Chapter 2
Process Identification

> *Things which matter most must never be at the mercy*
> *of things which matter least.*
> Johann Wolfgang von Goethe (1749–1832)

Process identification refers to those management activities that aim to systematically define the set of business processes of an organization and establish clear criteria for selecting specific processes for improvement. The output of process identification is a *process architecture*, which represents the processes and their interrelations. This process architecture serves as a framework for defining the priorities and the scope of process modeling and redesign projects.

In this chapter, we start by discussing the context of process identification. Then, we present a method for process identification that is based on two steps: process architecture definition and process selection. The definition step is concerned with listing an initial set of processes and their overall architecture. The selection step considers suitable criteria for defining priorities of these processes using a portfolio.

2.1   The Context of Process Identification

In order to understand the importance of process identification, we have to look at the strategic context of an organization. Few organizations have the resources required to model all their processes in detail, to rigorously analyze and redesign each of them, to deploy automation technology for each of these processes, and finally to continuously monitor the performance of these processes in detail. And even if such resources were available, it would not be cost-effective to spend them in this way. BPM is not for free. Like any other investment, investments in BPM have to pay off. Thus, it is imperative for organizations engaged in BPM to focus their attention on a relevant subset of processes.

Some processes need to receive priority because they are of strategic importance to an organization's survival. Mintzberg defines *business strategy* as an organizational perspective on setting and meeting business goals. Typically, it can be
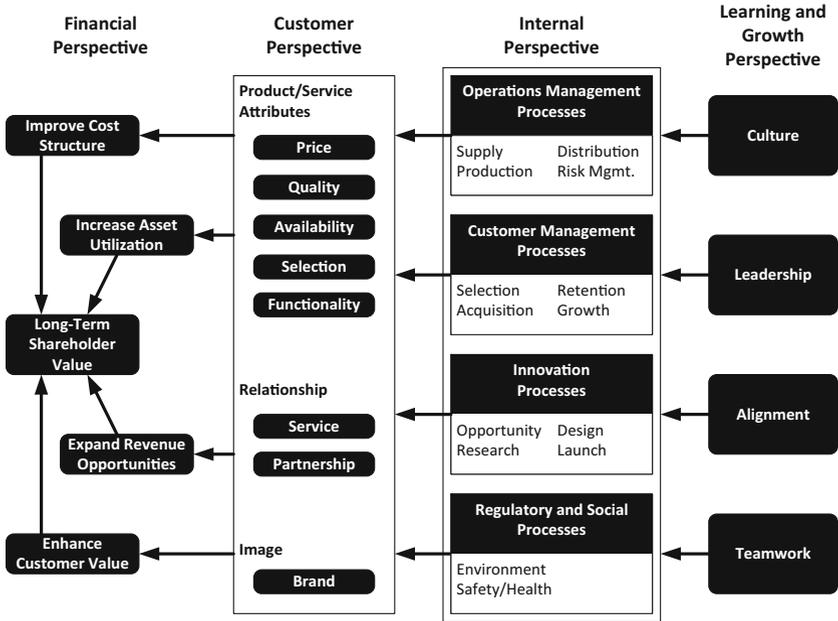
Financial
Perspective

Customer
Perspective

Internal
Perspective

Learning and
Growth
Perspective

**Product/Service
Attributes**

**Operations Management
Processes**

Culture

**Improve Cost
Structure**

Price

Supply   Distribution
Production   Risk Mgmt.

Quality

**Increase Asset
Utilization**

Availability

**Customer Management
Processes**

Leadership

Selection

Selection   Retention
Acquisition   Growth

Functionality

**Long-Term
Shareholder
Value**

**Innovation
Processes**

Alignment

Relationship

Opportunity   Design
Research   Launch

Service

**Expand Revenue
Opportunities**

Partnership

**Regulatory and Social
Processes**

Teamwork

**Enhance
Customer Value**

Image

Environment
Safety/Health

Brand

Fig. 2.1 The balanced scorecard by Kaplan & Norton

assumed that a business strategy exists and can be taken into account for process
identification. Strategy can be operationalized in different ways. One prominent
option is to define business goals using the structure of a *balanced scorecard*.

Figure 2.1 shows the logic of the balanced scorecard using the *strategy map*
notation of Kaplan & Norton [73]. The explicit representation of the strategy in
such a way is also often referred to as the *business model* of a company. Long-
term shareholder value is assumed as a generic and overarching corporate goal in
this setting. In the *financial* perspective, this goal is broken down into the four sub-
goals of improving the cost structure, increasing asset utilization, expanding revenue
opportunities, and enhancing customer value. These financial goals are presumably
influenced by factors of the *customer* perspective. The concept of a customer value
proposition posits that the product and service-related attributes of price, quality,
availability, selection and functionality, service and partner relationships, as well as
brand image are valued by customers. For instance, a company used to selling books
in shops and now making them available on Amazon could improve its customer
value proposition, because it becomes easier to order (availability). The customer
perspective is influenced by the *internal* perspective as defined by processes of
operations management, customer management, innovation, and regulatory com-
pliance. This means that, for example, offering cheap books as a product-related
proposition should be consistent with cheap production processes on the operations
management level. The capability of setting up efficient and effective processes
in the internal perspective is ultimately influenced by human capital, information

capital, and organizational capital in the *learning and growth* perspective. The balanced scorecard underlines the importance of business processes for implementing the business strategy. Business processes build on human, information, and organization capital and provide the basis for the customer value proposition, which will eventually result in financial success. This means, implementing the strategy requires transparency of business processes and their contribution to strategic goals.

Exercise 2.1 Consider the construction company BuildIT and its procure-to-pay process that is described on page 3. To which category in the internal perspective of Figure 2.1 does this process belong? How does it influence different aspects of the customer perspective? How is it shaped by aspects of the learning and growth perspective?

The strategic importance is just one consideration for looking at processes. For example, two processes can be of equal strategic importance, but only one of them might show striking problems, which should be resolved for the sake of all involved stakeholders. In order to trace problems of processes, we need to understand how processes are related to other perspectives of an organization. The balanced scorecard emphasizes the causal relationship between different goals of an organization. In contrast, the *enterprise architecture* describes the structural dependencies between different perspectives of the organization. Different frameworks are used for describing enterprise architectures, among others *The Open Group Architecture Framework* (TOGAF)[1] and the *Zachman Framework*.[2] The latter framework defines the following perspectives:

- The *organizational* perspective describing the actors, roles, and organizational structure by use of *organization charts*,
- the *product* perspective defining the products and services an organization offers along with their relationships by use of *product and service catalogs*,
- the *business process* perspective described using a *process architecture*,
- the *data* perspective including the informational entities and their relationships as described by a *data model*,
- the *application* perspective describing the different pieces of software with their dependencies by use of an *application model*, and
- the *technical infrastructure*, often with an emphasis on computer hardware and communication networks, as described by an *infrastructure model*.

The point of an enterprise architecture is that business processes play a central role for integrating these different perspectives of the enterprise. The importance of business processes is emphasized by Scheer's ARIS framework that places processes at the center. An enterprise architecture does not only describe these perspectives separately, but it also defines their connections. If systematically documented, a manager might use enterprise architecture documentation to answer

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[1]http://www.opengroup.org/subjectareas/enterprise/togaf.

[2]https://www.zachman.com/about-the-zachman-framework.

the following questions: To which process does the downtime of an online service relate and which IT system supports activities in the process that might be affected by the downtime?

Exercise 2.2 Consider again the construction company BuildIT and its procure-to-pay process described on page 3. Which aspects in the organizational, product, data, application, and technical infrastructure perspectives have to be described to understand this process?

The reason for conducting process identification is that an organization should focus on those processes that either create value of strategic relevance or that have substantial problems (or both). This makes process identification an ongoing task, because processes *inside* an organization are subject to the dynamics of time and change. Specific processes may be problematic at one point, but once the issues have been identified and resolved, it is time to shift the focus to other processes. For example, an insurance company suffering from customer dissatisfaction will naturally tend to focus on its customer-oriented processes, for instance its claims handling process. Once this process has improved and customer satisfaction is again within the desired range, the emphasis might move to its risk assessment processes, which are important for the long-term viability and competitiveness of the company.

But there are also dynamics *outside* in the environment of organizations. What may be processes that are of strategic importance to an organization at some point may grow less important as time elapses. Market demands may change and new regulations or the introduction of new products may limit what was once a profitable business activity. For example, the arrival of new competitors offering discount insurance policies through Web-based channels may push an established company to redesign its insurance sales processes to make them leaner, faster and accessible from the Web.

Example 2.1 Changes of the strategic relevance of certain processes are often slow, but they can be drastic. Consider the German company Mannesmann. Mannesmann was established in the last decade of the nineteenth century as a producer of steel pipes. In the twentieth century, Mannesmann expanded into various industries, among others into producing trucks. In 1990, Mannesmann set up a business division for telecommunications after the liberalization of the German telecommunications market. Its cellular network D2 Mannesmann soon became the major competitor of Deutsche Telekom. In 2000, after a thrilling takeover battle, Mannesmann was acquired by the British company Vodafone for € 190 billion. The story of Mannesmann illustrates that the strategic importance of different processes may drastically change over a longer period of time. Therefore, process identification can never be a one-time activity. For more on the history of Mannesmann, see the Wikipedia entry.[3]   □

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[3] https://en.wikipedia.org/wiki/Mannesmann.

To address the imperative of focusing on a subset of key processes, the management team, process analysts, and process owners need to have answers to the following two questions: (i) what processes are executed in the organization? and (ii) which ones should the organization focus on? In other words, an organization engaged in a BPM initiative needs to maintain a map of its processes as well as clear criteria for determining which processes have the highest priority. The box on the "Process Checklist" helps to identify what is a process when answering these two questions.

