



Motivation

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1.1 Business Processes and Business Process Management

There is no organization without processes. When people want to collaborate, they use the necessary tools and coordinate their activities to reach the desired result. Since such activities can not only be carried out by humans, but also by machines and computers, their activities must also be included when aligning human requirements and technical capabilities. In particular, different types of actors are involved in at least partially automated processes.

A process is triggered by an event that may originate inside or outside the organization, such as a travel request or customer order. Coordinated and targeted action in response to such an event is called a process. In case the organization is a company, this is referred to as business process.

There is no company without business processes. There are only differences in their level of maturity. The reactions of an organization to certain business events can always be coordinated anew when these events occur, or a procedure is defined that is then executed in such cases. Events of the same type, such as purchase orders, are referred to as event classes. A predefined procedure for an event class is called a process model. The execution of the activity sequences defined in the model as a reaction to an identified concrete event, e.g., the book order of customer Huber from May 20, is termed a process instance.

Every company, irrespective of its type of business, has certain standardized processes that can be designed and tailored to the individual company. For instance, every company has an order-to-cash process designed to react to business events, ranging from the customer order to the receipt of payment, and to document these through booking. Conversely, a procurement process will exist with purchase orders to satisfy individual requirements, the concrete reference (for example, receipt of goods and storage), and the payment of vendors. Other examples are processes for recruitment or logistics. A common classification categorizes processes according to their character into management, core and support processes. The classification is company-specific and depends, among other things, on the industry sector.

The more clearly a company defines its business processes and the more consistently it implements them in its daily operations, the more efficient it will be. For many companies, their competitiveness is not (or no longer) based solely on the uniqueness of their products, but on the quality of their business processes. For example, while a publisher's business is primarily determined by its books, at Amazon the customer experience in searching, selecting, purchasing, paying, delivering and returning products, i.e., the smooth, customer-centric process, is the key to success.

The models for such processes must be continuously adapted or completely redesigned because the reactions to an event class can change, or additional reactions to new event classes can become necessary. The resulting specifications must also be implemented in the organization and IT infrastructure so that employees can work through instances of the processes in day-to-day business. In doing so, underlying conditions, such as effectiveness, efficiency and compliance, i.e., the requirements to deliver the desired result with the lowest possible expenditure of resources and in compliance with valid external and internal regulations (e.g., laws), must be taken into account. Business Process Management (BPM) has established itself to handle these tasks. It describes an integrated management approach for analysis, design, optimization, implementation, control, monitoring, and further development of the management, core and support processes in a company. From a technical point of view, it also includes IT support for these subtasks through corresponding tools, e.g., for modeling or execution (such as process engines) or more comprehensive Business Process Management Systems (BPMS).

In Business Process Management, a company and its immediate environment are regarded as a selected part of reality for modeling and executing. In this dedicated part of the world, one party wants a deliverable from another party in the form of a physical product, a service, or a combination of both. The deliverable should be provided in accordance with associated requirements; the desire for it is the business event to which the company should react as perceived in the defined process model.

In Business Process Management, it is therefore necessary to define a model for the provision of services and apply it to the processing of business cases. This means adapting reality according to the model, i.e., analyzing affected sections of reality and changing this reality. Since this reality and the desired changes are very complex, several modeling concepts from the social sciences, business administration and computer science are brought together and combined in BPM.

In the following sections we outline an overall view of process management and then explain it in detail in the succeeding chapters. From the perspective of the participants on the world, the various facets of Business Process Management are presented, and a selection of models are introduced which have turned out useful in our practice. The design of such models supports the transition from a more or less unstructured or unsatisfactory way of working to a structured process handling that corresponds to the ideas of a company and its customers.

We develop the overall view step-by-step, starting from the individual perspectives of the participants on their work in a process, its structuring and harmonization, then moving forward with the specification in a model and its

embedding in the organizational and IT environment of the company and finally culminating in the joint processing of process instances in the resulting socio-technical systems. A corresponding illustration which grows with this overall view ultimately shows our comprehensive understanding of Business Process Management.

1.2 View of the World, Structuring and Modeling

As already mentioned, it is important for a company to identify the business events of interest and to define the activities triggered by them. For this purpose, the corresponding extract of reality must be identified and examined more closely.

This extract is determined by the customers who demand a service and, for the group of employees of the company involved in the provision of the service, it represents the reality which directly affects and surrounds them. In order to provide the desired service, the parties involved must cooperate directly or indirectly.

Everyone makes their contribution in coordination with the others. Based on their personal background in terms of education, knowledge, motivation, experiences and preferences, each group member has his own perception of the process and its context. He develops his individual idea of what his contribution should be, how it is provided, which events with which activities need to be considered and by whom, in which order partial steps take place, which preliminary services are expected by whom and for whom preliminary services are provided.

As a result, all affected people possess their own mental "world model" of the extract of reality under consideration (cf., Fig. 1.1). For a successful reaction to business events, it is necessary to structure the different realities of the participants and to transform them into a consistent process model for joint, goal-oriented action. This means that the business process is "agreed upon" by harmonizing the individual, to a greater or lesser extent matching, mental models of the people involved.

This joining of the individual ideas of those affected by a business process and the mutual coordination of the different aspects of a business process (cf., Section 1.3) is itself a complex process and the central aspect of BPM.

1.3 Components of a Process Description

We split a business process description conceptually into three parts (see Fig. 1.2). The first part, called **process strategy**, makes statements about the purpose, triggers, inputs, end and outputs of the process. The trigger is the event that sets the service provision in motion on the basis of the initiator's expectations, i.e., generates a process instance. This impulse is accompanied by the fact that the initiator provides information or objects which are to be processed according to his expectations. These inputs must be transformed into the expected results and made available to the defined recipient. In this way, the business process creates a value for which a customer pays.

