's business model before going on to describe the intermediary visualization and the transition to the enterprise architecture.

Business Model

Switcher SA is a small private Swiss company engaged in the manufacture and distribution of garments. The company places a particular focus on social responsibility throughout the whole value chain, from resource production to the distribution of its products. Its products are garments that are simple, colorful, and of good quality. The company sells them at an affordable price while still being able to guarantee a sustainable and traceable product to its customers. Their customers are not limited to buyers who are aware of sustainability issues; through its high quality and competitive pricing, Switcher has attracted a wide customer base that includes families. Other customers include clubs, enterprises, and events that use colored T-shirts as a base for custom-printed promotional articles.

The company uses three types of channels to reach customers: brick and mortar stores, the printer that carries out customization work, and an online store. The company's relationship with its customers is enhanced through a loyalty program called Switcher Friends, which offers special discounts. The brand is also promoted through event sponsorships. At the business model level, the key resources are the company's brand (well known in Switzerland) and its contacts with partners. Partners who constitute the backbone of the company's products include raw material producers (cotton, dye), garment manufacturers, and logistics companies (transport, storage). Key activities involve management of the value chain, which allows Switcher to guarantee supply to its wholesalers and point-of-sale management for its stores.

Intermediary Model

With regard to IT infrastructure and applications, Switcher has a standard set of IT support for employees as well as Enterprise Resource Planning (ERP) software for supply chain and financial management. In addition, it has the necessary resources for maintaining a point-of-sale system and an online store. It is worth mentioning that the special strategic application known as the *Switcher Color System* supports operational aspects by guaranteeing that all garments have the right color dye across all the suppliers. It therefore plays an important role in guaranteeing product consistency and quality.

The proposed visualization is particularly helpful in analyzing such a connection. By way of illustration, we focus on the implication of the value proposition of traceability for the lower levels. Going from top to bottom in figure 5, it is possible to see how the value proposition of a responsibly produced garment (ethics, traceability) is delivered, through the ability to trace each step of the production process. Traceability is made possible only by an innovative traceability management process, which depends heavily on a custom ERP application (Kookaburra Software) at the application portfolio level. Offering this application requires a custom ERP at the IT infrastructure level; this had to be developed in-house (IT research and development). Furthermore, the channel that allows customers to consult tracking information is made possible by a special website (respect-code.org).

Based on this analysis, we can identify the custom ERP (Kookaburra Software) as a key resource in the business model, because without it, one of the main value propositions could not be realized. Moreover, a custom ERP requires an activity of IT development. We therefore can justify the need for IT development in relation to the value proposition. Previously, the IT development might have been considered as an unnecessary cost at a strategic level.

Enterprise Architecture

To demonstrate the link with ArchiMate, we show in figure 6 a partial representation of Switcher SA's enterprise architecture. The view focuses on the traceability service and the main architecture components connected to it. This is a first step to a more zoomed-in view, which could then be further drilled down to reach a detailed process description. Although most of the business model components disappear, the business processes get more detailed, and links are drawn between elements. It can also be observed that ArchiMate provides a distinction between internal and external services, which are connected by interfaces. This is a distinction that our intermediary model does not provide, in order to be more abstract.

In our focus on traceability, we chose to consider the client side. Thus, we highlighted components from which the client can retrieve information. Another focus could have been on how the information is retrieved from the partner and put into the system for later retrieval. The elements corresponding to those mentioned in the intermediary model are given in boldface type. We will discuss them from top to bottom and comment on the new distinctions introduced by this more detailed view.

Partners and customers are at the top of the diagram and are grouped into one layer. The customer is directly connected to the external business service that provides the value proposition and not the general properties of the value proposition itself. The traceability management process is composed of sub-processes of the control and reporting of Corporate Social Responsibility (CSR). In addition to the more detailed description offered by the sub-processes, there is also information on actors' responsibilities in a process. We illustrate this here by adding the CSR Officer. At the application layer, we can observe the distinction between external and internal services. With regard to this ArchiMate model, it is possible to observe that the required applications and IT infrastructure, which were highlighted, have more dependencies into other components, without which the service in question would simply not be feasible. For example, the custom ERP (Kookaburra) depends on other applications that feed it the needed information. The more detailed low-level IT infrastructure also is added to this model.