PROCESS CHECKLIST

It may not be easy to decide on what to consider as a business process. A chunk of work that is frequently repeated might not be a business process on its own. To prevent poor scoping decisions, it is useful to consider the following *process checklist*:

Is it a process at all?   Not everything we can observe in a business context is a process. A department, for example, is not a process. Neither is a manager or email. For any *proper* process it must be possible to identify the *main action*, which is applied to a *category of cases*. For example, we can identify the business process *approve—leave requests*. Note how this name is of the form *verb + noun*. We can also test how appropriate the name is by considering whether the process outcome is of the form *noun + past participle*. For our example, completed cases are indeed *leave requests* that have been *approved*.

Can the process be controlled?   Something that is ongoing or active may resemble a process, while it is not. A proper way of looking at business processes is to see them as a repetitive series of events and activities to execute individually observable *cases*. In an insurance business process, cases may be the applications for healthcare coverage that flow through the process. Each application is clearly distinguishable from another. Without a clear case notion, process management is not feasible. Consider how difficult it would be to identify cases for false process candidates like *Human Resource Management* or *Strategy*. Also, without any sense of repetition, a group of business activities may better qualify as a *project* than as a business process. A case in point would be the Mars Orbiter Mission, which is a unique endeavor—not a business process, considering the currently scarce space trips to Mars.

Is the process important enough to manage?   Some processes do not even reach the minimum threshold to be considered as such. Clear indications for at least a modest importance of a process are that: (a) there is a customer who is willing to pay for its outcomes, (b) the organization that carries out the process would—in principle—be willing to pay another

party for taking over, or (c) there is a legal, mandatory framework that compels an organization to execute it. If none of these apply, the business process may be safely disregarded.

Is the scope of the process not too big?   Care should be taken that the activities that are considered to be within the scope of the process really contribute to its purpose. A good check for this is to determine whether there is a 1:1 relation between the event that initiates the process and each of the activities that are thought to be in scope. For example, let us consider a candidate make-to-order process like *manufacture bikes*. Even though it is important to *clean the work floor* for a bike factory, such an activity does not relate on a 1:1 basis to a bike manufacturing order. Rather, cleaning may take place periodically, such as at the end of the day. In other words, cleaning the work floor should not be part of this process (but it may be part of another process of course).

Is the scope of the process not too small?   One can sometimes come across *micro* business processes, which are not worth managing as processes at all. A rule of thumb is that for something to be a business process, there should be at least three different actors—*excluding* the customer—involved. If there are no handoffs between multiple actors or systems, there is little that can be improved using BPM methods.

We have seen in Chapter 1 that there is a range of stakeholders involved in the management and execution of a business process. Generally, only a handful of such stakeholders have a full overview of all the business processes in an organization. Yet, it is precisely this insight that is required in order to identify the subset of processes that need to be closely managed or improved. Capturing this knowledge and keeping it up-to-date is the aim of process identification.

More specifically, process identification is concerned with two steps: definition of the process architecture and selection of processes. The first step to *define a process architecture* (also called designation) has the objective to gain an understanding of the processes an organization is involved in as well as their interrelationships. The second step of *selecting processes* aims to develop a prioritization of processes for the BPM activities (discovery, analysis, redesign, implementation, monitoring, etc). Note that *neither* of these two steps is concerned with the development of process models. Indeed, process identification is not even concerned with a single process. It always takes the overall set of processes into account. Therefore, it is sometimes called *multi-process management*. The set of all processes is also referred to as a *process portfolio*.

2.2 Definition of the Process Architecture

The aim of a process architecture is to provide a representation of the processes that exist in an organization. The definition of a process architecture has to face the complexity of the whole organization. In order to approach this complexity in a systematic way, we first differentiate categories of processes. Second, we describe different relationships between processes that are important for a process architecture. Third, we present a method for defining the process landscape as a top-level representation of the process architecture.

2.2.1 Process Categories

If an organization is at the very start of becoming a process-centered organization, the first difficult task it faces is to come up with a meaningful enumeration of its existing processes. One difficulty here arises from the hierarchical nature of business processes: different criteria can be considered for determining which chains of operations can be seen as forming an independent business process and which ones are seen as being part of another process. There are various views on how to categorize business processes. Some of these support the idea that there are actually *very few* processes within any organization. For example, some researchers have argued for the existence of only two processes: managing the product line and managing the order cycle. Others identify three major processes: developing new products, delivering products to customers, and managing customer relationships.

One of the most influential categorization schemes is Porter's Value Chain model. It originally distinguished two categories of processes: core processes (called primary activities) and support processes (support activities). Management processes were added as a third category.

Core processes   cover the essential value creation of a company, that is the production of goods and services for which customers pay. These include design and development, manufacturing, marketing and sales, delivery, after-sales, and direct procurement (i.e., sourcing required for the making of products or the delivery of services).

Support processes   enable the execution of these core processes. These include indirect procurement (i.e., sourcing of hardware, furniture, stationery, etc.), human resource management, information technology management, accounting, financial management, and legal services.

Management processes   provide directions, rules, and practices for the core and support processes. These include strategic planning, budgeting, compliance and risk management, as well as investors, suppliers, and partners management.

The distinction of core, support, and management processes is of strategic importance to a company.
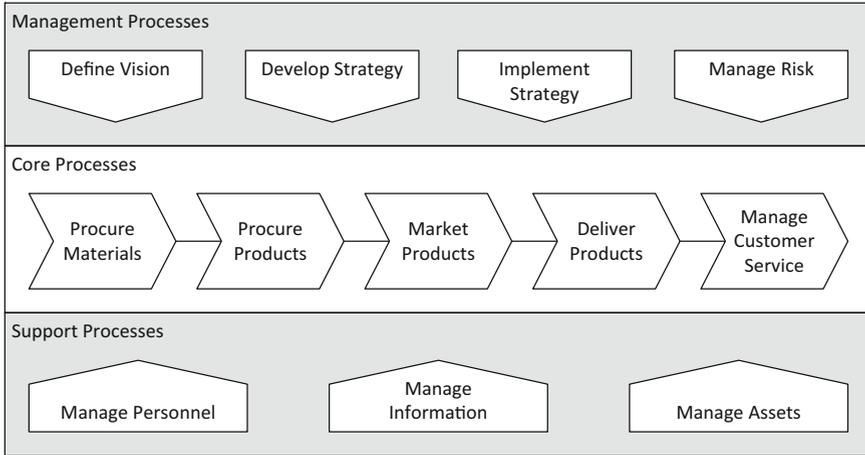
Fig. 2.2 Example of process categories of a production company

Figure 2.2 shows the example of a production company and a high-level representation of its processes. We will later call this type of representation a *process landscape model*, which describes the most abstract view of the process architecture. The example uses three categories for grouping the business processes according to their strategic importance. The core processes include the direct procurement of materials, produce products, market products, deliver products, and manage customer service. These core processes are supported by processes to manage personnel, information, and assets. Management processes include the definition of a vision, the development and implementation of the corporate strategy, and the management of risk.

Visual representations like the one in Figure 2.2 are often used in organizations to summarize the major processes in a compact and readable manner. The symbol used for core processes is called chevron and modeling processes as a sequence of sub-processes shown as chevrons is often called *value-chain modeling*. For a better visual distinction, support processes can be shown with upwards pointing blocks and management processes with downwards pointing blocks.

Exercise 2.3 What are core, support, and management processes of a university?

2.2.2 Relationships Between Processes

For a process architecture, we can distinguish three types of relationships between processes: sequence, decomposition, and specialization.

Sequence: This relationship describes that there is a logical sequence between two processes. Sequence is also referred to as a horizontal relationship. For
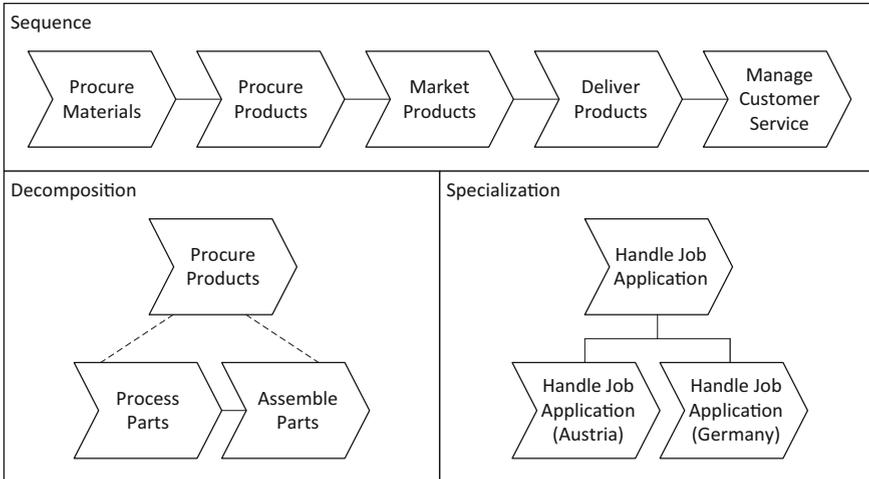
Fig. 2.3 Value chain models for sequence, decomposition, and specialization

instance, processes can be in a consumer-producer relationship. This means that one process provides an output that the other process takes as an input. In Chapter 1, we distinguished the quote-to-order and the order-to-cash processes. The output of the first one (the order) is the input to the second one. Also the example of Figure 2.3 shows that the core processes are in a sequential relationship from Procure Materials to Produce Products, Market Products, Deliver Products, and eventually Manage Customer Service. The object that is passed between the sequential processes characterizes the relationship.