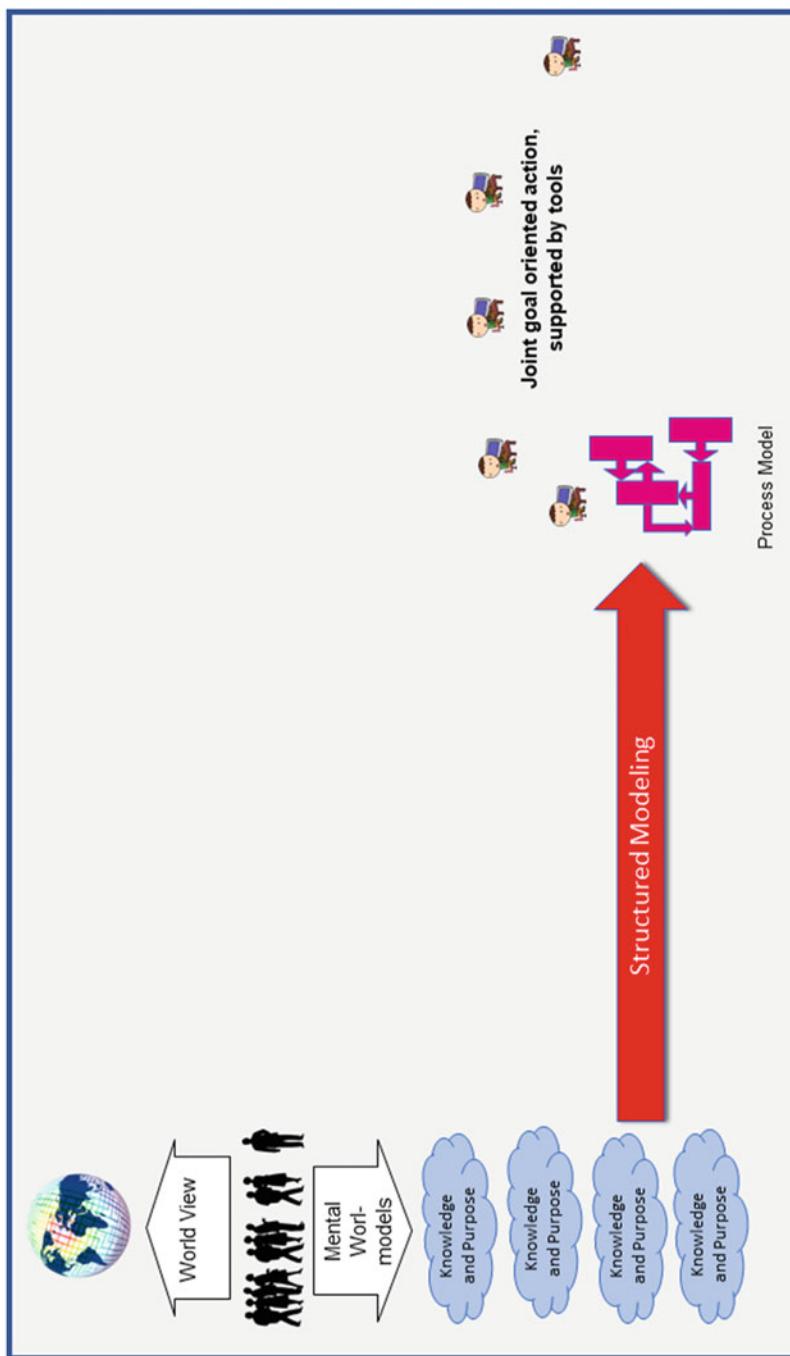


Figure 1.1: Individual mental models of the participants

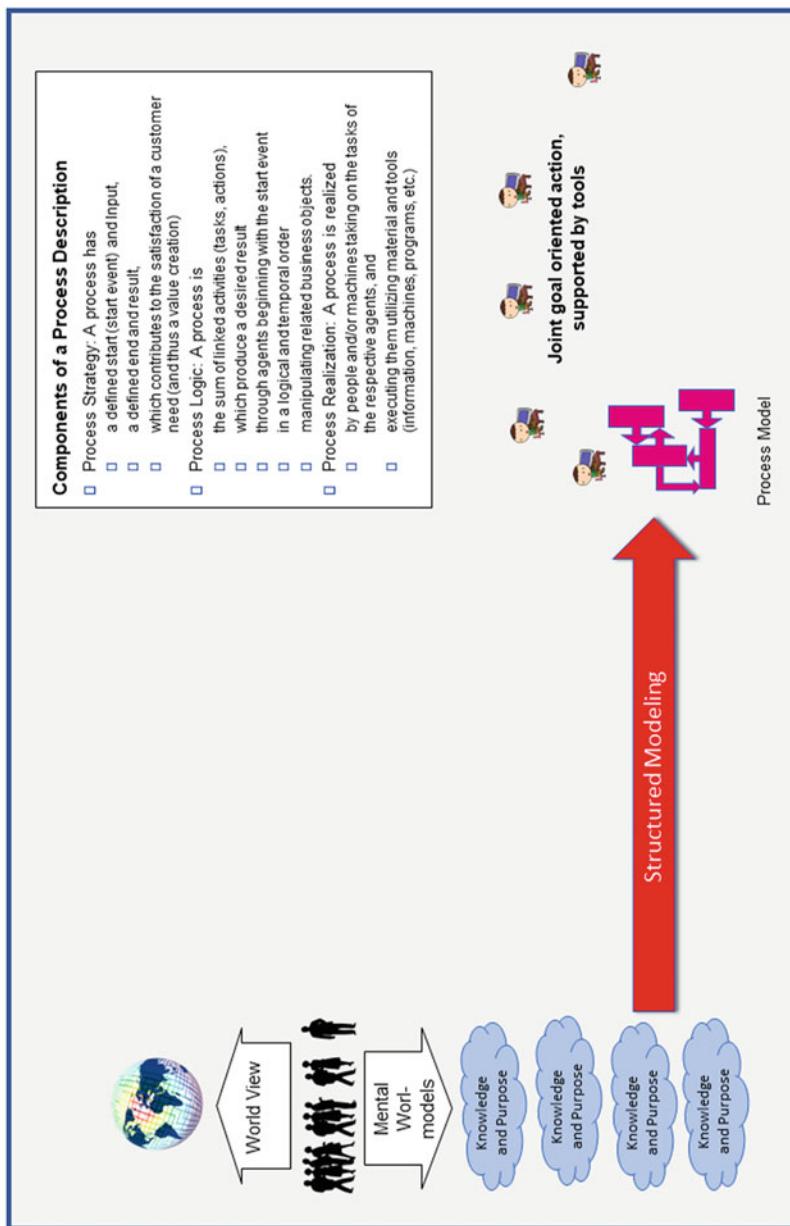


Figure 1.2: Components of a process description

This external view of a business process is supplemented by the **process logic**. This inner perspective describes the actors involved and their coordinated interaction. The actors carry out activities in a logical and timely meaningful order. They transfer the results of their actions to other actors for further processing, or to the intended recipient at the end.

Process implementation involves the provision of resources for the processing of process instances. These can be humans, machines and software systems, which take over the activities assigned to them as concrete realizations of the involved persons. In the age of digitalization, software systems (process or workflow engines) synchronize the actions of the actors by controlling the temporal and logically necessary sequence of the sub-steps according to the process model. For the handling of their individual tasks, the actors can use aids such as information, application programs or tools where required.