[[INSERT FIGURE 5 HERE]]

Figure 5: Switcher SA Business Model Enterprise Architecture

[[INSERT FIGURE 6 HERE, ideal if next to each other left right page]]

Figure 6: Switcher SA ArchiMate partial extract for traceability

EVALUATION

Design science research iterates on the artifacts it builds, improving through feedback gained from evaluations. In our early iterations, we applied our intermediary model to use cases to gain insights into the ease of identifying and connecting elements for each defined element in our model. We also presented the intermediary model in e-business and enterprise architecture master level courses, and we collected feedback on the legibility of the visualization by doing a small exercise after the presentation. These tests resulted in iterations, the result of which was a switch from a custom layout of the nine elements of the Business Model Ontology to the current representation of the Business Model Canvas. This change reduces the time to read the model for anyone who is familiar with BMC

visualization. Another change was switching the order of the layers in the application portfolio. Initially, as a result of poor foresight, the order was transactional, informational, and strategic. This simple mistake of having transactional applications directly under key activities made it harder for some testers to identify the application. During this first iteration, we also observed that users either struggled to categorize a transactional application into one of three subcategories (operations, customer, innovation) or simply added it to all three of them. After we put the layers in a more logical order (strategy, informational, transactional) and removed the sub-categorization for transactional applications, students had less difficulty in completing the application portfolio. This further convinced us that a fixed placement of elements in business visualization is important, because it simplifies comparison of different versions and across different companies. The concept positions need to be learned only once. Because we reuse terminology from business modeling and enterprise architecture, user already know at least half of the model's element.

The model was also evaluated in use, during a course on e-business presented to a mixed group of students from the University of Lausanne. Students participating were from master's programs either in information systems or in management. Groups consisting of four or five students had to create business models, an intermediary model, and an ArchiMate model of a real company and write a report detailing their findings. The companies chosen by the nine groups were all SME's and were not limited to e-businesses companies: one public utility, one large sporting event, one manufacturing enterprise, three web services, two web portals, and one financial services company.

Students worked on the assignment during the 12 weeks of one semester. It had three deliverables: (1) business-model focused, with a first version of the business model of the chosen company; (2) alignment focused, where students had to develop the intermediary model and the ArchiMate model and discuss alignment; and (3) environment focused, describing the environment in which the company evolves.

Of the nine groups, eight had their enterprise architecture model closely match their business models, through the use of the intermediary model. This marked an improvement over the previous year, when the students developed the enterprise architecture and the business model separately without trying to match them through an intermediary model. One caveat to this result is that the choice of company was up to the groups of students, so that it is difficult to say whether one set of companies was easier to model than the other. The one group that failed to match the enterprise architecture closely to the business model did not develop the intermediary model correctly on a one-page visualization; these students treated each layer separately and seemed to struggle with the connections between them.

Another insight gained with this test was that even though the models were of better quality and showed connections from the business model to IT infrastructure, it is still difficult to provide a good analysis of the alignment. Only three of the eight groups that had a workable intermediary model managed to articulate a clear profile of alignment or misalignment for their company. This led us to propose the visual tracing, which we illustrated using the Switcher case study. In a future evaluation, we intend to examine whether asking for such a tracing can help trigger students to start a better, more productive discussion of alignment. One future step will be performing an evaluation using more in-depth cases. In addition, we will take into account feedback from the professional community that uses enterprise architecture and business models.

We used the Switcher SA case to gain some insights about the intermediary model. Before applying the intermediary model to the case, we attempted to model the business model and the enterprise architecture separately. Trying to merge the two models presented two

problems. First, adding some elements from ArchiMate into the business models (IT resources into resources, and processes into activities) produced elements with technical terms that are not familiar to many businesspeople. Second, for some abstract external business service activities, we had trouble identifying the corresponding concrete implementation process in the ArchiMate model.

Creating the intermediary model forced us to use more consistent wording of the elements, acceptable to both businesspeople and technical people. Reaching the right compromises for the wording helped to improve the classification used in the layers and to select the right abstraction level for each element. This helped in developing the correspondence between the intermediary model and the ArchiMate model. Unnecessary technical detail was not added to the business model; on the contrary, such key assets as Kookaburra Software were highlighted. The importance of IT development staff was also identified, a fact that might have been missed if there had been no classification to guide us.

The previous exercice led us to observe that there are three type of transitions to evaluate separately: top-down, bottom-up, and mixed-mode. For the top-down approach, it will be interesting to evaluate the range of variation that can be generated using a given identical starting business model. In terms of control, testing will also allow us to examine whether using a pattern library to guide the addition of elements at the lower layers helps or hinders in the search for an architecture that can efficiently support the overarching business model. Testing for the bottom-up approach will be more difficult. As yet, there is no formal process for identifying which elements should be considered for filtering or aggregation before they are added to the intermediary model. Additionally, for an architecture that supports multiple business-model focuses, several versions will have to be produced and then merged together or split according to different business considerations. This evaluation therefore will require several iterations if we are to gain useful insights into how to approach the modeling and alignment problem in a more formal way. The potential for better identification of key resources or discovering new business opportunities based on existing resources should justify the time required for such an evaluation.

Finally, it is difficult to envisage a test to evaluate a dynamic approach to mixed-mode iteration if the above two evaluations have not been undertaken. An iterating approach touches on the topic of comparing different versions of a model and determining its evolution, a topic that we consider to be outside the scope of this paper but a worthy subject of future study.