Decomposition: This relationship describes that there is a decomposition in which one specific process is described in more detail in one or more sub-processes. Decomposition is also referred to as a vertical or hierarchical relationship. For instance, the Produce Products process of Figure 2.3 can be described in more detail including the different activities that have to be executed to bring it to a successful completion. Decomposition is often used as the primary relationship that defines the structure of the process architecture. Figure 2.4 illustrates this idea: at the most abstract level of the process architecture, we define a process landscape like the one above. Each element of this process landscape model is decomposed into a more detailed process on the next level.

Specialization: This relationship describes that there exist several variants of a generic process. For instance, there might be a generic process for handling job applications in a multi-national company. Since there are different legal constraints on this process in different countries, there will be, for example, one variant of this process for Austria and one for Germany (see Figure 2.3). Variants are not only defined for different legal contexts, but also for different categories of products or services and for different types of customers or suppliers. Our production company offers different products, and naturally the production
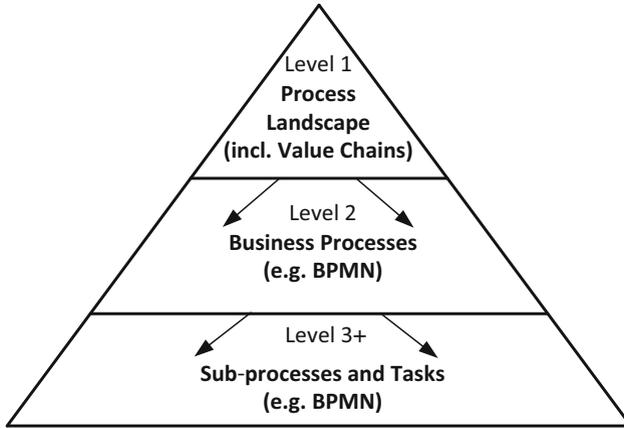
Fig. 2.4 A process architecture with three levels

process for these products varies. All of these different production variants refer to the single "Procure Products" element in Figure 2.3.

Value chains can be systematically described by the help of these relationships. To this end, we can first identify generic processes and then ask ourselves of which sequences they are composed. For example, consider an organization that has a generic process called order management. Its value chain includes order booking, billing, shipment, and delivery. Among each other, these processes are related in a sequential way. With respect to the generic order management process, they are decompositions. Furthermore, we call billing an upstream process of shipment: for the same order, the bill is sent out usually *before* the ordered goods are shipped. In the same way, shipment can be considered a downstream process of billing.

Exercise 2.4 At this point, we discussed sequence, decomposition, and specialization relations between business processes. Can you think of other types of relations that are useful to distinguish between processes?
Hint. Think about the purpose of identifying the relations between business processes.

The definition of a process architecture often proceeds in a top-down fashion, as illustrated by the pyramid in Figure 2.4. The starting point is the process landscape on Level 1 that shows the value chains of the company. Level 2 provides a decomposition for each business process of the value chains. Level 3 provides a further decomposition down to sub-processes and tasks. The arrows in the figure indicate these decompositions.

Question Should a process architecture have three levels like in Figure 2.4, or more, or maybe less?

First, it has to be noted that a level should be defined with respect to a specific purpose. This has often the implication that modeling concepts are tailored or
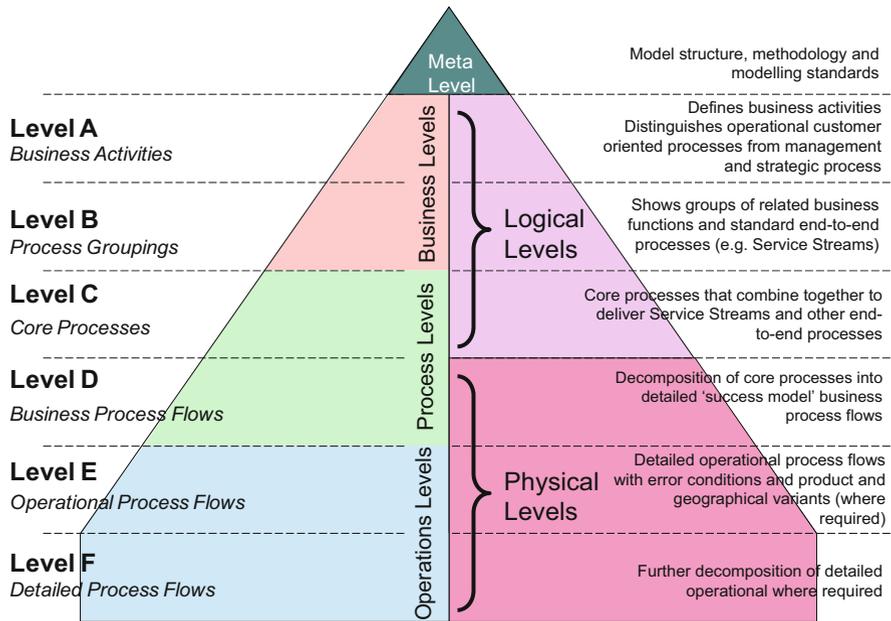
Fig. 2.5 The process architecture of British Telecom and its different levels . © British Telecommunications (2005)

utilized to specifically address this purpose. For example, Figure 2.4 emphasizes that processes on Level 1 are often modeled as so-called value chains while processes on Levels 2 and 3 are modeled with BPMN. Second, the different requirements for a process architecture depend on the overall approach to business process management. Figure 2.5 shows the example of the process architecture as defined by British Telecom in 2005. Here, six levels were defined down to a detailed operational level. Note that organizations will often define their own terms for these levels. For example, the term "Core Process" as used by British Telecom for processes on Level C is related, but not identical to the definition by Porter.

2.2.3 Reuse of Reference Models

Often, process analysts find it difficult to identify processes of an organization and the levels of a process architecture. It might be helpful to use reference models as an aid. These reference models are developed by a range of industry consortia, non-profit associations, government research programs, and academia. The best-known examples are the *Information Technology Infrastructure Library* (ITIL) by

AXELOS,[4] the *Supply Chain Operations Reference Model* (SCOR) by APICS,[5] the *Process Classification Framework* (PCF) by the American Productivity and Quality Center (APQC),[6] and the *Performance Framework* by Rummler & Brache.[7]

The excerpt in Table 2.1 shows Level 1 and Level 2 of APQC's PCF four levels: the categories (in bold) and the corresponding process groups. Reference models standardize what can be seen as different processes, with unique characteristics and delivering distinguishable products, and how their performance can be measured. For example, when a company like BuildIT wants to create a process architecture for the first time, they can use the PCF as a reference. First, they would check each category and decide if it is relevant for them. Then, they would continue to do the same check for each process group inside of the relevant categories, and so forth. Second, BuildIT would double-check if some of their processes are still missing and add them. Third, they might partially adjust terminology and replace generic terms of PCF with terms that are more common within BuildIT.

The reuse of reference models provides several benefits. First, reference models can serve as a starting point to develop a classification of major process areas. In this way, they directly support the identification of regulatory or highly industry-specific processes. This makes it also easier to benchmark with peers and competitors. Second, reference models may be useful to check the completeness of the processes identified by an organization. For example, an organization can use the APQC's PCF to inventory the processes they use, flag those they do not use, and add its own unique processes. Third, reference models provide a standardized vocabulary that is useful for labeling processes. In fact, terms may not always be precisely defined when process identification is conducted for the first time in an organization. Different stakeholders may use heterogeneous terminology. Homonyms and synonyms pose a challenge in this context. For example, what is called "acquisition" in one part of the organization may be called "market survey" in another (synonym). At the same time, the term "implementation" may represent different activities: one may represent the implementation of software, while the other represents the implementation of new regulations in the organization (homonym). Apart from being aware of the various terms that are being used, an intricate understanding of the operations of an organization is important to sort these issues out. Reference models like APQC's PCF can help us to avoid terminological issues right from the start. Note that there are several more specialized versions of the PCF, for example, for automotive, for banking, and for retail.

Exercise 2.5 Which APQC categories on Level 1 are relevant for a construction company like BuildIT?

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[4]https://www.axelos.com/best-practice-solutions/itil.

[5]http://www.apics.org/.

[6]https://www.apqc.org/pcf.

[7]https://www.rummlerbrache.com.