Throughout process realization, it must be ensured that several process instances can be executed in parallel and independently of each other on the basis of the defined exemplary model through appropriate resource allocation.

1.4 Determining Factors for Process Models and Process Instances

The business model essentially describes how a company affects the world and how it thereby generates revenues and profits. The customer promise as well as the resources and partners with whom this promise is fulfilled are essential.

The enterprise architecture describes a machinery with which the business model is to be brought to life. As a typical layer concept, it defines business and IT structures and links them together. The concept of Business Engineering, for [1] example, envisages the business architecture on a strategic level with the definition of goals and services that are interwoven with the business model. At the level of the processes, as implementation tools of the strategy, the process architecture follows with its organizational and operational structure. The transition to the IT structures for supporting the processes leads to the level of information systems with the application architecture and the IT architecture.

As a central component of an enterprise architecture, business processes are therefore in a kind of sandwich position that illustrates how they are influenced by other architectural elements. For example, a given organizational structure that is difficult to change can influence the procedures in processes and the way in which a company works together with external partners. The same applies to the availability of resources. But horizontal dependencies within the process organization must also be taken into account, e.g., whether a certain way of working in the ordering process has an effect on the design of payment processing.

The underlying technological infrastructure not only affects the content design of the process models, but also the level of detail and accuracy. For the development of IT solutions for process digitalization, rigorous requirements apply to the model

definition. Process parts that are to be executed with IT support must be specified precisely.

In addition to the internal determining factors explained above by way of example and supplemented in Figure 1.3, external factors also have an impact on process design. Here one can see as an example test steps which have to be included in a process due to compliance regulations.

1.5 Process Metrics

The processes to be developed or changed have the general goal of supporting the implementation of the business model and the associated strategy. The relationship between the Key Performance Indicators (KPIs) from the business model and the processes is established using Process Performance Indicators (PPIs). These Process Performance Indicators are refinements of objectives from the business model (cf., Fig. 1.4).

Typical business Key Performance Indicators are derived from business models and strategies and measure business success at higher aggregation levels, e.g., revenues and costs at the overall company, division, product group level, etc. The focus here is on effectiveness ("Doing the right things"). The business processes are used to implement the strategy and bring together the elements of the enterprise architecture. The associated Process Performance Indicators aim at efficiency ("Doing things right"). They are therefore closely related to the Key Performance Indicators and are partly derived from them.

When deriving the performance indicators, it must already be checked whether they can be measured with sufficient precision and justifiable effort. Under certain circumstances, this may also place demands on the process to be developed in order to be able to measure the performance indicators directly or indirectly. If direct measurement is not possible, targets for alternative performance indicators can also be defined and values for the performance indicator actually desired can be derived from them.

Target values are defined for the Process Performance Indicators, which are to be achieved by a changed or redesigned process. Throughout the entire process, from the identification of the problem to the implementation of a modified or new process, it is important to constantly check whether the desired goals can be achieved with the resulting process.

1.6 Support Concepts

The path from individual knowledge and willingness, i.e., from the mental models of the participants, to a process model that can at least in part be digitalized, is complex and costly. In order to reduce complexity and effort, support concepts such as frameworks, process models and description languages were developed.

