Enterprise BPM – A Systemic Perspective

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Enterprise as a System

At the most abstract level, an enterprise can be seen as a system. As such, it cannot be defined in terms of its actions as a whole or by enumerating its constituent elements. In their seminal work on systems in biology, Maturana and Varela make a useful distinction between the organization and structure of a system. The *organization* of the system defines its identity in terms of inter-component relationships. It specifies a category, which can be realized through specific *structures*. Figure 1 illustrates this distinction. A system may change its structure without loss of identity, as long as its organization is maintained.

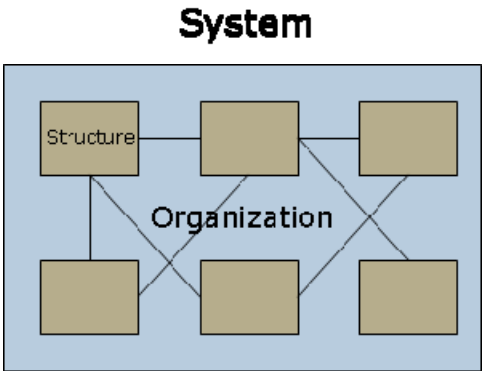

Figure 1. Organization defines the system's identity in terms of inter-component relationships. Structure realizes the category specified by the organization.

An enterprise is essentially defined by its business processes encompassing both systemic organization and structure – the relationships between process participants as well as the specific realizations of the participants. A business function, for instance, plays different roles in different business processes and aligns its internal operations accordingly. The implementation of a separate business functionality can be changed – e.g., by automating a manual task – without affecting the nature of the business process as a whole.

IT Approaches to Process Management

Business Process Management (BPM), in general, is essentially about discovering these relationships, analyzing and redesigning them, defining performance metrics for each participant, and monitoring and optimizing their performance. In the wake of enterprise computing, an ever-higher degree of process management is supported by and automated with information technology (IT). Three broad IT paradigms of increasing coverage can be distinguished:

1. **Workflow Management (WfM)** is used to manage the class of *controlled processes*. These processes take place within the structure of the enterprise under a single control. Formally, workflow processes are based on Petri Nets, which have static flow paths. The behavior of these processes is scripted: Every conceivable flow path needs to be

imperatively determined. Thereby, the approach is not suitable for complex collaborations with varying contingencies.

2. **Business Process Management (BPM)** approach transcends workflow management by further managing the class of *coordinated processes*. These processes include the organization aspect of the enterprise by addressing the coordination between multiple control realms. The formal underpinning of BPM is pi-calculus, in which concurrency is based on messages passing between natively parallel threads of execution. The behavior of these processes is fluid; a declarative choreography specifies the boundaries for all feasible flow paths. Thereby, the approach is suitable for mechanistic, structured, collaborative processes with a normative coordination contract. However, it does not address irregular collaborations where contract dynamically changes in the course of the process.

3. **Human Interaction Management (HIM)** addresses the previous two classes of processes as well as the class of *contracted processes*. These processes allow the organization of the enterprise change by enabling renegotiation of the coordination contract within the process. HIM is also based on pi-calculus, and the behavior of contracted processes is essentially mobile: The network "wiring" between the participants can change due to channel passing. The approach is suitable for managing irregular collaborations, specifically human interactions, in which the process dynamically evolves as it is executed.

The three IT approaches to process management are compared in Figure 2. Workflow Management addresses the *controlled process* in the form of a *workflow*. An analogous concept in the BPM approach is *orchestration* that specifies the private process of a process participant in the overall business process. The public process governing the message exchange between these participants is specified by *choreography* that addresses the *coordinated process*. Coarsely corresponding concepts for controlled and coordinated process in Human Interaction Management are *Role* and *Story*, respectively, yet these are much more flexible and adaptive than in WfM/BPM. An HIM process is known as a *Story*, and includes both *Roles* representing process participants and *Interactions* representing their channels of communication. Further, a HIM *Agreement* specifies the means by which a specific type of consensus about next steps is arrived at in *contracted processes*.