Table 2.1 Level 1 and Level 2 of the APQC Process Classification Framework

1.0 Develop Vision and Strategy
1.1 Define the business concept and long-term vision
1.2 Develop business strategy
1.3 Execute and measure strategic initiatives

2.0 Develop and Manage Products and Services
2.1 Govern and manage product and service development program
2.2 Generate and define new product and service ideas
2.3 Develop products and services

3.0 Market and Sell Products and Services
3.1 Understand markets, customers, and capabilities
3.2 Develop marketing strategy
3.3 Develop and manage marketing plans
3.4 Develop sales strategy
3.5 Develop and manage sales plans

4.0 Deliver Physical Products
4.1 Plan for and align supply chain resources
4.2 Procure materials and services
4.3 Produce, manufacture, and deliver product
4.4 Manage logistics and warehousing

5.0 Deliver Services
5.1 Establish service delivery governance and strategies
5.2 Manage service delivery resources
5.3 Deliver service to customer

6.0 Manage Customer Service
6.1 Develop customer care and customer service strategy
6.2 Plan and manage customer service contacts
6.3 Service products after sales
6.4 Manage product recalls and regulatory audits
6.5 Evaluate customer service operations and customer satisfaction

7.0 Develop and Manage Human Capital
7.1 Develop and manage human resources planning, policies, and strategies
7.2 Recruit, source, and select employees
7.3 Develop and counsel employees
7.4 Manage employee relations
7.5 Reward and retain employees
7.6 Redeploy and retire employees
7.7 Manage employee information and analytics
7.8 Manage employee communication
7.9 Deliver employee communications

8.0 Manage Information Technology (IT)
8.1 Manage the business of information technology

8.2 Develop and manage IT customer relationships
8.3 Develop and implement security, privacy, and data protection controls
8.4 Manage enterprise information
8.5 Develop and maintain information technology solutions
8.6 Deploy information technology solutions
8.7 Deliver and support information technology services

9.0 Manage Financial Resources
9.1 Perform planning and management accounting
9.2 Perform revenue accounting
9.3 Perform general accounting and reporting
9.4 Manage fixed-asset project accounting
9.5 Process payroll
9.6 Process accounts payable and expense reimbursements
9.7 Manage treasury operations
9.8 Manage internal controls
9.9 Manage taxes
9.10 Manage international funds/consolidation
9.11 Perform global trade services

10.0 Acquire, Construct, and Manage Assets
10.1 Plan and acquire assets
10.2 Design and construct productive assets
10.3 Maintain productive assets
10.4 Dispose of assets

11.0 Manage Enterprise Risk, Compliance, Remediation and Resiliency
11.1 Manage enterprise risk
11.2 Manage compliance
11.3 Manage remediation efforts
11.4 Manage business resiliency

12.0 Manage External Relationships
12.1 Build investor relationships
12.2 Manage government and industry relationships
12.3 Manage relations with board of directors
12.4 Manage legal and ethical issues
12.5 Manage public relations program

13.0 Develop and Manage Business Capabilities
13.1 Manage business processes
13.2 Manage portfolio, program, and project
13.3 Manage quality
13.4 Manage change
13.5 Develop and manage enterprise-wide knowledge management (KM) capability
13.6 Measure and benchmark
13.7 Manage environmental health and safety (EHS)

2.2.4 *Process Landscape Model*

The model of the process architecture that covers the processes on Level 1 is known
as the *process landscape model* or simply the process architecture for Level 1. It
shows the core processes on a very abstract level. Each of the elements of the process
landscape model points to one or more detailed business processes on Level 2.

The definition of a process landscape model is the most important challenge for
the definition of the process architecture. The process architecture on Level 1 has to
be understandable by all major stakeholders in the first place. As a rule of thumb, it
should be compact, showing no more than 20 business processes of an organization.
Further, it has to be sufficiently complete such that all employees of the organization
can relate their daily work to it, and accept it as a consensual description of the
company. Therefore, it is important to define the process architecture in a systematic
way, with a specific focus on the derivation of the process landscape model.

Figure 2.6 shows the example of a process map of Vienna's public transport oper-
ator Wiener Linien. We see that the categories of core processes, support processes,
and management processes were used. It is interesting to note that the core processes
are subdivided into different end-to-end processes: manage customer relationship,
operate vehicles, transport customer, and provide infrastructure. Visually, these
are shown as *process groups*. Organizations often have more than one end-to-end
process, such that different sequences are shown in the process landscape's category
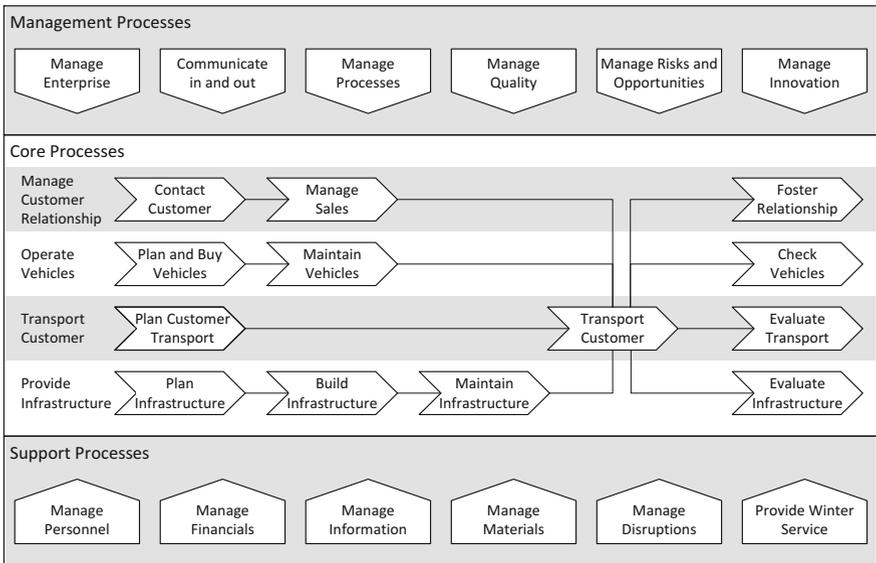of core processes.

Fig. 2.6 Process landscape model of Vienna's public transport operator Wiener Linien [168]

The definition of a process landscape model requires the involvement of major stakeholders of the organization, either using interviews or, preferably, using a workshop setting. The contributions of the stakeholders are required in order to establish the legitimacy of the resulting model. For this reason, it is important that all senior executives are involved.

Once the commitment of the stakeholders is secured, there are several steps that help us to define the process landscape model in a systematic way. We present these steps as a sequence, but note that in practice there will be jumps back and forth with iterations.

1. **Clarify terminology:** The key terms to be used in the process landscape model should be defined. Often, there exists already an organizational glossary, which can be used as a reference. Reference models are also useful to support this step. The definition helps to make sure that all stakeholders have a consistent understanding of the process landscape model to be defined.
2. **Identify end-to-end processes:** End-to-end processes are those processes that interface with customers and suppliers of the organization. The goods and services that an organization provides to customers or procures from suppliers are a good starting point for this identification, since they are explicitly defined in most organizations. Several properties help us to distinguish end-to-end processes, including:

   - Product type: This property identifies types of products that are produced in a similar way. For instance, at this abstract level, an automotive company might distinguish cars from trucks.
   - Service type: This property identifies types of services that are produced in a similar way. For instance, a software vendor might distinguish purchased software from software-as-a-service.
   - Channel: this property represents the channels through which the organization interacts with its customers. For example, an insurance company might separate its Internet offerings from its offerings via intermediary banks.
   - Customer type: This property represents the types of customer that the organization deals with. A bank might, for instance, distinguish wealth customers, private banking customers, and retail customers.

   The identification of end-to-end processes combines an *external view of what* the provisions of the organization are from the view of the customer, and an *internal view of how* these are created. The selection of the listed properties should be driven by the idea to only define separate end-to-end processes when their internal behavior is substantially different. Those end-to-end processes that are shown on the process landscape model represent the value chains of the organization.
3. **For each end-to-end process, identify its sequential processes:** For this step, it is important to identify the internal, intermediate outcomes of an end-to-end

process. There are different perspectives that help setting the boundaries of these processes:

- Product lifecycle: The lifecycle of a product or service includes different states, which can be used to subdivide an end-to-end process. For instance, a plant construction company typically first submits a quote, then sets up the contract, designs the plant in collaboration with the customer, produces its building blocks, delivers and constructs the plant on premise, writes the invoice, and provides maintenance services.
- Customer relationship: There are also typical stages that a customer relationship goes through. First, leads are generated, then a contract is sealed and services provided. For these, invoices are written. The contract might be changed and eventually terminated.
- Supply chain: Along the supply chain, materials are procured, which are used to produce products. These are checked for quality assurance and delivered to customers.
- Transaction stages: There are different stages that transactions typically go through from initiation to negotiation, execution, and acceptance. Consider, for instance, buying clothes at a fashion retailer. First, interest in the products is generated (initiation). Advisory services in the shop have to be provided to the customers, such that they can make a good decision (negotiation). Taking the clothes to the point of sale marks execution. The payment completes the transaction (acceptance).
- Change of business objects: If there are different business objects, the process should be split up into respective business processes. For instance, the transition from a quote to a contract or from an order to a payment mark the boundaries of different processes. A change of multiplicity is a specific condition for splitting up; for example, when several job applications lead to one hiring.
- Separation: Different stages of a process can also be defined by a temporal, spatial, logical, or other type of separation. Often, these separations define handoffs, and major handoffs are suitable points to distinguish sequential processes.

The identification of business processes is closely connected with the internal view of an end-to-end process. It is also referred to as the identification of internal functions, because there typically exist functional units in the organization like divisions or departments that are responsible for particular business processes.

4. **For each business process, identify its major management and support processes:** The question for this step is what is required in order to execute the previously identified processes. Typical support processes, as also shown in Figure 2.6, are management of personnel, financials, information, and materials. Note, however, that these support processes can be core processes if they are an integral part of the business model. For a staff-borrowing company, personnel management is a core process. However, management processes are usually generic.

5. **Decompose and specialize business processes:** Each of the business processes of the process landscape should be further subdivided into an abstract process on Level 2 of the process architecture. Also further subdivision to Level 3 might be appropriate until processes are identified that can be managed autonomously by a single process owner. There are different considerations when this subdivision should stop:

   • Manageability: The smaller the number of the identified processes, the bigger their individual scope is. In other words, if only a small number of processes is identified, then each of these will cover numerous operations. This makes their management more difficult. Among others, the involvement of a large number of staff in a single process will make communication more difficult and improvement projects more complex.
   • Impact: A subdivision into only a few large processes will increase the impact of their management. The more operations are considered to be part of a process, the easier it will become, for example, to spot opportunities for efficiency gains by rooting out redundant work. Also risks arising from compliance violations might be considered as having an impact.

