Achieving Business Process Agility through Service Engineering in Extended Business Networks
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The rise of service-dominant business
Many business domains are currently transitioning towards a service-oriented business setting [10]. Before the transition, business settings used to be centered on the delivery of products. After the transition, they will be centered on the provisioning of solution-oriented services to customers. Services may require the deployment of products, but these products become part of the delivery channel of services, not the focal point themselves. Ownership of products becomes a less relevant issue. The emphasis shifts from the value of the individual product to the value of the use of the product in an integrated context – the so-called value-in-use.

This transition has consequences for the very basic characteristics of doing business. Firstly, customers expect coherent solutions, not stand-alone solution fragments. Thus, solution-oriented services are of a complex nature that requires the integration of the capabilities of multiple service providers. This introduces the necessity of explicitly managed business networks. Secondly, customer-driven requirements to solution-oriented services will evolve much faster than requirements to the underlying products. Rapid technology developments will further reinforce this process. Thus, managing agility in service delivery will be a key factor in the market position of a service provider. Thirdly, managing service complexity and business agility requires a tight integration between the structure of business strategy and models on the one hand and the structure of business operation and information management on the other hand. It is not only about what service to sell, but also about how to get it delivered. This is where agile business process management enters the stage.

Performing the transition to service-oriented business and managing its consequences is a formidable task for any non-trivial business organization. Taking a traditional top-down, business-strategy-to-operations approach can be too slow to follow the current fast pace of market developments. Taking a quick-win, opportunity-driven, bottom-up approach can result in chaos. An approach is required that is completely tuned to the service-oriented transition and that has the very basics of service-oriented business at its core. BASE/X is such an approach, as we explain in this article.

The core of BASE/X
BASE/X is a business engineering framework for service-dominant business, i.e., service-oriented business that puts service management at the forefront. BASE/X
covers the entire spectrum from high-level business strategy definition to business information system architecture design, including elements like business model conception, business service specification and business process modeling. The very core of BASE/X is the understanding that to achieve truly agile service provisioning business, these elements cannot be treated in isolation.

To capture networked, service-oriented business, BASE/X has two core business principles:

1. Business services and the value-in-use they deliver to customers are the primary building blocks for contemporary business design and execution.
2. To deliver integrated business services as a solution to a customer, networks of providers of basic services are required. Given the volatility of many markets, these networks must be dynamic in their structure. Explicit orchestration of these networks in business processes is of paramount importance.

To structure business organizations, BASE/X uses two core business engineering principles:

3. An explicit distinction is required between the stable essence of a business organization and the agile market offerings of that organization. These two elements must be explicitly co-engineered in business design to achieve a well-structured bimodal capability [11].
4. An explicit distinction is required between business structures, operational structures, and information system platform structures. These three elements must be explicitly co-engineered in service and process engineering.

Below, we briefly outline business design, operations design, and IT platform design in BASE/X to provide the general flavor of BASE/X.

**Business design in BASE/X**

Business design in BASE/X is based on the observation that we need the distinction between business goals (the ‘what’ of business) and business operations (the ‘how’ of business) on the one hand and the distinction between the stable essence of an organization and its agile market offerings on the other hand [4]. This leads to a model with four layers, as shown in *Figure 1*.

![Figure 1: BASE/X business pyramid layers](image-url)
As shown in the left side of Figure 1, the top half of the pyramid covers business goal engineering. As shown in the right side of the figure, the top layer contains the service-dominant business strategy. This strategy describes the identity of an organization in a service-dominant market. The identity is relatively stable over time: the strategy evolves. The second layer contains service-dominant business models. Each business model describes a market offering in the form of an integrated, solution-oriented complex service: a concrete value-in-use. Business models follow fluid market dynamics and are agile: they revolve – they are conceived, modified, and discarded as required. An organization has one single strategy, but a dynamically evolving set of business models – each addressing a specific customer segment in terms of value offered, customer group, or geography.