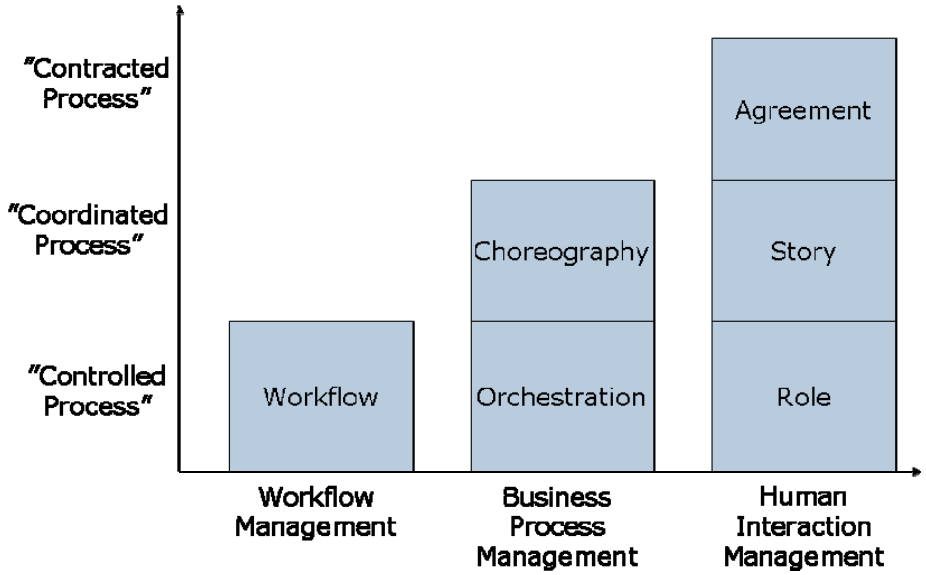

Figure 2. IT increasingly supports process management.

Decision-Making Perspectives in an Enterprise

An enterprise operates at different levels, each with different objectives, data needs, and methods. These levels can be classified by the decision-making horizon as follows:

1. **Strategic** decision-making affects activities in the distant future. These decisions are usually made in the face of external influences – technical advances, market shifts, environmental factors, or competition. They have a high impact on the organization and require significant effort over a long period of time. Strategic enterprise decisions are made by the top management.

2. **Tactical** decisions involve actions intended to occur in the future – business process re-engineering, incorporating new suppliers, installing new software or equipment. The decisions are often interlinked to strategic plans and based on operational data. Tactical decisions are far-reaching and their implementation requires substantial time and effort. They are generally made by the middle management that translates the strategic intent to the concrete reality of business.

3. **Operational** decision-making is related to concerns of the immediate future – resource allocation, priorities, and expenditures. Operational decisions have a direct impact on the conduct of business and typically do not require laborious implementation. The decisions are made in response to tactical plans or based on operational data and are mostly made by front-line business managers.

4. **Real-time** decisions pertain to current activities. They are made within the operations themselves, in line with the operational plans, by automation or people conducting the work.

Each level of decision-making drives the next level down. Strategic level sets performance measures for horizontal business processes on the tactical level. Tactical plans impose targets and decision rights for departmental processes on the operational level. Finally, operational decisions aim at optimizing the use of resources to meet these targets. Decision-making can also be driven inside out; operational demands may require escalation to the tactical level decision-making and tactical decisions may further propagate to the strategy process.

Strategic decision-making and planning pertains to the systemic organization of the enterprise and, thus, to its very identity – its identification of systemic structures and their relationships, the specification of high-level business processes, and contract for coordination within the processes.

Tactical level decisions are about adapting the structure of the enterprise to changes in its organization – definition of targets and performance measures for the operational level to optimize the performance of the total process as well as replacements and extensions concerning the systemic structures. Decision rights about these changes can be assigned to the operational level where the detailed decisions are made.

Operational decisions are made within the structure. The control over resources is limited by the coordination and decision rights assigned to the structure.

Control Structure Aligned with Decision-Making Perspectives

Service Oriented Architecture (SOA) is a set of design principles to structure and expose information resources, such as legacy systems, as coarse-level, context-independent services. It

has been proposed as a means to reduce inherent complexity of an enterprise and improve its agility by organizing business functionality into modular, reusable services.

Business-driven top-down BPM meets IT-driven bottom-up SOA at endpoints of service orchestration in which services are bound to process activities. Together, SOA and BPM improve the alignment between IT and business, but this requires appropriate governance to facilitate communication and align responsibilities between the two.