6. **Compile process profile:** Each of the identified processes should not only be modeled, but also described using a process profile. This process profile supports the definition of the boundaries of the process, its vision and process performance indicators, its resources, and its process owner. Figure 2.7 shows an example of a process profile of BuildIT's procure-to-pay process.

7. **Check completeness and consistency:** These checks should build on the following inputs. First, reference models can be used to check whether all major processes that are relevant for the organization are included. Reference models can also help us to check the consistency of the terminology. Second, it should be checked whether all processes can be associated with functional units of the organization chart and the other way around.

Example 2.2 We already know BuildIT from the descriptions of its procure-to-pay process in Example 1.1 on page 3. The following passage describes the company from a more general perspective. With this information, we will construct its process landscape model.

> The overall end-to-end process of BuildIT starts with a customer demand and ends with the expiry of the warranty of construction works. The business development department is responsible for identifying customer demands and public tenders. Together with the pre-sales engineering department, they select projects for which BuildIT prepares bids. Bids that are approved lead to contract negotiations. Once contracts are signed, the contract is transferred to execution. Contract execution starts with the project initiation, which includes engineering, design, and planning. What follows then are the actual construction works. The procure-to-pay process that we already know from Example 1.1 also belongs to these initiation procedures. Once the construction works are finished, the construction site is commissioned to the customer. What can still follow are corrective works to meet warranty obligations.

Name of Process: Procure-to-Pay
Vision: The objective of the procurement process is to secure that the entire range of external products and services becomes available on time and is at the required level of quality.
Process Owner: Chief Financial Officer (CFO)

Customer of process:	Expectation of customer:
• Requesting unit	• Timely, economic and complete provision

Outcome: Delivered products or provided services for the requested unit
Trigger: Need is identified
First activity: Submit Request ….. **Last activity:** Create Purchase Order
Interfaces inbound: Plan-to-Procure **Interfaces outbound:** Construct-to-Complete

Required resources:
• Human resources:
  Site Engineer, Clerk, Works Engineer
• Information, documents, know-how:
  procurement guidelines, supplier rating, framework contract
• Work environment, materials, infrastructure:
  Procurement information system

Process Performance Measures: • Cycle Time • Operational Costs • Error Rate

Fig. 2.7 Process profile of BuildIT's procure-to-pay process, adapted from [190]

We proceed with our seven-step design method as follows:

1. Clarify terminology: The decision was made to design the process landscape model based on APCQ. Accordingly, APQC's terms are adopted for management and support processes. The APCQ Categories 1–3 plus 13 were also found relevant for management processes and 7–12 for support processes. Instead of "products and services", BuildIT only refers to "services". The core processes in the end-to-end value chain are replaced by the more specific descriptions of the construction business from above.

2. Identify end-to-end processes: The end-to-end process starts with the identification of the customer demand and ends when the warranty expires. We might want to differentiate different types of construction works, but the text does not provide us information in this direction.
3. For each end-to-end process, identify its sequential processes: The end-to-end process includes the following business processes. They reflect the product lifecycle of the construction work, organized in the two groups "Contract Acquisition" and "Contract Execution":

   - Demand-to-Selection,
   - Selection-to-Bid,
   - Approval-to-Contract,
   - Contract-to-Plan,
   - Plan-to-Completion,
   - Completion-to-Expiry.

4. For each business process, identify its major management and support processes: Here, we rely on the APQC categories 1–3 and 7–13. The names are slightly shortened.
5. Decompose and specialize business processes: Here, we only decompose the planning process as an example. It can be subdivided into several business processes including: plan-to-procure and procure-to-pay, plan-to-deliver and deliver-to-pay for ordering construction materials, and plan-to-schedule for assigning workers to construction sites.
6. Compile process profile: BuildIT defines process profiles for each process on Level 2. The procure-to-pay process belongs to the set of these processes. We have shown the process profile of this process in Figure 2.7.
7. Check completeness and consistency: Finally, we have to check if all major departments of BuildIT are represented. The result is shown in Figure 2.8.

□

Exercise 2.6 Create a process landscape model for a university by applying the seven steps described in this section. Use the APQC Process Classification Framework as an aid.

To balance the advantages and disadvantages of a large process scope, Davenport suggests that it may be useful to identify both *broad* and *narrow* processes. Broad processes are identified in those areas where an organization feels it is important to completely overhaul the existing operations at some point, for example because of fierce competitive forces. For example, an organization may have found out that its procurement costs are overly high compared to its competitors. Accordingly, it selects procurement as a broad process, which covers all of the services and products the company acquires from other parties. By contrast, narrow processes are not targeted for major overhauls; they need to be actively monitored and are subjected to continuous fine-tuning and updating. A narrow process may be, for example, how the same company deals with improvement suggestions of employees.
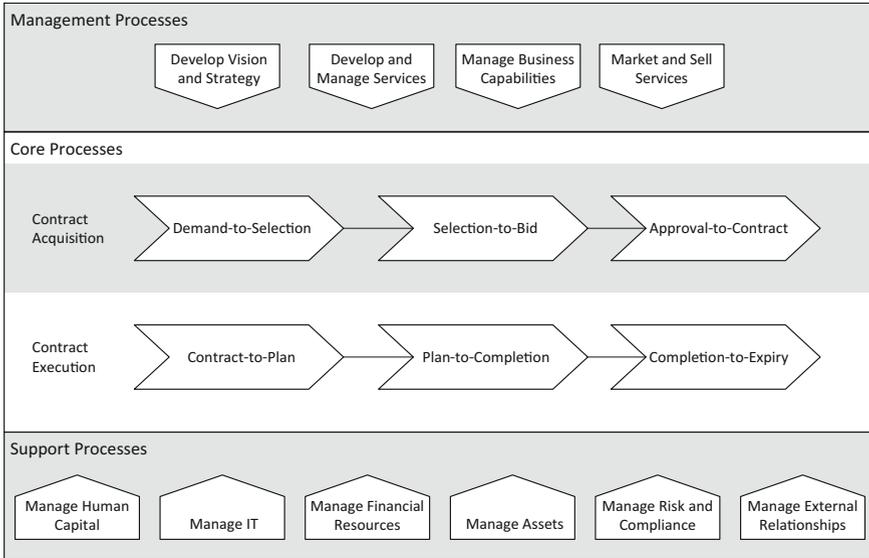
Fig. 2.8 Process landscape model of BuildIT

Exercise 2.7 Explain how the trade-off between impact and manageability works out for broad and narrow processes, respectively.

Any enumeration of business processes should strive for a reasonably detailed outcome, which needs to be aligned with the organization's specific goals of process management. For most organizations, as a rule of thumb, this will boil down to a couple of dozen business processes. Very large and diversified organizations might be better off with identifying a couple of hundred processes. As an example, consider the multinational software vendor SAP that has identified one thousand different business processes. Each of these business processes is assigned to a process owner, who oversees the performance of the process and monitors the achievement of its objectives in terms of profitability, compliance, and accountability. Detailed process models are kept up-to-date, both as a means for documenting planned changes to any process and for satisfying the requirements of reporting. By contrast, for a small medical clinic in The Netherlands, which employs medical specialists, nurses, and administrative staff, 10 different treatment processes have been identified. A few of these have been mapped in the form of process models and are now in the process of being automated with a business process management system. For all other processes, it is sufficient to be aware of the distinctive treatment options they can provide to different patient categories.

Finally, it is worth emphasizing again with respect to the design of the process architecture that processes change over time, deliberately or not. Above, we have discussed the changes of Mannesmann's business focus in the past. Change naturally implies that process identification is a continuous pursuit. There are organizations

that have defined governance procedures to continuously update their process architecture. In case such procedures are not in place, a process architecture may well be usable for a period of time (e.g., 2–3 years) and should then be revised.

Clearly, given the extent and depth of a process architecture, coming up with a comprehensive architecture is hardly achieved in one go. Practically, this can be done by applying incremental extensions and updates as part of each new BPM project, especially as far as the hierarchical perspective of the process architecture is concerned. For example, a project to manage the claims handling process of an insurance company will use the process architecture to determine which support and management processes should also be considered. Then, as the project is executed and sub-processes and individual activities within the claims handling process are discovered, this information is used to update the process architecture.

2.2.5   The Example of SAP's Process Architecture

SAP is one of the largest software vendors worldwide. Its ambition is to help its customers to streamline their processes, such that they are able to predict customer trends based on live data. SAP also has an internal unit that is responsible for business process management, organizing the processes in which more than 87,000 employees of SAP work.[8]

Figure 2.9 shows the model of Level 1 of SAP's process architecture. It distinguishes ten major processes: two in the category management processes, three
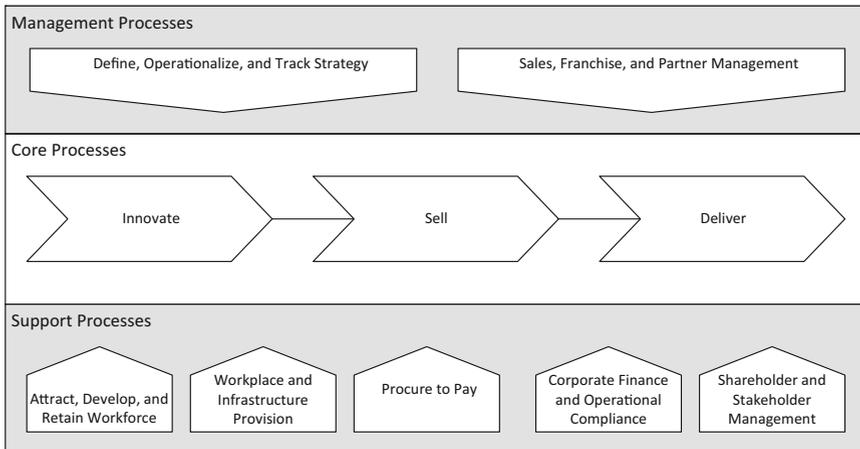

Fig. 2.9 The SAP process map describing the process landscape of the company [139]

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[8]http://www.sap.com/corporate/en/company.html (accessed in Nov. 2017).

core processes, and five support processes. The core processes Innovate, Sell, and Deliver are part of an overarching end-to-end process. To a certain extent, it is inspired by the product lifecycle view of innovating, selling, and delivering software solutions. An important aspect of SAP's process architecture is that it defines three levels. Those processes on Level 1 shown in Figure 2.9 are subdivided into more detailed processes on Level 2 and Level 3 using the same value-chain notation with chevron symbols as used for the sequence of core processes [139]. For example, there is a sub-process on Level 2 called Order-to-Cash that belongs to the Sell process. This is further refined on Level 3. As a result, there are roughly 1,000 processes on Level 3. A process is only specified on this level if it generates more than € 1 million cost or returns, if it is relevant to compliance, or if it directly supports a core process. All text labels of the process architecture are in line with company terminology.