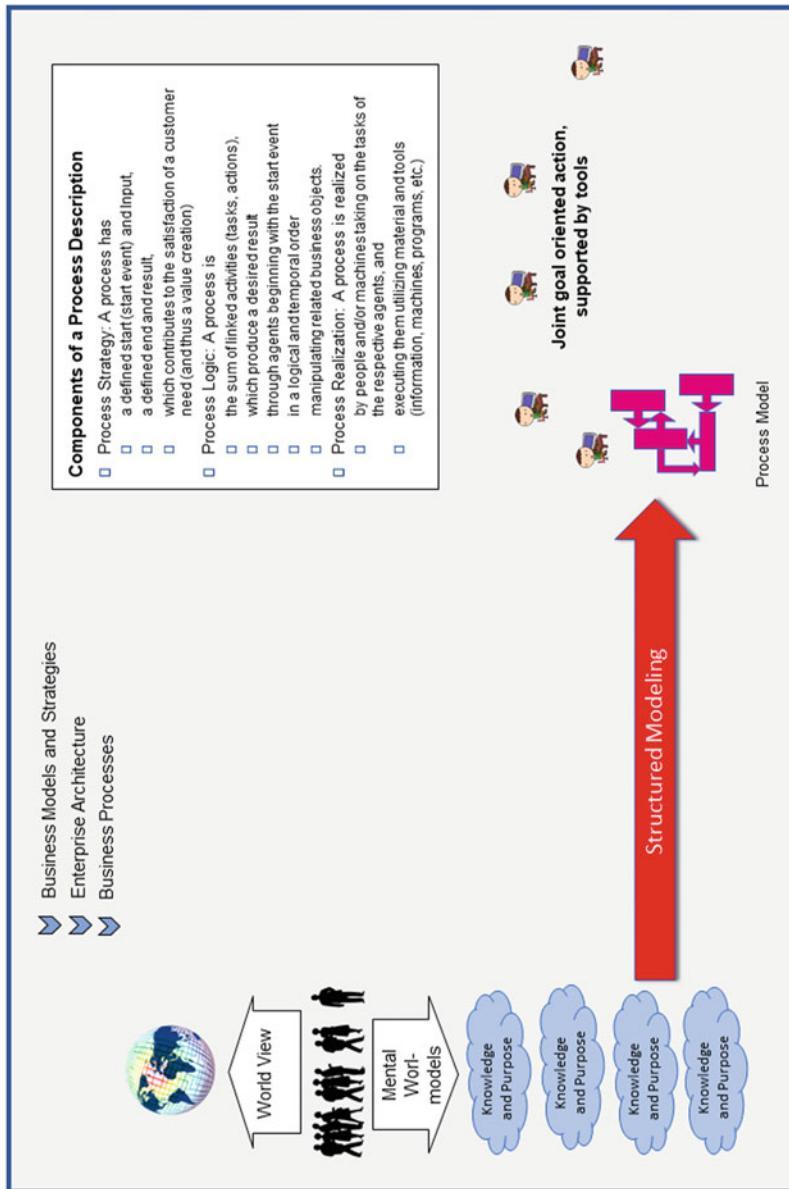


Figure 1.3: Addition of determining factors for process definition

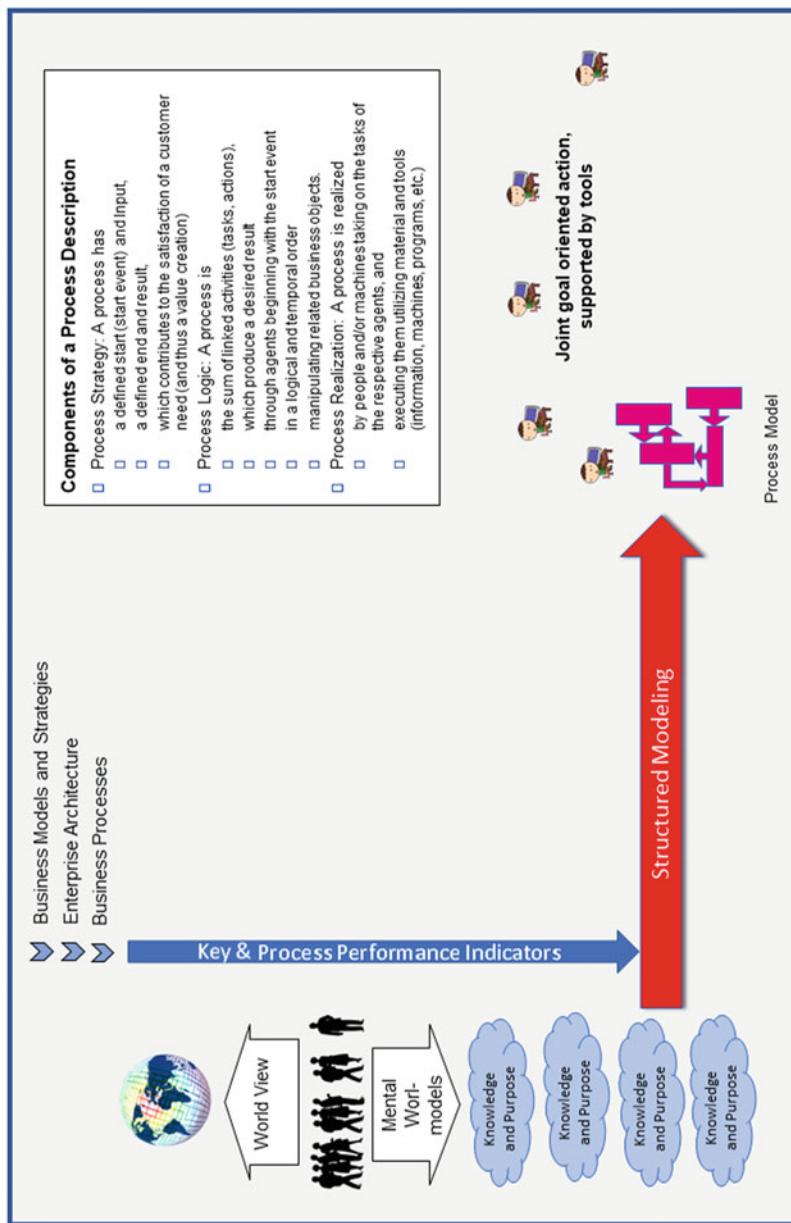


Figure 1.4: Definition of Process Performance Indicators

The following overview comprises a thematically grouped selection of such tools, which according to our experience are widely used in practice. They are inserted in Figure 1.5 and are discussed in more detail in the chapters on models (Chapter 2) and modeling languages (Chapter 3).

Frameworks for Quality Management:

- Total Quality Management (TQM) TQM/PDCA,
- Deming Cycle (PDCA, Plan-Do-Check-Act)
- EN ISO 9001
- European Foundation for Quality Management (EFQM)

Frameworks for Enterprise Architecture Management (EAM):

- Zachman Framework
- The Open Group Architecture Framework (TOGAF)
- Architecture-Animate (ArchiMate)

Frameworks for IT management and IT governance:

- IT Infrastructure Library (ITIL)
- Control Objectives for Information and Related Technology (COBIT)

Description languages for process logic:

- Flowcharts
- Event-controlled Process Chains and extended Event-controlled Process Chains (EPC, eEPC)
- Business Process Model and Notation (BPMN)
- Subject-oriented Business Process Management (S-BPM)

1.7 Digitalization

Today, digitalization is the key word in the transformation of value creation. Digitalization in the economy or in organizations in general means digitalization of business models, products and services as well as of whole processes or parts thereof. For processes, however, this does not necessarily mean full automation without any human intervention. For example, a program that controls a process may, if necessary, include actions executed by humans or by Cyber-Physical Systems. The latter consist of communicating devices with software as well as mechanical and electronic components. In the Industry 4.0 Initiative, the aim is to achieve this comprehensive consideration of processes, i.e., the communication between people, machines and workpieces. On the one hand, these aspects must