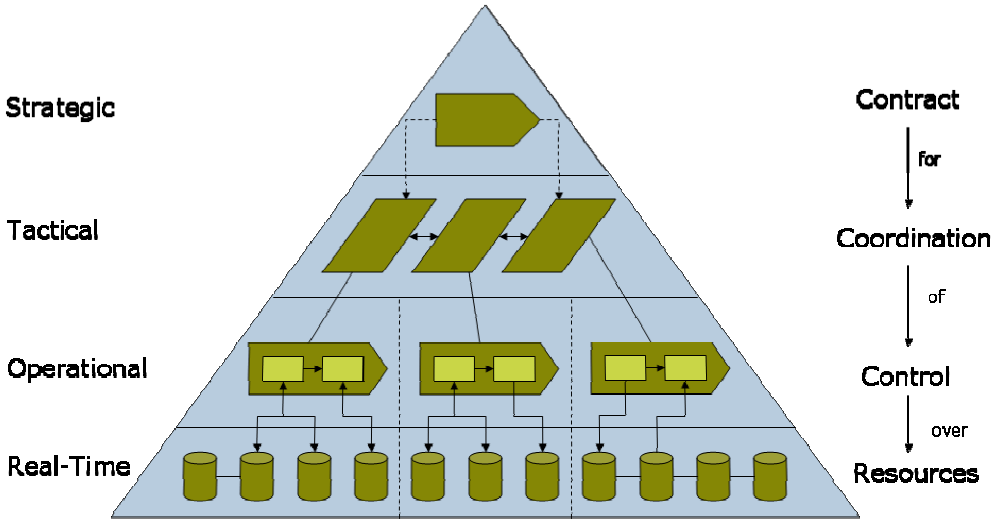

Figure 3. Decision-making perspectives and control structure in an enterprise.

The governance model is a set of services, policies, and best practices to establish chains of decision rights and related measurement, policy, and control mechanisms. An applicable approach to arrange governance is to align the control structure of the enterprise with the decision-making perspectives, as depicted in Figure 3:

1. **Strategic: contract**. The enterprise needs to identify its focal point, an unchangeable distillation of its corporate strategy – e.g., Best Value, Zero-Defect Quality, or Fast Service. The focal point sets the destination with which the strategies shall be aligned. This includes the classification of logical domains based on business functions, technical infrastructure, applications, or a combination of these. As the enterprise needs to adapt to fluctuating external circumstances, it needs to continuously revise its strategies and, consequently, its business processes. On the highest level, this translates to renegotiating the contract for coordination between service domains. From the systemic perspective, the enterprise realigns its organization to conform to its strategy. In HIM, the corresponding concept is known as *Strategic Control*.

2. **Tactical: coordination**. The coordination between service domains conforms to the negotiated contract. Choreography is a declarative formal description of the *public process* between business process participants, specifying their relationships and interactions. Orchestration, in contrast, is an imperative formal description of the *private process* of a business process participant, specifying the sequence and conditions in which the participant invokes services and interacts with other participants. As the enterprise changes the public process, it needs to reflect these changes in the respective private processes. If the required role does not exist, it needs to be implemented, typically by orchestrating services and exposing the process as a composite service. From the systemic perspective, the enterprise realigns, changes or extends its structure to conform to the new organization. In HIM, the corresponding concept is known as *Executive Control*.

3. **Operational: control**. The control within a service domain is restricted by coordination with other domains. The interface behavior of a business process participant must coincide with the public process governing the coordination. Within these bounds, however, it has control over its private process to achieve its objectives. As the private process is reorchestrated, new services may need to be bound to its context. If the required service does not exist, it needs to be implemented, typically by orchestrating native resources and exposing the process as a service. From the systemic perspective, the enterprise changes its structure in conformance with its existing organization. In HIM, the corresponding concept is known as *Management Control*.

4. **Real-time: model**. The model of the enterprise reflects how it perceives the reality of its business. It consists of the vast repository of "sources of truth" dispersed in enterprise information systems and databases – the ultimate corporate knowledge. This knowledge needs to be elicited as a canonical operational and information model. Integration technologies such as Enterprise Application Integration (EAI), Enterprise Information Integration (EII) and Extract, Transformation, and Load (ETL) are used to SOA-enable legacy applications and data sources in the form of context-independent services. These services are then bound to the context of a business process participant through orchestration. As the implementation of the service changes, the change does not have repercussions on the process level as long as the service interface remains constant. From the systemic perspective, the enterprise does not change its structure or its organization on the macro level. The change is encapsulated in a service that is a system in its own right. In HIM, for instance, the real-time perspective is captured by *Tasks* inside *Activities* – Activities are transactional units of work within a Role.

Agenda for Enterprise BPM

Currently, most enterprises are building their second floor – integration of their applications, mostly through fine-grained EAI orchestration of native resources. More advanced companies are wrapping these integrations up as business services and building SOA upon them – service orchestration within a service domain and, in rare cases, choreography between domains. More often than not these endeavors are driven bottom-up and inside-out. They are lacking a systemic view, strategic perspective, and necessary governance mechanisms.

What is ultimately called for, to enable a responsive, agile enterprise, is a holistic set of standards and tools that covers all classes of processes, and a related governance framework that facilitates interaction between the levels of enterprise. As a result, the impact of any business decision at any level will be properly propagated to the entire enterprise; the process participants will have a better influence on the total business process and negotiate their roles therein.

The presented four-tier model provides a high-level classification of elements pertaining to enterprise-wide business process management. The idealized systemic view herein is proposed as a foundation for a more comprehensive and concrete framework of Enterprise BPM.

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