The bottom half of the pyramid covers business operations engineering. The bottom layer contains business services, each of which contains a core service capability of the organization. As these capabilities are related to the resources of the organization (personnel and infrastructure), they are relatively stable over time: they evolve. The services are organized in a service catalog. The third layer of the pyramid contains the service compositions. Each composition is a combination of business services to realize the service functionality required by a business model: it implements a concrete value-in-use. The combination includes business services from the organization’s internal service catalog, but also business services of partner organizations. As service compositions follow business models, they are agile: they revolve with their associated business models. Service compositions are operationalized into business process models by adding control flow.

As shown in Figure 2, engineering the stable part of business takes place in the strategic design cycle. In this cycle, the identity and the capabilities of an organization are aligned in an evolutionary fashion. Engineering the agile part of business takes place in the tactic design cycle. Here, business models and their realization in service compositions are created, modified and discarded in a revolutionary fashion. The tactic design cycle ‘spins’ at a higher speed than the strategic design cycle. Alignment of both cycles takes place by confronting business goals between strategy and business models, and by confronting business means between business services and service compositions. This alignment realizes the necessary co-engineering of stable and agile business elements.

The dual-cycle approach of business engineering in BASE/X allows for harmonized decoupling of long-term strategic thinking and medium-term tactic thinking. It eliminates the need for rigid top-down or chaotic bottom-up business design - as discussed before, often found in current practice. By including explicit confrontation mechanisms, we lay the basis for achieving well-structured bi-modality in business design.
Tooling in BASE/X business design

BASE/X offers more than the conceptual approach outlined above. It also offers a set of business design tools for each of the four layers of the business pyramid:

- For strategy design, a service-dominant business strategy canvas is available [9]. This canvas is inspired by the well-known Business Model Canvas, but focuses on the strategy level in a service-dominant context.
- For business model design, a service-dominant business model radar is available [14]. Like a canvas, this tool is a template for business design. Unlike other business modeling tools, the radar tool has network-centric business model design at its core (shown in its circular design), allowing the composition of service design in collaborative, multi-party business networks.
- For service composition design, models are available from established business process management practice, applied in a service management context. These include both the support of provider-managed service solutions (in the form of structured business processes) and customer-managed service solutions (in the form of flexible service mash-ups).
- For business service design, models, templates and design criteria are available for the creation of well-structured business service catalogs [4]. These catalogs are the basis for the agile creation of multi-party service compositions.

For merely illustrative reasons, an example business strategy canvas and business model radar are shown in Figure 3 and Figure 4 (adopted from a service-dominant business design in the travel industry domain [4]). The strategy canvas specifies how TraXP positions itself strategically as a provider of seamless travel experiences in the travel market. The business model shown in Figure 4 is centered on one type of concrete value-in-use that is associated with the abstract value-in-use described by the business strategy: the value-in-use for executive business travelers. Other business models exist concurrently for other types of concrete value-in-use that address other customer segments (three more business models for this case, to be precise).
The center of the BASE/X radar in Figure 4 shows the solution provided (in this case, a business travel solution for executive travelers) and the pie slices around it the parties (organizations) that collaborate in providing this solution (including the customer, i.e., the executive traveler, and the orchestrator, i.e., TraXP). The three rings list per party (inside-out) which value the party contributes to the solution, which activities the party performs to generate this value, and what the costs and benefits are in doing so (see [14] for further details about this design technique).
Operations design in BASE/X

Operations design in BASE/X provides the organizational operationalization of the elements in the business pyramid discussed in the previous section. Organization design covers both automated organizational processes and manual processes.

To obtain proper alignment between business and organization design, organization design follows the same four layers as business design – as shown in Figure 5. Proper co-engineering is achieved by mapping changes in a layer of the business pyramid to changes in the corresponding layer in the operations pyramid (and reversely, if so required).