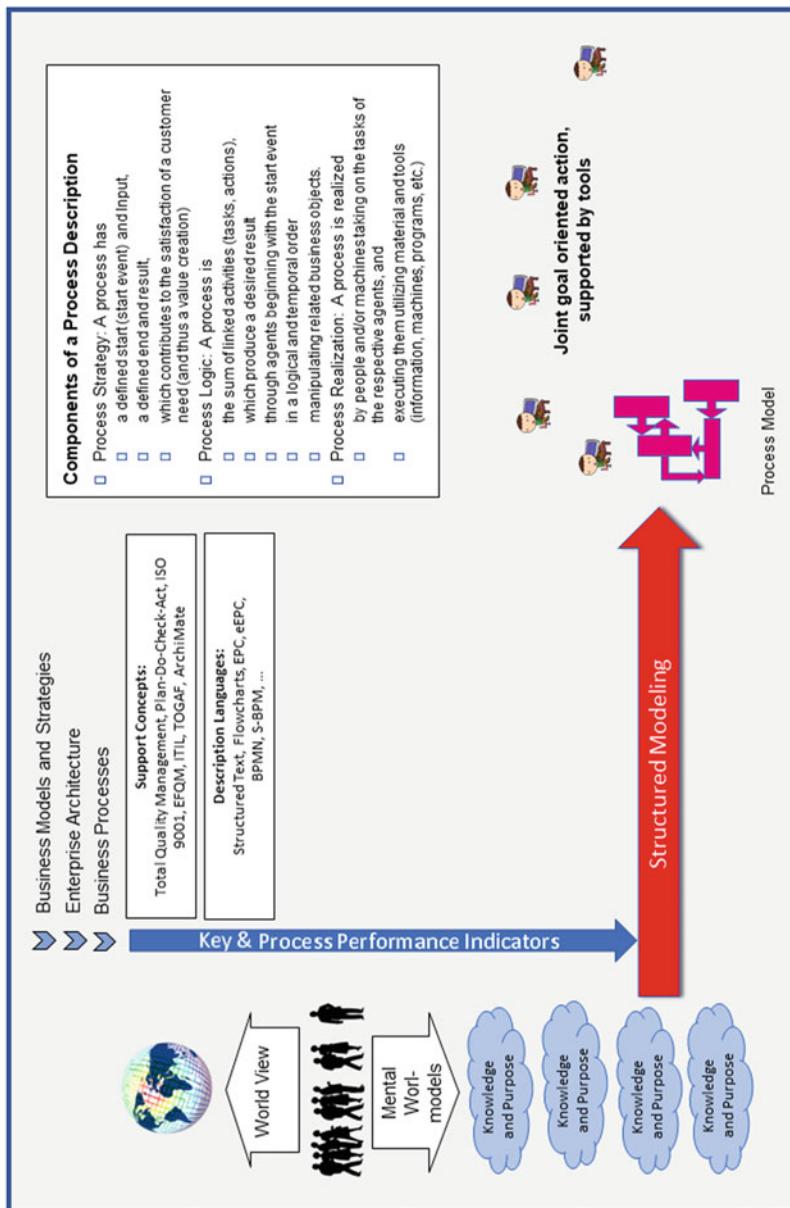


Figure 1.5: Addition of concepts to support the process definition

be expressed in the process models, and on the other hand, the transfer of a business process model into digital execution must be supported as far as possible. Particularly when aspects of quality management, i.e., the continuous improvement of processes, are taken into consideration, it must be possible to implement process changes that entail a change in digitalization quickly and with as little effort as possible.

The aspects described in the previous sections must already be included in the creation of the models in order to facilitate the technical implementation of processes, but without already anticipating implementation details (cf., Fig. 1.6). The more precisely the processes are described, the easier this task becomes. Process segments whose flow logic cannot yet be precisely described at the time of modeling must be marked accordingly. However, these parts of a process can be modeled with other suitable methods according to the desired or necessary candor. Such process segments can either be described with Adaptive Case Management methods or, if a communication-oriented description language is used, as a communication loop. The latter is terminated by one of the partners involved after a corresponding result has been achieved, before continuing the process.

Important in this context is the granularity, i.e., the level of detail of the process description. Activities should be broken down in such detail that one can clearly determine whether they can be digitalized, partially digitalized (human IT, physical IT), or are performed manually by humans. The tailoring should be based on the business requirements and not on the functionality of a potentially already existing IT system. If necessary, such a system must be adapted to meet the needs of the desired business specification during process implementation.

1.8 Process for Creating Processes

The definition of the business processes cannot be done schematically or algorithmically, i.e., there is no software that when fed with the business model, the enterprise architecture, and the Key Performance Indicators with associated target values and support concepts, delivers a suitable process description directly.

The definition of business processes is an intuitive and creative process. Therefore, creativity techniques and knowledge management methods such as Storytelling, World Café or Value Networks are also used, especially at the beginning of Business Process Management activities.

For example, one can use the Design Thinking approach. This is a concept in which interdisciplinary teams work together in an iterative process in an environment which fosters creativity to develop innovative solutions to a problem (see section 5.3). A key point thereby is to develop and consider an in depth understanding of the needs and motivations of people in the target group. Design Thinking offers a comprehensive collection of methods for use in the individual steps of the approach. With these characteristics, it can also be used for the revision or redefinition of a business process. Under certain circumstances, extraordinary solutions can be found that would not have been possible with the usual BPM approach.

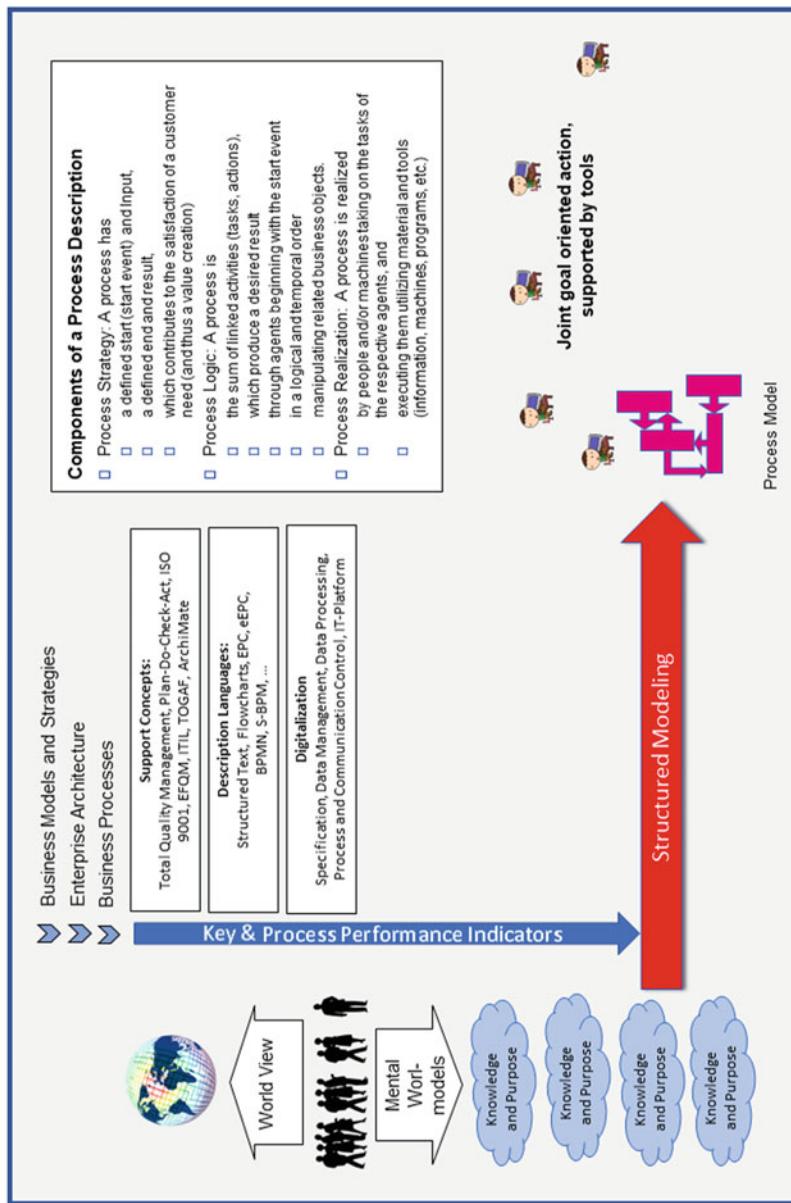


Figure 1.6: Consideration of digitalization aspects in the model

However, a creative, innovative process concept must also be devised and implemented in detail. Creative design is therefore embedded in a bundle of activities that ultimately makes the process part of the real world. As such activity bundles, we identify analysis and modeling, validation, optimization, organizational implementation, IT implementation as well as operation and monitoring. These activity bundles are a further development or refinement of the Plan-Do-Check-Act cycle. They are usually arranged in a circle, which implies a corresponding flow. This does not always correspond to reality, which is why we present the activity bundles in Figure 1.7 as loosely networked honeycombs (cf., Fig. 1.7). There, the phases of the Design Thinking process and the activity bundles are supplemented. Both concepts are presented in more detail in Chapter 4 and put into relation with each other.