2.3 Process Selection

The aim of process selection is to define criteria for assessing the performance of the identified business processes. This task builds on the observation that business processes differ in terms of their importance and maturity. In order to define a solid basis for process selection, process performance measures should be considered in combination with general criteria. The advantage of process performance measures is that they can be used to plot the set of processes as a process portfolio.

2.3.1 Selection Criteria

As stated before, not all processes are equally important and not all processes can receive the same amount of attention. BPM involves commitment, ownership, investment in performance improvement and redesign. Therefore, processes that create loss or risk can be considered for consolidation, decommissioning, or outright elimination. Various criteria have been proposed to steer this evaluation. The most commonly used ones are the following:

Strategic Importance: This criterion is concerned with assessing the strategic relevance of each process. The goal is to find out which processes have the greatest impact on the strategic goals of an organization, for example considering profitability, uniqueness, or contribution to competitive advantages. It makes sense to select those processes for active process management that most directly relate to the strategic goals of an organization.

Health: This criterion aims to render a high-level judgement of the health of each process. The question here is to determine which processes are in the deepest trouble. These processes are the ones that may profit the most from BPM initiatives.

Feasibility: For each process, it should be determined how susceptible it is to
BPM initiatives, either incidental or on a continuous basis. Most notably, culture
and politics involved in a particular process may be obstacles to achieving results
from such initiatives. In general, BPM should focus on those processes where it
is reasonable to achieve benefits.

All of these criteria assume that there is certain information available. For
example, to assess the *strategic importance* of a process it is of utmost importance
that an organization has an idea of its strategic course. Sometimes, it is sufficient
if such strategic considerations are defined at an abstract level, but often this is
additionally justified by a business case. For example, an increasing number of
organizations are exploiting the strategic benefit of being able to change the products
they provide according to the demands of customers. Zara, the Spanish clothing
retailer, is a prime example of an organization that follows a measure-and-react
strategy. It sends out agents to shopping malls to see what people already wear for
determining the styles, fabrics, and colors of the products it wants to deliver. Such an
organization may look with specific interest at the production and logistic business
processes that are best able to support this strategy.

Similarly, to determine the *health* of a business process, an organization needs
information. Here, we do encounter a chicken-and-egg problem. Many organi-
zations that are not working in a process-centered way do not have a good,
quantitative insight into the performance of their individual processes. One of
the BPM initiatives that such an organization may be after would exactly be to
put the systems and procedures in place to collect the data that is needed for
a performance assessment of its processes. In such cases, an organization will
need to use more qualitative approaches to determine which of its processes do
not perform well, for example depending on the impressions that management
or process participants have about the efficiency or effectiveness of the various
processes. Another approach would be to rely on customer evaluations, either
gathered by surveys or spontaneously delivered in the form of complaints.

The criterion of *feasibility* needs attention, too. It has become common practice
for organizations to undergo a continuous stream of programs to improve their
performance in one dimension or the other. Consider Philips, the multi-national
electronics company. It has gone through an intermittent range of improvement
programs since the 1980s to boost its performance. The same phenomenon can now
be observed within many telecommunication and utility organizations. Since the
profitability of products may change sharply from 1 year to the other, this requires
continuous changes to product and service portfolios as well as market priorities. In
such a volatile setting, it may happen that managers and process participants become
tired or outright hostile towards new initiatives. This kind of situation is not a good
starting point for BPM initiatives. After all, like other organizational measures, such
initiatives also depend on the cooperation and good intentions of those directly
involved. While we will not deal with the subject of change management in much
detail in this textbook, it is important to realize that political sensitivities within an

organization may have an effect on the success rate of process management efforts too.

Exercise 2.8 Consider again the procure-to-pay process of BuildIT (page 3) and the admission process of a university (page 5) as described in Chapter 1. Discuss their strategic importance, their health, and the feasibility of a potential improvement to these processes.

Question Given all the discussed criteria, does an assessment of the importance, health, and feasibility always point us to the same processes to actively manage?

No, there is no guarantee for that. It may very well be that a strategically important process is also the process that can be expected to be the most difficult one to manage, simply because so many earlier improvement efforts have already failed. An organization may not have a choice in such a situation. If a strategic process cannot be improved, this may turn out to be fatal for an organization as a whole. Think of a situation where the process to come up with new products creates much turmoil and conflicts within an organization: If the issues cannot be sorted out, the company may stop functioning quickly. In other settings, it may be more important to gain credibility with process management activities first. This can be accomplished by first focusing on problematic processes of milder strategic importance but where there is a great desire to change. If successful, an improvement project at such a place may give credibility to the BPM initiative. These are not choices that can be easily prescribed without taking the specific context into consideration. The various evaluation outcomes should be balanced to reach a list of those processes that should receive priority over others.

Question Should all processes that are unhealthy, of strategic importance, and feasible to manage be subjected to BPM?

The general answer to this question is that for most organizations this is not doable. Recall again that BPM consumes resources. Even when there is a clear incentive to, for example, redesign various existing business processes, most organizations lack sufficient resources—people, funds, and time—to do so. Only the largest organizations are able to support more than a handful of BPM projects at the same time. A good example is IBM, an organization known to have process improvement projects going on within all its existing business processes on a continuous basis. Another caveat of carrying out many simultaneous BPM efforts is that these will create coordination complexity. Remember that processes may be linked to each other in various respects, such that measures taken for one process should be synchronized with those taken for others.

Davenport emphasizes that many companies focus on a small set of critical business processes in order to gain experience with innovation initiatives; each successful initiative can then become a model for future efforts [30].

2.3.2 Process Performance Measures

For many BPM-related management activities, we need a precise measurement of the health of a business process. In this context, we distinguish generic performance dimensions and specific performance measures. Often, four generic dimensions of process performance measures are distinguished: time, cost, quality, and flexibility. Any company would ideally like to make its processes faster, cheaper, and better. This simple observation leads us already to identifying three *process performance dimensions*: time, cost, and quality. A fourth dimension gets involved in the equation once we consider the issue of change. A process might perform extremely well under normal circumstances, but then perform poorly in other perhaps equally or more important circumstances. For example, Van der Aalst et al. [178] report the story of a business process for handling claims at an Australian insurance company. Under normal, everyday conditions, the process performed to the entire satisfaction of all managers concerned (including the process owner). However, Australia is prone to storms and some of these storms cause damages to different types of properties (e.g., houses and cars), leading to numerous claims being lodged in a short period of time. The call center agents and backoffice workers involved in the process were literally over-flooded with claims and the performance of the process degraded—precisely at the time when the customers were most sensitive to this performance. What was needed was not to make the process faster, cheaper, or better during normal periods. Rather, there was a need to make the process more flexible to sudden changes in the amount of claims. This observation leads us to the identification of a fourth dimension of process performance, namely flexibility.

Each of the four performance dimensions mentioned above (time, cost, quality, and flexibility) can be refined into a number of *process performance measures* (also called *key performance indicators* or *KPIs*). A process performance measure is a quantity that can be unambiguously determined for a given business process—assuming that the data to calculate this performance measure is available.

For example, there are several types of cost such as cost of production, cost of delivery, or cost of human resources. Each of these types of cost can be further refined into specific performance measures. To do so, one needs to select an aggregation function, such as count, average, variance, percentile, minimum, maximum, or ratios of these aggregation functions. A specific example of a cost performance measure is the average delivery cost per item.

Below, we briefly discuss each of the four dimensions and how they are typically refined into specific performance measures.

Time: Often the first performance dimension that comes to mind when analyzing processes is time. Specifically, a very common performance measure for processes is *cycle time* (also called *throughput time*). Cycle time is the time that it takes to handle one case from start to end. Process selection is often driven by the ambition to reduce cycle time, and there are many different ways of further specifying this aim. For example, one can aim at a reduction of the average cycle time or the maximal cycle time. It is also possible to focus on the ability to meet

cycle times that are agreed upon with a client. Yet another way of looking at cycle time is to focus on its variation, which is notably behind approaches like Six Sigma (see Chapter 1). Other aspects of the time dimension come into view when we consider the components of cycle time, namely:

- *Processing time* (also called *service time*): the time that resources, such as process participants or software applications invoked by the process, spend on actually handling the case.
- *Waiting time*: the time that a case spends in idle mode. Waiting time includes *queueing time*—waiting time due to the fact that no resources are available to handle the case—and other waiting time, for example because synchronization must take place with another process, with other activities, or because an input is expected from a customer or from another external party.