DISCUSSION AND CONCLUSIONS

Comparing IT services and a business model and seeing how they are connected helps to highlight the interactions between them. This offers a possibility of assigning a cost to each value proposition. It also enables identifying the alignment of the business strategy with the infrastructure supporting it. Having access to information on connectedness allows to prioritize assets according to their strategic importance. This evaluation, in turn, could be used to identify opportunities for outsourcing non-core services. It also could help to create new business models, providing new value propositions that would capitalize on underutilized assets.

We addressed the research question of whether a visual intermediary model support IT alignment by helping to transition between a business model and an enterprise architecture? As a solution, we put forward an intermediary model that takes components of both

paradigms in order to have a common ground. Through a use case, we showed how this model can connect to the business model vision as well as to the enterprise architecture. Because we constructed our intermediary model using formalism from both domains, it provides a common basis to start a discussion with parties from both paradigms. The proposed model is agnostic regarding the direction of study: it can be used from a top-down view, moving from a business model strategy to an architecture supporting it, or it can be used in a bottom-up view, starting from the enterprise architecture and extracting the business model it can support. Offering this mixed view, containing both a business-focused and an IT-focused view, helps the alignment of business strategy and technical IT infrastructure.

Our intermediary model construction contributes to finding a correspondence between BMC and ArchiMate components. We demonstrate a way to match elements, using a matrix/pivot of two classifications where the correspondence is weak. ArchiMate was used for our demonstration instantiation, but any model that supports the layers used by the intermediary and can map to its components can be used as destination target for a transition between them. The process of finding corresponding elements and the visual focus of the intermediary's model presentation are the key sources of the value added by our construction.

Our visualization will be useful to practitioners as a tool that, with its visual one-page layout and classification at each layer, offers a way to find common ground for managerial and technical people. This provides a starting point for discussing alignment and assisting collaboration.

ArchiMate provides a more IT-centric view, with technical details that must be abstracted to transform it into business visualization. In addition, the business visualization elements must be extended with additional information if they are to be used t to build an ArchiMate model. Therefore, an intermediary model could result in the creation of multiple variants of the related ArchiMate model or business model. This is not necessarily a problem; indeed, it could lead to the development of new opportunities as well as helping to identify areas that require more attention when considering alignment.

Further use cases should be tested to see how the method can help in identifying misalignments. It might also be possible to define a more systematic way to transition between models, although such a method would have to handle the variability of these multiple models.

By choosing to use a fixed layout for the visualization, we made it possible to compare different models and thus start addressing the need for more "formalized means of representations as well as procedure model to allow a structured and comparable visualization of business models" (Burkhart, Krumeich, Werth, & Loos, 2011, p. 15). Our proposed visualization and its technique of zoom/pivot focus on IT applications and activities. The visualization should be applied to other components of the business model canvas in a formalized and visual way. One possibility is to address the customer segment with a more detailed model of customer profiles and insights.

Further Work

Creating an intermediary model to help with IT alignment is an early step in addressing the opportunities to using IT as a strategic asset. The interconnected nature of such a model provides the possibility of exploring a variety of domains. We briefly describe three. First is an approach using patterns to further structure the internal alignment possibilities between an IT model and a business model. Second, we could expand on the internal focus covered in the current iteration of the intermediary model, looking for possibilities to add the external

environment. Third, we can look for opportunities to leverage the identified connections in practice, through the use of computer assisted design tools.

Applying Patterns

Beyond making it possible to visualize the business model on a one-page canvas, the BMC also allows us to highlight and compare business model patterns and BMCs (Osterwalder & Pigneur, 2010). A business model pattern describes some components of a business model and their relationships in a way that can be applied to other similar situations (freemium, double-sided, unbundling, long tail). As with patterns in other fields, once a pattern or situation is recognized, it is possible to identify components that are missing.

Weill and Vitale (2002) used the notion of pattern to classify the importance of the IT capabilities they defined for each situation. It may be possible to compare the implications of patterns at the IT infrastructure level, as well as the strategic business model level, to further help with alignment.

For example, Switcher SA acts as a value net integrator. According to the IT capabilities pattern, this role requires important channel management systems. This is the case for Switcher SA. The company has an important investment in a point-of-sale system, which aligns to the business model strategy of owning stores to reach niche customers interested in responsibly produced garments.

External Factors

In its current form, the proposed model focuses on enterprises' internal factors. With the need for to have more collaboration between companies and the growing importance of external factors such as social and regulatory constraints, the model should be augmented. At the business layer, the environment map described for the BMC (Osterwalder & Pigneur, 2010) could help in identifying external influences using its four components (key trends, market forces, industry forces, and macro-economic forces). These components of external influences, as with the internal components, could be aligned to the fourth unused process category of the strategy map: regulatory and social processes. Alignment with the lower layers might be more difficult because these concerns seem to impact on every component of the schema and cannot be resolved simply by adding one more column to the visualization. The proposed model already provides good insights into a large part of internal considerations.