Extensive and complex process changes usually require activities from several activity bundles and are carried out as a project. Such a project can thus be regarded as an iteration (process instance) of the process for creating business processes. For this, a detailed project plan must be created with the activities to be carried out, responsibilities and deadlines (cf., Fig. 1.7). The project plan should then be executed according to the methods of project management.

1.9 Organizational and Technical Implementation

Once the process model has been created, the model must be embedded in the organizational structure of a company. This determines which activity is performed by which person or organizational unit. This mapping does not have to be static, but can vary from instance to instance. For example, the purchasing process can have the same flow logic for parts A and B, but a different purchasing department is responsible for purchasing parts A than for parts B. Process instances for parts A thus affect other organizational units (and persons assigned to them) than for parts B. These rules must be mapped in such a way that a process is correctly linked to the organizational structure.

In addition to activities performed by people, there may also be activities in the process that execute application programs or IT services. For this purpose, such actions must be mapped in the process model to functions of software modules, which then execute them at runtime. If during the process modeling attention was already paid to the possible digitalization, this mapping is more or less unproblematic.

Software can also control the processing of process steps and assign the tasks specified in the model to the respective persons or IT services as actors. Software systems that support this are also referred to as workflow systems (process engine, workflow engine). Ideally, process descriptions can be transferred directly into workflow systems.

After being embedded into the organization and the IT environment, a process can be used for the handling of instances, i.e., real business cases - the goal is achieved. Figure 1.8 shows the now completed path from the individual mental

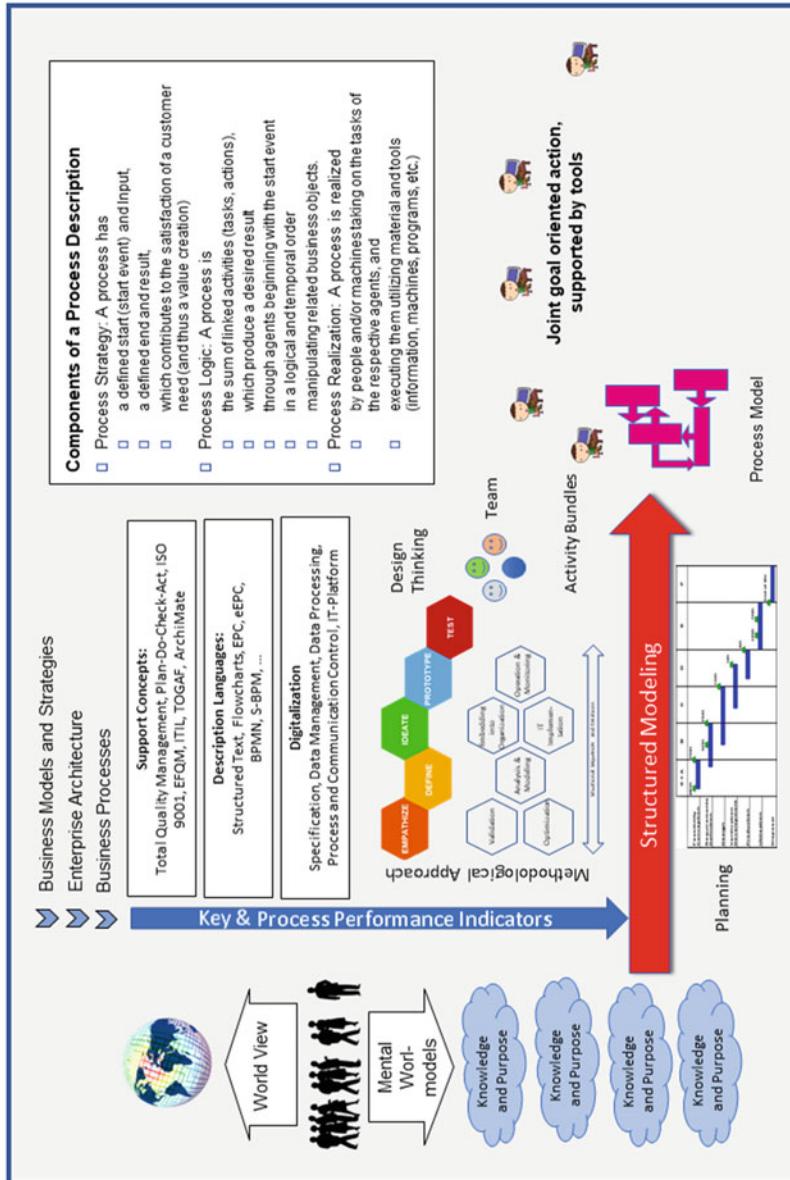


Figure 1.7: Supplementing with process structure and planning for process changes

models, including knowledge and intentions of participants, to the joint handling of process instances.

1.10 Success Measurement with Performance Indicators

When instances of a process are executed, one can check whether the target values defined for the Process Performance Indicators are reached. For this purpose, actual values for the defined Key and Process Performance Indicators (KPIs and PPIs) are measured, calculated, stored and compared with the target values. This comparison can be made in real time or over longer time intervals. Any real-time evaluation leads to the immediate initiation of suitable countermeasures in the event of a deviation from the target. An evaluation of measured values over a longer period of time, on the other hand, shows medium to long-term trends in performance indicators and can trigger corresponding changes. Evaluation results are visualized in process cockpits, among other things (cf., Figure 1.9).

1.11 Continuous Improvement

Processes are not static but are rather subject to changes in the internal and external determining factors described in Section 1.4. Developments such as business model modifications, new competitors, technical progress or deteriorations in measured PPIs, such as lead time, may require adjustments to a process. To this end, appropriate measures should be taken within the framework of the bundles of activities and procedures presented in Section 1.8.

The feedback arrow in Figure 1.10 indicates that the participants may again have diverging views of the selected part of reality. By harmonizing them in the way described, a new instance of the process for creating processes is started.