Cost: Another common performance dimension when analyzing and redesigning a business process has a financial nature. While we refer to cost here, it would also have been possible to put the emphasis on turnover, yield, or revenue. Obviously, a yield increase may have the same effect on an organization's profit as a decrease of cost. However, process redesign is more often associated with reducing cost. There are different perspectives on cost. In the first place, it is possible to distinguish between fixed and variable cost. Fixed costs are overhead costs which are (nearly) not affected by the intensity of processing. Typical fixed costs follow from the use of infrastructure and the maintenance of software systems. Variable costs are positively correlated with some variable quantity, such as the level of sales, the number of purchased goods, the number of new hires, etc. A cost notion which is closely related to productivity is *operational cost*. Operational costs can be directly related to the outputs of a business process. A substantial part of operational cost is usually labor cost, the cost related to human resources in producing a good or delivering a service. Within process redesign efforts, it is very common to focus on reducing operation cost, particularly labor cost. The automation of tasks is often seen as an alternative for labor. Obviously, although automation may reduce labor cost, it may cause incidental cost involved with developing the respective application and fixed maintenance cost for the lifetime of the application.

Quality: The quality of a business process can be viewed from at least two different angles: from the client's side and from the process participant's perspective. This is also known as the distinction between external quality and internal quality. The *external quality* can be measured as the client's satisfaction with either the product or the process. Satisfaction with the product can be expressed as the extent to which a client feels that the specifications or expectations are met by the delivered product. *Service level agreements* (SLAs) precisely specify what is to be expected. On the other hand, a client's satisfaction concerns the way how the process is executed. A typical issue is the amount, relevance, quality, and timeliness of the information that a client receives during execution on the progress being made. Various specific measures are used to capture customer satisfaction:

- *Churn rate*: In particular for processes that interface with the customer over the Internet, it is important to know how many customers do not complete their interaction successfully. Such processes with customer interactions are also called *customer journeys*. The churn rate is calculated by dividing this amount by the number of all interactions.
- *Net promoter score*: This measure is often defined in a range from 1 to 10, and captures how far customers would be willing to recommend a product or service. Specifically for services, it is directly connected with the business process behind it.

On the other hand, the *internal quality* of a business process relates to the process participants' viewpoint. Typical internal quality concerns are: the level that a process participant feels in control of the work performed, the level of variation experienced, and whether working within the context of the business process is felt as challenging. It is interesting to note that there are various direct relations between quality and other dimensions. For example, the external process quality is often measured in terms of time, e.g., the average cycle time or the percentage of cases where deadlines are missed. In this book, we make the choice that whenever a performance measure refers to time, it is classified under the time dimension even if the measure is also related to quality.

Flexibility: The criterion that is least noted to measure the effect of process redesign is the flexibility of a business process. Flexibility can be defined in general terms as the ability to react to changes. These changes may concern various parts of the business process, for example:

- The ability of resources to execute different tasks within a business process setting;
- The ability of a business process as a whole to handle various cases and changing workloads;
- The ability of the management to change the structure and allocation rules;
- The organization's ability to change the structure and responsiveness of the business process to wishes of the market and business partners.

Another way of approaching the performance dimension of flexibility is to distinguish between runtime and build-time flexibility. *Runtime flexibility* concerns the opportunities to handle changes and variations while executing a specific business process. *Build-time flexibility* concerns the possibility to change the business process structure. It is increasingly important to distinguish the flexibility of a business process from the other dimensions.

Example 2.3 Let us consider the following scenario.

A restaurant has recently lost many customers due to poor customer service. The management team has decided to address this issue first of all by focusing on the delivery of meals. The team gathered data by asking customers about how quickly they liked to receive their meals and what they considered as an acceptable wait. The data suggested that half of the customers would prefer their meals to be served in 15 min or less. All customers agreed that a waiting time of 30 min or more is unacceptable.

In this scenario, it appears that the most relevant performance dimension is time, specifically serving time. One objective that we can distill from the scenario is to completely avoid waiting times above 30 min. In other words, the percentage of customers served in less than 30 min should be as close as possible to 100%. Thus, the percentage of customers served in less than 30 min is a relevant performance measure. Another threshold mentioned in the scenario is 15 min. There is a choice between aiming to have an average meal serving time below 15 min or again, minimizing the number of meals served above 15 min. In other words, there is a choice between two performance measures: average meal delivery time or percentage of customers served in 15 min.   □

This example illustrates that the definition of process performance measures is tightly connected with the definition of *performance objectives*. In this respect, one possible method for deriving performance measures for a given process is the following:

1. Formulate performance objectives of the process at a high level, in the form of a desirable state that the process should ideally reach, e.g., customers should be served in less than 30 min.
2. For each performance objective, identify the relevant performance dimension(s) and aggregation function(s), and from there, define one or more performance measures for the objective in question, e.g., the percentage of customers served in less than 30 min. Let us call this measure ST_{30}.
3. Define a more refined objective based on this performance measure, such as $ST_{30} \geq 99\%$.

During the redesign and implementation phases, a possible additional step is to attach a timeframe to the refined performance objective. For example, one can state that the above performance objective should be achieved in 12 months time. A performance objective with a timeframe associated to it is usually called a *performance target*. At the end of the chosen timeframe, one can assess to what extent the redesigned process has attained its targets.

Exercise 2.9 Consider the following summary of issues reported in a travel agency.

A travel agency has recently lost several medium-sized and large corporate customers due to complaints about poor customer service. The management team of the travel agency decided to appoint a team of analysts to address this problem. The team gathered data by conducting interviews and surveys with current and past corporate customers and also by gathering customer feedback data that the travel agency has recorded over time. About 2% of customers complained about errors that had been made in their bookings. In one occasion, a customer had requested a change to a flight booking. The travel agent wrote an email to the customer suggesting that the change had been made and attached a modified travel itinerary. However, it later turned out that the modified booking had not been confirmed in the flight reservation system. As a result, the customer was not allowed to board the flight and this led to a series of severe inconveniences for the customer. Similar problems had occurred when booking a flight initially: the customer had asked for certain dates, but the flight tickets had been issued for different dates. Additionally, customers complained of the long times it took to get responses to their requests for quotes and itineraries. In most cases, employees of the travel agency replied to requests for quotes within 2–4 working hours, but in the case

of some complicated itinerary requests (about 10% of the requests), it took them up to 2 days. Finally, about 5% of customers also complained that the travel agents did not find the best flight connections and prices for them. These customers essentially stated that they had found better itineraries and prices on the Web by searching by themselves.

1. Which business processes should the travel agency select for improvement?
2. For each of the business processes you identified above, indicate which performance measure the travel agency should improve.

All the specific process performance measures related to the dimensions of time, cost, quality, and flexibility can be further aggregated in order to obtain a single measure of process health. Such an aggregated measure must be defined for each business process separately, because processes differ in terms of their vision and performance objectives. The health then captures to what extent these objectives have been achieved.

Balanced scorecards can be used for this purpose. Figure 2.10 shows an example of balanced scorecard for three processes of a utility company. For each process, the balanced scorecard provides a hierarchy of process performance measures over four layers of granularity: from detailed process performance measures (Layers 3 and 4) up to key process performance areas (Layer 1). By populating the measures at the lowest level with concrete measurements and aggregating the results, one can obtain a single health measure for each business process.
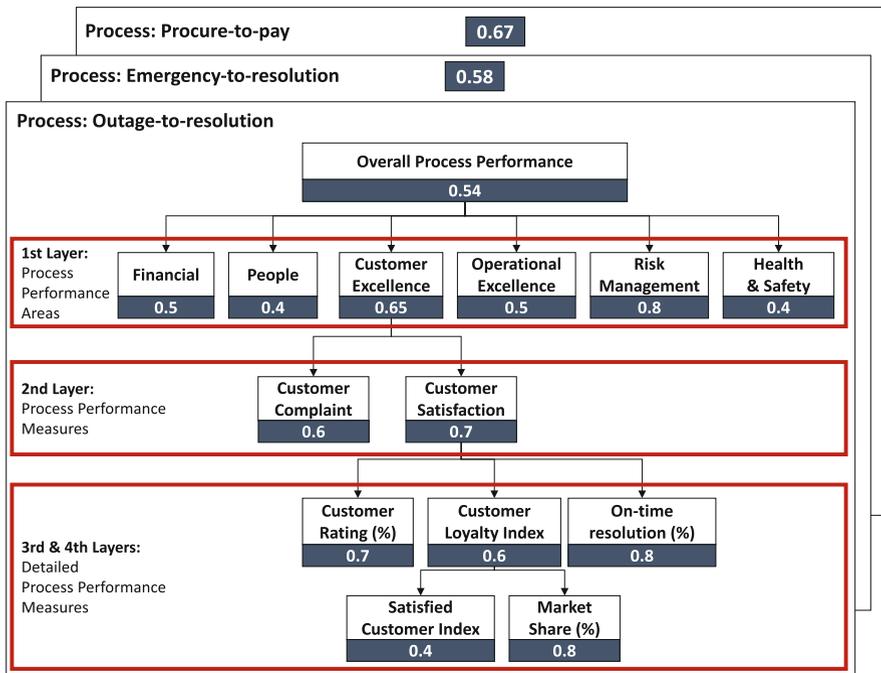

Fig. 2.10 Example of balanced scorecards with the cascading definition and measurement of various process performance measures

2.3.3   Process Portfolio

The term *process portfolio* refers to the set of all processes in general, and more specifically to their visualization by the help of different criteria. Process selection builds on the three criteria of importance, health, and feasibility. The strategic importance of each process can be assessed by senior managers in reference to the organization's strategy. Health can be quantified by calculating the difference between the objectives and actual values for the major process performance measures of each process. Feasibility requires an assessment by the process owner. In this way, we get numeric values for each of the three criteria for each process, such that the process portfolio can be plotted as shown in Figure 2.11.