Computer-Assisted Design

Selectively focusing on a specific part of a business model, as well as the need to compare different implementation possibilities for it, raises the issue of managing these multiple models. We argue that one way to manage them is to use a computer-assisted design tool. Such a tool could help, for example, in making sense of differences between different versions of the model by providing visual hints such as changing the size or color of the different components. A digital version has additional benefits, such as adding information to elements without overloading the visualization, because its visibility can be toggled. With a digital version of the model, it would be possible to connect elements with each other, as we did for the alignment tracing in the Switcher case. With such a tool, the defined links could help to compute total costs for different parts of a business model. This, in turn, could enable

a rough estimation of a business model's viability based on the chosen connected implementation.

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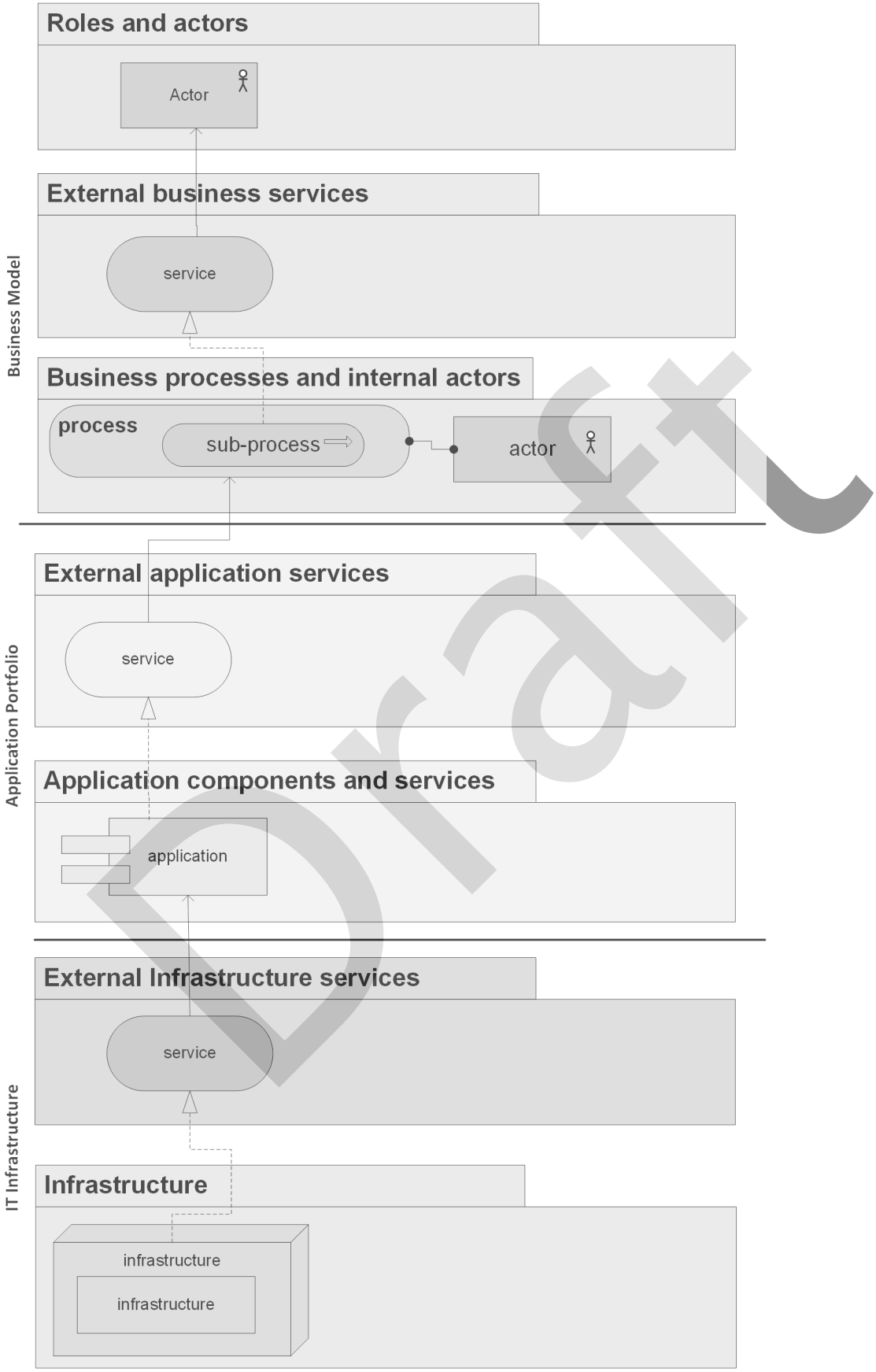
Business Model
Application Portfolio
IT Infrastructure
Roles and actors
Actor
External business services
service
Business processes and internal actors
process
sub-process
actor
External application services
service
Application components and services
application
External Infrastructure services
service
Infrastructure
infrastructure
infrastructure

The Business Model Canvas

Designed for:

Designed by:

On:

Iteration:

Key Partners

Who are our Key Partners?
Who are our key suppliers?
Which Key Resources are we acquiring from partners?
Which Key Activities do partners perform?