The top layer of the organization pyramid contains support for service-dominant strategy design, analysis and enactment. This includes processes, practices and conceptual tools (IT tools are dealt with later, as we will see). The second layer contains support for service-dominant business model design, analysis and enactment. In the third layer, we find support for service compositions, i.e., design and execution of operational business processes. These can have the form of specifications of automatically executable processes. To illustrate things, Figure 6 shows an example abstracted business process based on the service composition of the business model shown in Figure 4.
In the bottom layer of the operations pyramid, support is located for creation and execution of business services and business service catalogs. The activities in a business process (as shown in Figure 6) are mapped to business services identified in the service catalog. One business process activity typically corresponds to several business services that are modeled as a sub-process (usually with a simple control flow). An example is shown in Figure 7, where the activity ‘messaging’ of Figure 6 is implemented by a simple sub-process containing two business services and a simple control flow containing an iteration over one service.

Figure 6: example abstract business process model derived from BASE/X service composition
Platform design in BASE/X

So far, we have not yet addressed the information technology aspect in BASE/X – this is part of what we call platform design. The design of the information technology platform in BASE/X provides the blueprint for the information systems platforms that are required for the execution of the elements identified in the organization pyramid. For proper alignment, the platform design also follows the same four layers as the other two BASE/X pyramids – as shown in Figure 8.

The top layer of the platform pyramid contains decision support systems (DSS) for strategy design and maintenance. Depending on the sophistication of the organization, this may include automated systems, or may be fully manual. The second layer contains systems for business model design and maintenance. This includes decision support systems (again automated or manual) and online management dashboards for the tactical monitoring of business model execution (i.e., the operational and financial faring of the organization). The third layer contains business process management systems or other forms of service orchestration platforms. Typically, a high level of automation is desired here for efficient integrated service delivery. The bottom layer of the platform pyramid contains platforms for the management and execution of actual business services. Also here, a high level of automation is typically desired, as found in managed service environments.

The embodiment of the platform pyramid is realized in practice with the use of the BASE/X reference architecture. This architecture is shown for illustrative purposes in Figure 9 (a detailed discussion can be found in the BASE/X documentation [3]).
full alignment with the three BASE/X pyramids, this reference architecture again follows the same four layers as the pyramids. In these four architecture layers, the strategic and tactic business feedback loops are explicitly embedded by information flows, such that business intelligence is structurally included in the IT landscape design.

### Conclusion

The BASE/X framework, its scientific background and its practical tooling have been developed in a period of several years of tight collaboration between academy and industry. Consequently, the framework is strongly rooted in both academic research and in business practice. BASE/X has been and is currently being applied in a substantial number of industrial cases – both directly with industry and in major R&D efforts like European Horizon 2020 projects. Covered industry domains so far include the financial industry, the mobility industry, the document handling industry, high-tech manufacturing, international logistics [13], traffic management [12, 5, 6, 8] and event management. Application in practice has demonstrated the added value of BASE/X in structured modeling and engineering of complex service-dominant business. The approach has been presented to a broad spectrum of industrial and academic audiences. Experience with all applications and discussions is currently used for further evolution of the approach in several directions: further scientific underpinning, further practical detailing of concepts and development of supporting automated tools.

As we have briefly shown in this article, BASE/X is a basis for the semi-automatic generation of business processes from collaborative, multi-party service-dominant
business models. We think that the ability to efficiently generate and execute these business models will be a discriminating advantage in a service-dominant business world where customers expect ever more complex service offerings with ever shorter life cycles. We couple this agile approach in a tactic design loop to a more stable approach in a strategic design loop (as illustrated in Figure 2) to avoid the problems encountered in bimodal approaches without proper structure [2].

Doing so requires small extensions of current BPM technology, but a radically different approach to using it in practice: business processes will not so much be a refinement of static information system specification with an emphasis on what happens within an organization, but a conversion of highly dynamic business models with an emphasis on what happens between organizations and their customers. The former characterizes the traditional practice of exploitation in the BPM field with emphasis on internal process standardization and optimization, while the latter signifies the practice of exploration with special focus on opportunities, customer orientation, and creativity [1]. The former is problem-centered while the latter is opportunity-driven and solution centered [7].

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