Continuous improvement is a very important aspect of process management. Ongoing adaptations bring one closer to the desired process. However, changes in the environment can influence this convergence. The state being pursued is therefore a 'moving target'.

1.12 Corporate Governance and Business Process Management

Corporate governance as an institution shapes a company. It has a decisive influence on the business model, corporate strategy, and organization. The business model and strategy are designed to open up future potential for success and thus, secure the sustainable existence of the company. The enterprise architecture creates the infrastructure to exploit the potential for success. The business processes and the business objects (data) processed by them link the business and technical levels of the enterprise architecture.

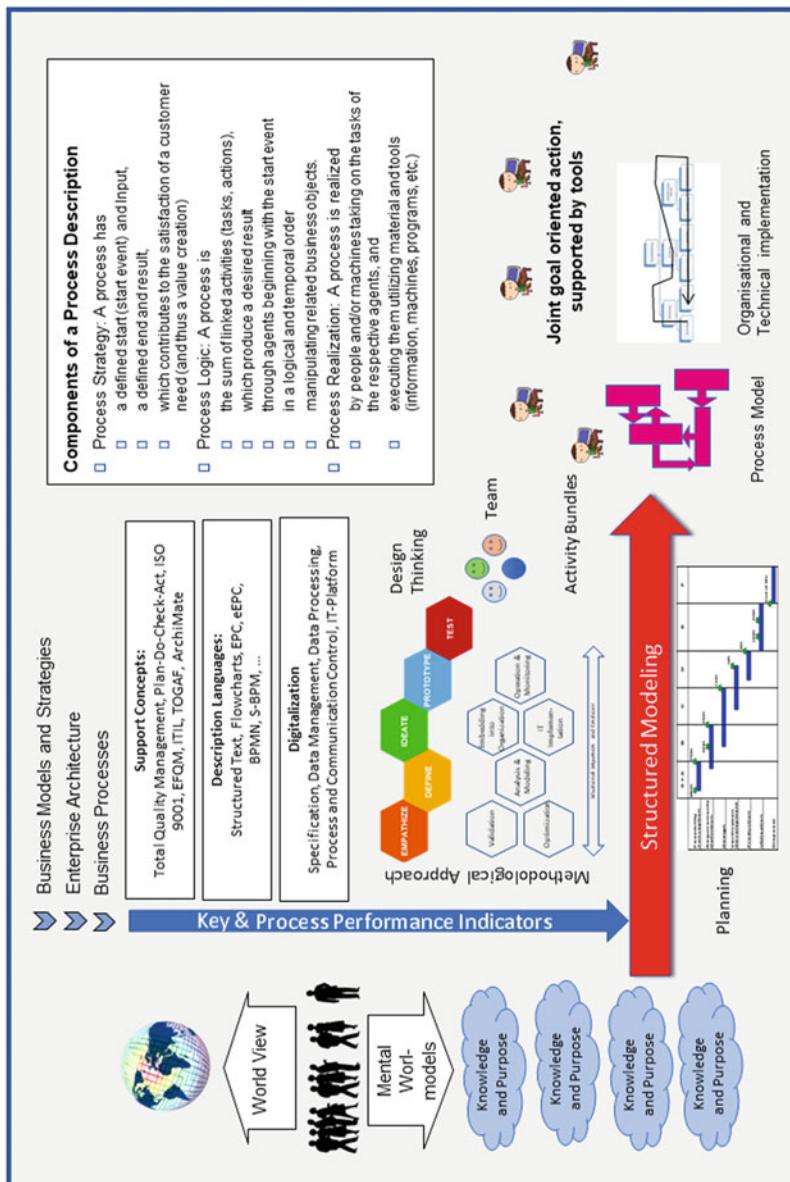


Figure 1.8: Addition of embedding in the organization and IT environment

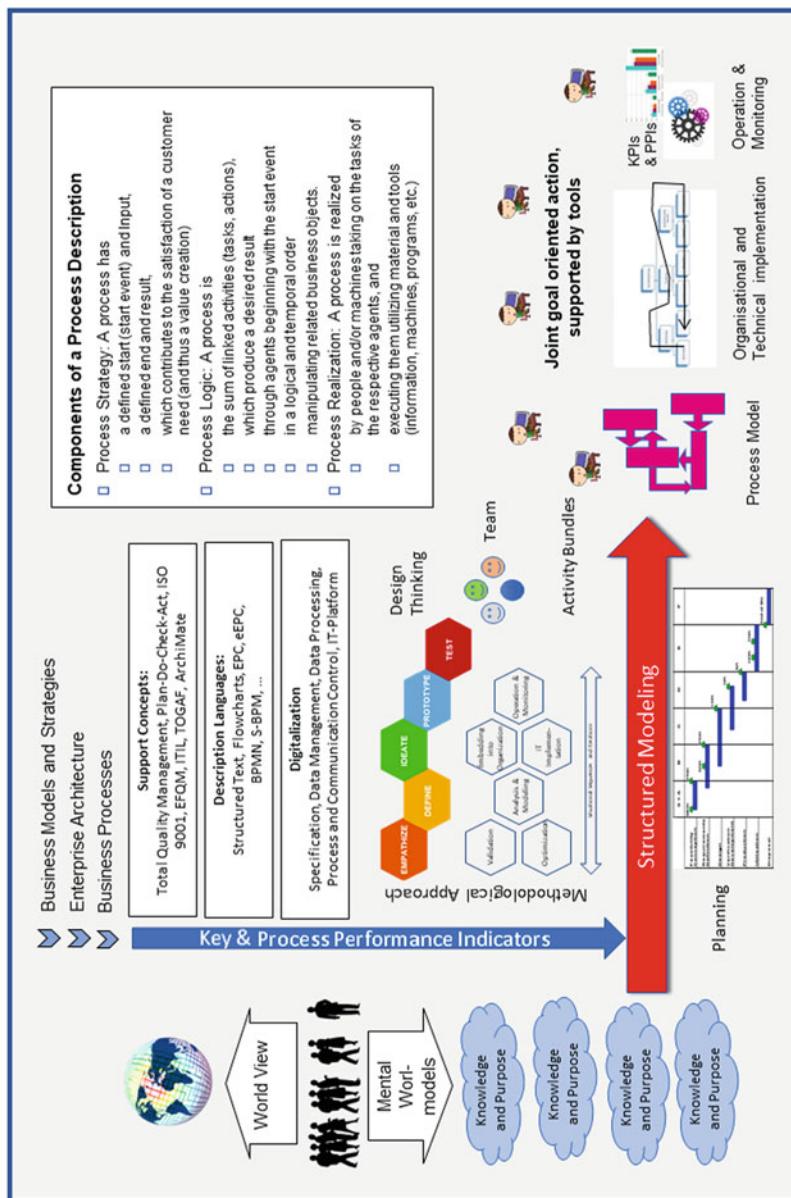


Figure 1.9: Operation, monitoring and performance indicators

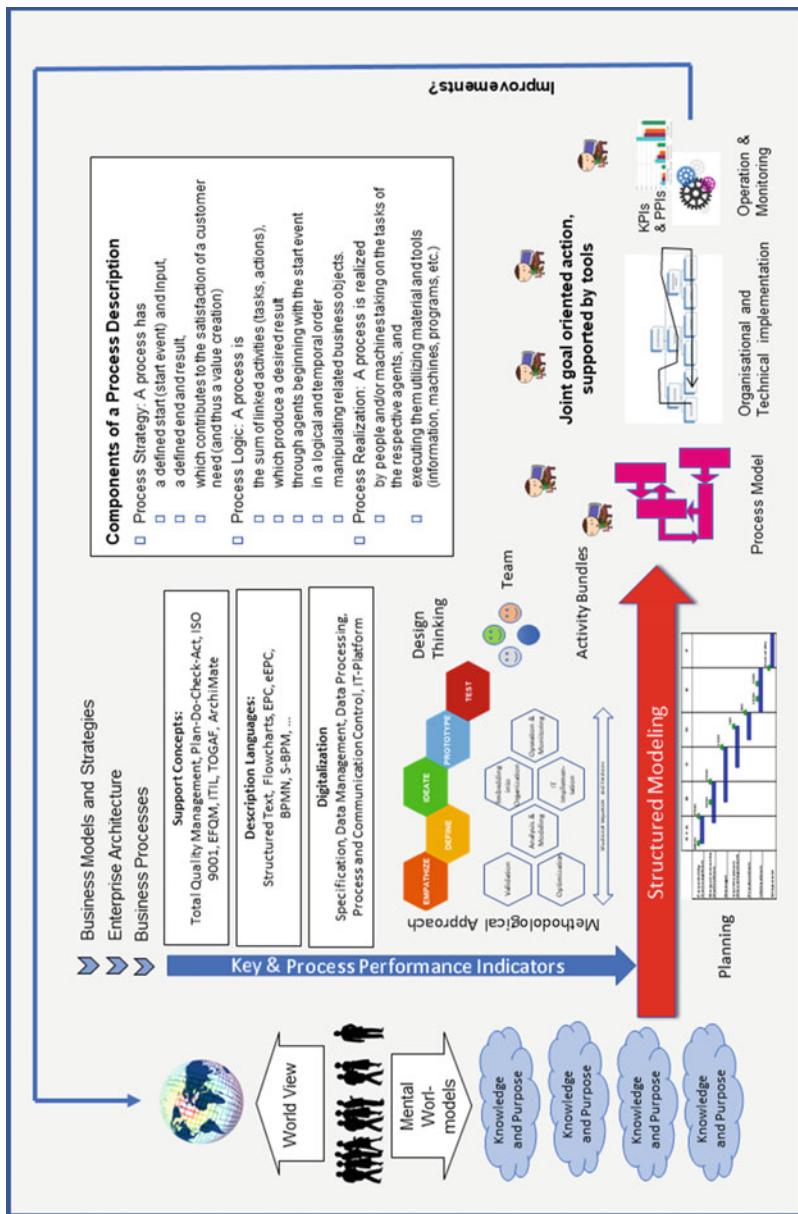


Figure 1.10: Supplementing with continuous improvement

The business processes are the subject of digitalization, i.e., the IT support of process execution by people and machines. In recent years, the associated requirements have increased significantly. In business processes, not only people and IT systems, but also "smart" machines and devices should be able to interact. This refers to highly integrated business processes in the context of Industry 4.0 and the Internet of Things, which integrate human actors as well as individual devices and machines into a common whole. The technical players are often referred to as "smart" or "intelligent".

Corporate governance as a process describes the management activities involved in creating and exploiting the potential for success. In the context of BPM, this means the management of socio-technical systems with people that are involved in processes, and machines that support people in their activities or autonomously carry out a chain of activities.

Despite the increasing importance of digitalization, the human being, as designer of socio-technical systems and user of supporting technology, is at the center of process management. Not least due to increasing agility requirements, the goal today is for employees to be able to design (model) the operative processes autonomously and independently as far as possible, and for these to then be directly supported by Information Technology without significant delays and additional effort. With a clear commitment to process orientation, management must create the conditions for this as such ("Tone from the top"). These include both the necessary infrastructure