Key Activities

What Key Activities do our Value Propositions require?
Our Distribution Channels?
Customer Relationships?
Revenue streams?

Key Resources

What Key Resources do our Value Propositions require?
Our Distribution Channels? Customer Relationships?
Revenue Streams?

Value Propositions

What value do we deliver to the customer?
Which one of our customer's problems are we helping to solve?
What bundles of products and services are we offering to each Customer Segment?
Which customer needs are we satisfying?

Customer Relationships

What type of relationship does each of our Customer Segments expect us to establish and maintain with them?
Which ones have we established?
How are they integrated with the rest of our business model?
How costly are they?

Channels

Through which Channels do our Customer Segments want to be reached?
How are we reaching them now?
How are our Channels integrated?
Which ones work best?
Which ones are most cost-efficient?
How are we integrating them with customer routines?

Customer Segments

For whom are we creating value?
Who are our most important customers?

Cost Structure

What are the most important costs inherent in our business model?
Which Key Resources are most expensive?
Which Key Activities are most expensive?

Revenue Streams

For what value are our customers really willing to pay?
For what do they currently pay?
How are they currently paying?
How would they prefer to pay?
How much does each Revenue Stream contribute to overall revenues?

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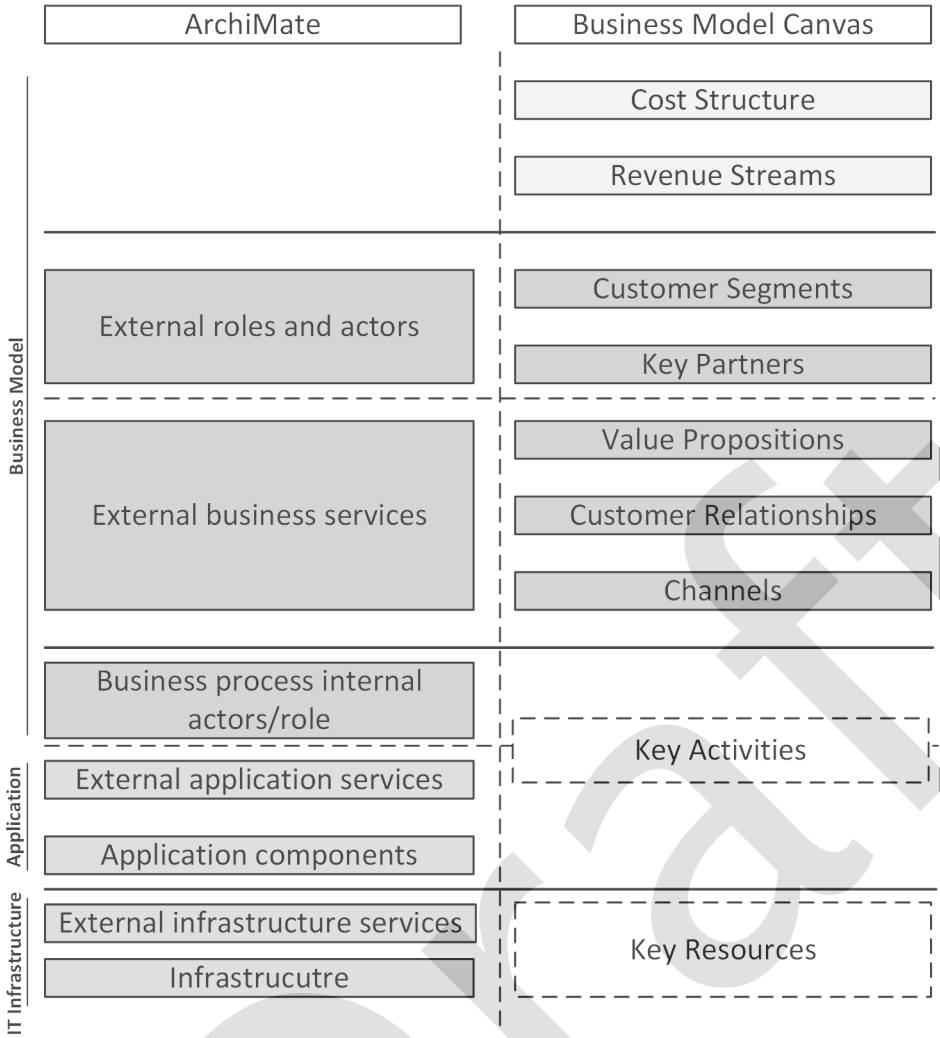
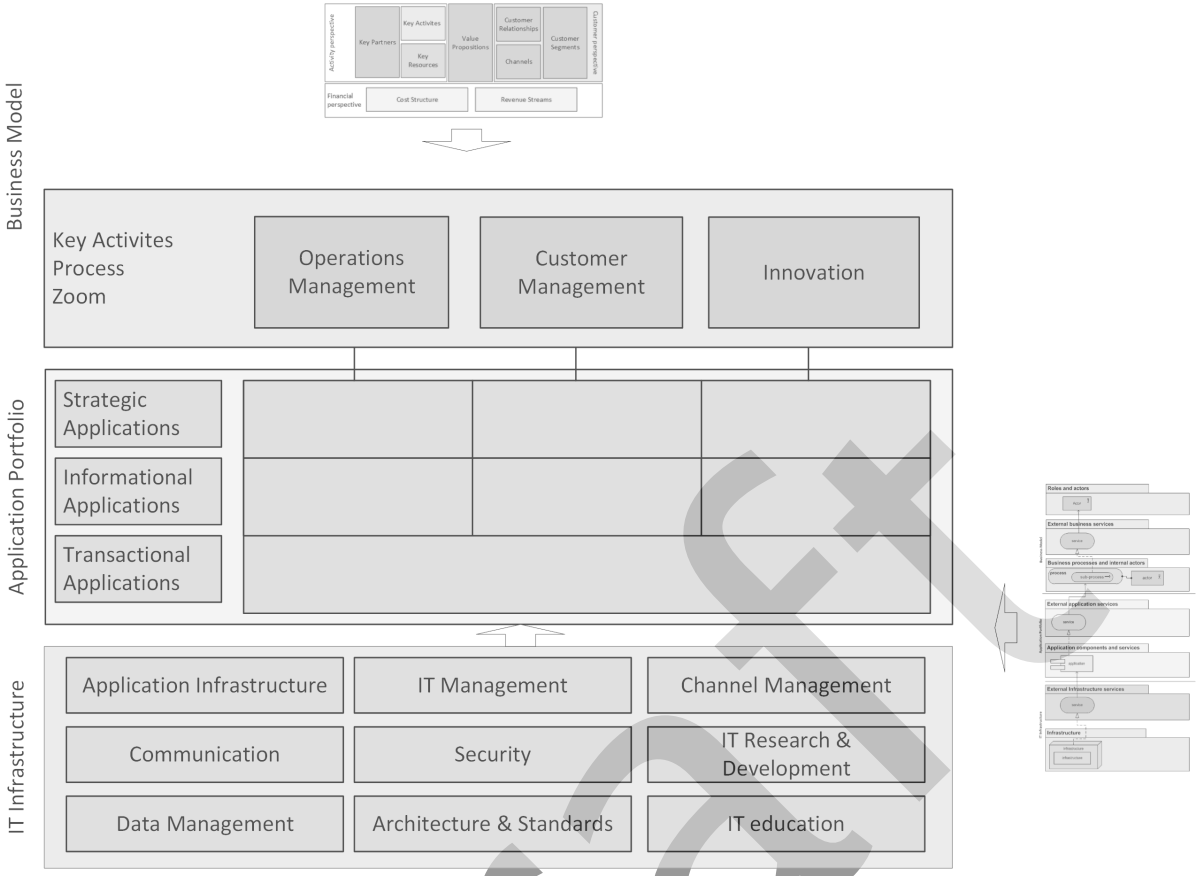
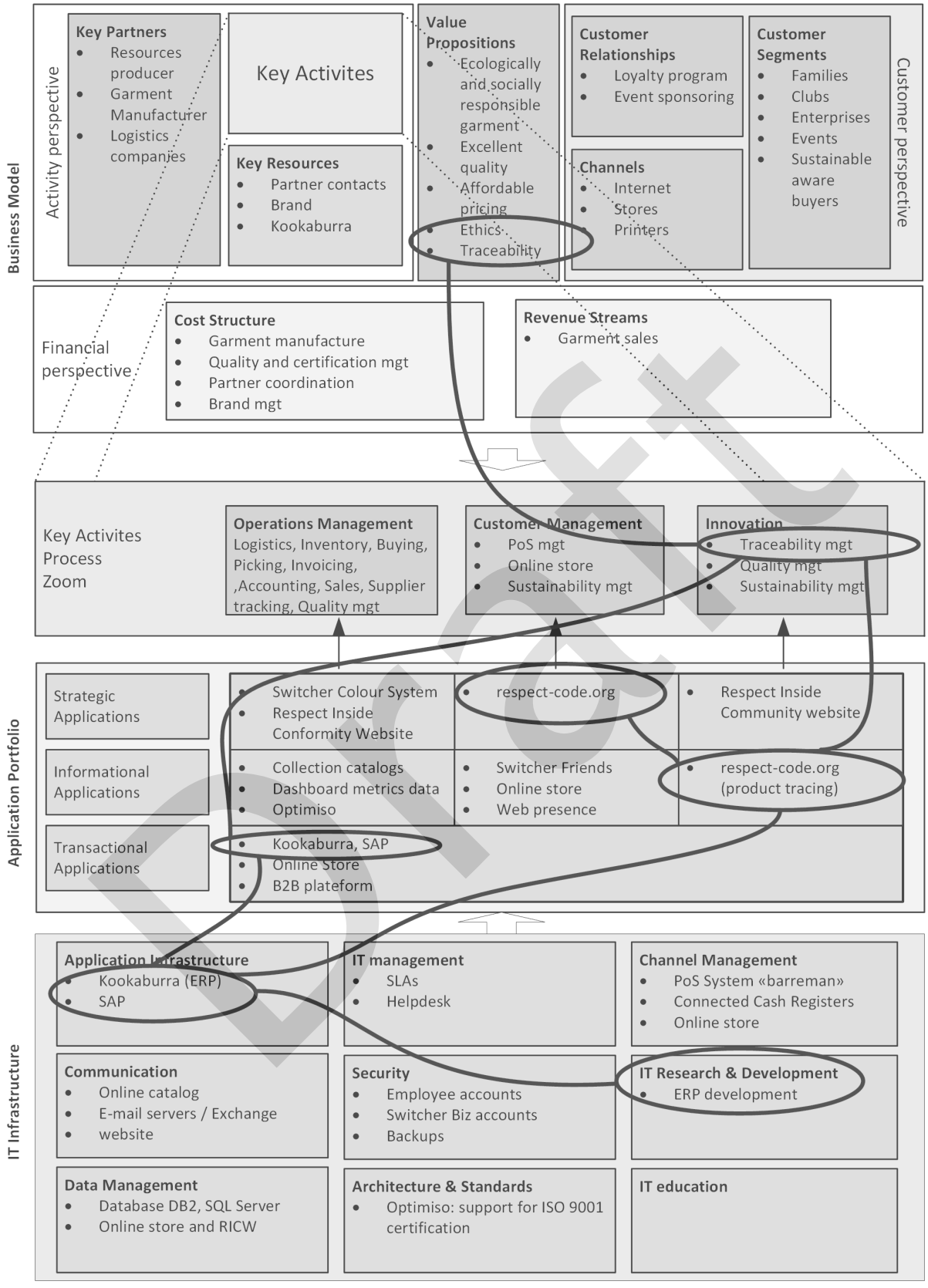
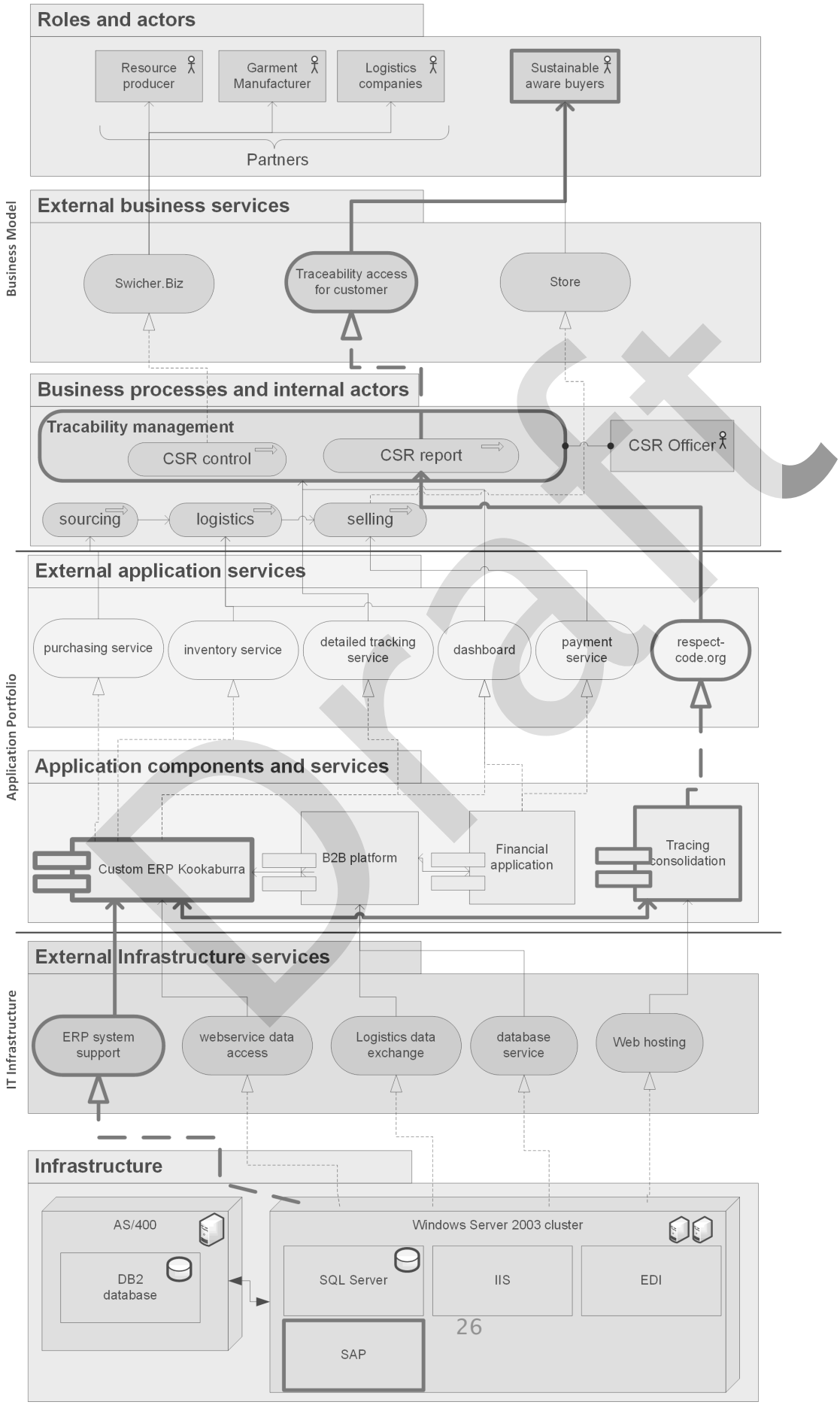