and an environment that encourages people to become actively involved in process management activities. The degree of employee involvement is determined by the image of humanity and the associated management philosophy of the company management ("Tone at the top"). In a classical, more hierarchical approach, people and their skills are seen as a resource that is the subject of managerial action, and these people ultimately execute instructions. Such a management philosophy is characterized by direct intervention of the company management and follows Theory X. According to this theory, any lack of motivation is countered by the threat of sanctioning by the company management.

In a more systemic, i.e., holistic approach, such as the one that the St. Gallen Management Model is based on, a system is to be created that works itself largely independently on the design of a Business Process Management System. All employees should be able to actively contribute. This management style follows the image of humanity according to Theory Y. According to this theory, the essential characteristics of humans are pleasure in demanding work, self-discipline, responsibility and intellectual power.

The image of humanity is supplemented by corresponding organizational theories. The purpose of these is to explain the creation, existence and functioning of organizations. Organizational theories implicitly assume a corresponding view of humanity. Thus, Taylorism is more based on an image of man that corresponds to Theory X. Luhmann's Systemic Organizational Theory, on the other hand, makes no ethical assumptions about the people in an organization; it only assumes that they communicate. Although the Theory of Communicative Action also focuses on

communication, the world is to be changed through theory and rationality. It is assumed that man is by nature insightful and open to argumentation.

There are management philosophies and organizational theories to match the various concepts of humanity. The nature and use of methods, techniques and tools must be consistent with them. For example, it is not appropriate to propagate the involvement of employees if the company management then does not take their suggestions seriously or does not take notice of these suggestions at all. Before it starts designing processes, a company should therefore be aware of the image of humanity that shapes its leadership and corporate culture.

We think that especially for the challenges associated with digitalization, an orientation to Theory Y is necessary, which will often (and must) lead to cultural change in practice.

Reference

1. Österle, H., & Winter, R. (Eds.). (2003). *Business Engineering* (2nd ed.). Berlin: Springer.

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