ArchiMate
Business Model Canvas
Cost Structure
Revenue Streams
External roles and actors
Customer Segments
Key Partners
External business services
Value Propositions
Customer Relationships
Channels
Business process internal actors/role
Key Activities
External application services
Application components
External infrastructure services
Infrastrucutre
Key Resources
Business Model
Application
IT Infrastructure


Business Model
Activity perspective
Key Partners
Key Activites
Key Resources
Value Propositions
Customer Relationships
Channels
Customer Segments
Customer perspective
Financial perspective
Cost Structure
Revenue Streams
Key Activites
Process
Zoom
Operations Management
Customer Management
Innovation
Application Portfolio
Strategic Applications
Informational Applications
Transactional Applications
IT Infrastructure
Application Infrastructure
IT Management
Channel Management
Communication
Security
IT Research & Development
Data Management
Architecture & Standards
IT education


Business Model
Activity perspective
Key Partners
Resources producer
Garment Manufacturer
Logistics companies
Key Activites
Key Resources
Partner contacts
Brand
Kookaburra
Value Propositions
Ecologically and socially responsible garment
Excellent quality
Affordable pricing
Ethics
Traceability
Customer Relationships
Loyalty program
Event sponsoring
Channels
Internet
Stores
Printers
Customer Segments
Families
Clubs
Enterprises
Events
Sustainable aware buyers
Customer perspective
Financial perspective
Cost Structure
Garment manufacture
Quality and certification mgt
Partner coordination
Brand mgt
Revenue Streams
Garment sales
Key Activites Process Zoom
Operations Management
Logistics, Inventory, Buying, Picking, Invoicing, ,Accounting, Sales, Supplier tracking, Quality mgt
Customer Management
PoS mgt
Online store
Sustainability mgt
Innovation
Traceability mgt
Quality mgt
Sustainability mgt
Application Portfolio
Strategic Applications
Switcher Colour System
Respect Inside Conformity Website
respect-code.org
Respect Inside Community website
Informational Applications
Collection catalogs
Dashboard metrics data
Optimiso
Switcher Friends
Online store
Web presence
respect-code.org (product tracing)
Transactional Applications
Kookaburra, SAP
Online Store
B2B plateform
IT Infrastructure
Application Infrastructure
Kookaburra (ERP)
SAP
IT management
SLAs
Helpdesk
Channel Management
PoS System «barreman»
Connected Cash Registers
Online store
Communication
Online catalog
E-mail servers / Exchange
website
Security
Employee accounts
Switcher Biz accounts
Backups
IT Research & Development
ERP development
Data Management
Database DB2, SQL Server
Online store and RICW
Architecture & Standards
Optimiso: support for ISO 9001 certification
IT education


Roles and actors
Resource producer
Garment Manufacturer
Logistics companies
Sustainable aware buyers
Partners
Business Model
External business services
Swicher.Biz
Traceability access for customer
Store
Business processes and internal actors
Tracability management
CSR control
CSR report
CSR Officer
sourcing
logistics
selling
External application services
purchasing service
inventory service
detailed tracking service
dashboard
payment service
respect-code.org
Application Portfolio
Application components and services
Custom ERP Kookaburra
B2B platform
Financial application
Tracing consolidation
External Infrastructure services
ERP system support
webservice data access
Logistics data exchange
database service
Web hosting
IT Infrastructure
Infrastructure
AS/400
DB2 database
Windows Server 2003 cluster
SQL Server
IIS
EDI
SAP