Process selection should prioritize processes in the left upper quadrant, but also take feasibility into account. A detailed business case might further substantiate the feasibility assessment. Not too many processes should be selected for improvement for two reasons. First, as discussed, the temporal and financial resources of improvement teams are typically limited. Second, having too many improvement projects running leads to complexity of coordination, since processes are often interrelated. Davenport also suggests not to tackle for first the process that is the most strategically important and the least healthy, because you will have high chances of failure. Rather, we should start with a small number of projects and learn from these. Accordingly, with reference to Figure 2.11, if this was our first BPM project, the natural candidate for selection would be the process for handling payments.

Exercise 2.10 A university defined four core processes in relation to teaching. An evaluation of strategic importance, health, and feasibility using a survey among the department chairs has resulted in the following assessment:
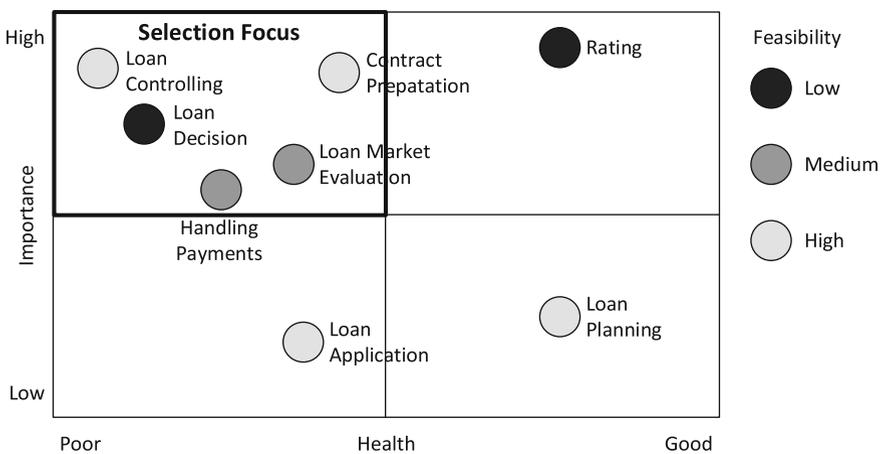

Fig. 2.11 Process portfolio of a financial institution

- Develop and Manage Study Programs: Importance 90%, Health 90%, Feasibility 40%.
- Market Study Programs: Importance 75%, Health 80%, Feasibility 60%.
- Schedule Courses: Importance 95%, Health 30%, Feasibility 50%.
- Deliver Courses: Importance 95%, Health 70%, Feasibility 30%.
- Manage Student Services: Importance 85%, Health 50%, Feasibility 40%.
- Manage Facilities: Importance 40%, Health 35%, Feasibility 70%.

Draw a process portfolio and suggest one process to be selected for process improvement. Justify your choice.

We have already emphasized that it is not feasible to have too many BPM projects at the same time, and that a BPM initiative should try to create success stories in the beginning. What is *really* happening in some organizations is that widespread efforts are made to at least *model* all important business processes at an abstract level, delaying the decision to make the step to more advanced BPM efforts (e.g., process redesign or automation). The idea is that process models are a cornerstone of any further BPM effort in any case and that their existence will help us to better understand where improvements can be gained. Creating a model of a process leads to the valuable insight of how that process works at all, and can provide a good basis for small improvements that can easily be implemented. On the downside, such an approach bears the risk that major improvements are missed and stakeholders create a feeling of a lack of return for the efforts. It should be stressed here, too, that the actual modeling of business processes is not an element of the process identification stage. Also, making a specific process subject to discovery, but not further through to analysis and redesign, will not provide improvements of the process and, therefore, it will fail to deliver the benefits that BPM promises.

2.4   Recap

In this chapter, we discussed the process identification phase of the BPM lifecycle. First, we distinguished the two steps of process architecture definition and process selection. The step of process architecture definition aims at enumerating the major processes within an organization, as well as determining the boundaries between those processes. An insight into the major processes that are carried out in an organization is important before setting up any BPM activity.

A process architecture defines the relationship between the different processes. Often, different levels of detail are distinguished. We discussed a seven-step method for the definition of a process architecture including the process landscape model.

The step of process selection is concerned with prioritizing processes before conducting discovery, analysis, and redesign. It is a good practice to base priorities upon the importance of processes, their health, and the feasibility of improvements. These three criteria can be assessed by process owners or they can be grounded on process performance measures and objectives. The most common performance

dimensions are time, cost, quality, and flexibility. Process portfolios help in the selection of processes for improvement by visualizing the most important criteria for improvement. Those processes that have been selected become the subject of the remaining phases of the BPM lifecycle.

2.5   Solutions to Exercises

Solution 2.1   The procure-to-pay process belongs to the operations management processes. The way it is organized has an impact on the customer perspective. If it is not working well, this causes problems with availability and quality. Customers might be less willing to pay a high price and to extend the partnership. Altogether, these problems would also translate into a bad brand image. The procure-to-pay process is influenced by how well the process owner takes leadership of the management responsibility and how well the process is aligned with strategic goals. Problems are less likely to occur if there is good teamwork of the process participants and a general organization culture of getting problems solved.

Solution 2.2   In the organizational perspective, the process builds on the three roles site engineer, office clerk, and works engineer. Organization charts can be used to describe to which departments they belong. The product perspective captures which products and services BuildIT provides. These can be various types of construction work. A service catalog can be used to specify these services systematically. Different data fields are used to process a request between the different roles involved, such as "available" or "approved". A data model can be used to define the elements of the data perspective. The application landscape of BuildIT includes an email system and a financial information system. The overall application landscape can be described using an application model. The technical infrastructure encompasses the computer hardware and the construction machinery of BuildIT. It can be described using an infrastructure model.

Solution 2.3   The management processes of a university relate to vision and strategy. The core processes are typically centered around research and teaching. Regarding research, there are processes in place for producing research results and potentially for commercializing research results. Regarding teaching, there are processes for managing the study programs, for scheduling courses each semester, for managing student enrollments in courses, and many other processes covering the entire lifecycle of a student. There are also support processes for personnel administration, information technology management, and infrastructure management.

Solution 2.4   Organizations wish to accomplish certain *goals*. Processes are a means to achieve these goals. A relation that, therefore, may be important is how processes are related to one another in the sense that they contribute to the same or related goals. Other, context-specific relations may be important for organizations

as well. Consider how it may be important for an organization to know on which *technologies* their processes are based; if a particular technology becomes obsolete, such an organization knows which processes are affected. A similar line of reasoning can be taken for geographic areas, regulations, etc.

Solution 2.5 In general, all of the Level 1 categories of APQC's Process Classification Framework are relevant. Categories 1–3 and 13 are related to BuildIT's management processes. BuildIT's construction operations relate to categories 4–6; however, they might be too generic to capture the construction business. Categories 7–12 refer to support processes of BuildIT. Although BuildIT tries to minimize ownership of construction machinery, they still need to manage and handle these assets, which is related to category 10.

Solution 2.6 We use the seven steps of designing a process landscape model.

1. Clarify terminology: We make use of APQC where possible.
2. Identify end-to-end processes: We refine the APQC Categories 4–6 as follows: Deliver Research Outcomes, Deliver Teaching Services, Manage Student Services.
3. For each end-to-end process, identify its sequential processes:

   - Deliver Research Outcomes: We identify the sequential business processes using the product lifecycle. These are Plan Research, Conduct Research, Report Research.
   - Deliver Teaching Services: We take inspiration from the supply chain phases. The processes are Prepare Materials, Deliver Course, Grade Students, Check Quality.
   - Manage Student Services: We consider the customer relationship. The sequence is Generate Leads, Grant Admission, Collect Credits, Graduate.

4. For each business process, identify its major management and support processes: Management processes are Develop Vision and Strategy, Develop and Manage Study Programs, Market and Sell Study Programs, and Manage Business Capabilities. Support processes are Manage Human Capital, Manage IT, Manage Financial Resources, Manage Assets, Manage Risk and Compliance, and Manage External Relationships.
5. Decompose and specialize business processes: The core processes should be further decomposed.
6. Compile process profiles: All processes should be described with a profile.
7. Check completeness and consistency: All major departments must be represented.

Solution 2.7 Explain how the trade-off between impact and manageability works out for broad and narrow processes, respectively. A broad process has by definition a large scope. Managing it actively can potentially have a large impact on an organization's performance. The flip side is that it is more difficult to actively manage such a broad process and the improvement projects that are related to it. For a narrow process, this is exactly the other way around: given its smaller scope, it is

more easily managed but it will probably have a lesser impact on an organization's performance as a whole.

Solution 2.8 The procure-to-pay process of BuildIT has an internal customer, and is therefore of secondary importance. The description in Chapter 1 points to several problems, but it is also explicitly defined who does what. Therefore, we can rate its health as medium. An improvement seems feasible, because there is only a small number of process participants involved.

The admission process is of major importance, because it is the process that brings students into the university. The description in Chapter 1 points to several problems, but it is also explicitly defined who does what. An improvement is more difficult to achieve, because there are many parties involved at different stages.

Solution 2.9   There are at least two business processes that need improvement: the quote-to-booking process—which starts from the moment a quote is received to the moment that a booking is made—and the process for modifying bookings.

The quote-to-book process needs to be improved with respect to cycle time, and with respect to error rate. The booking modification process needs improvement with respect to error rate.

Solution 2.10   The process portfolio can be plotted as shown in Figure 2.12. It is recommended to select the Schedule Courses process for improvement.
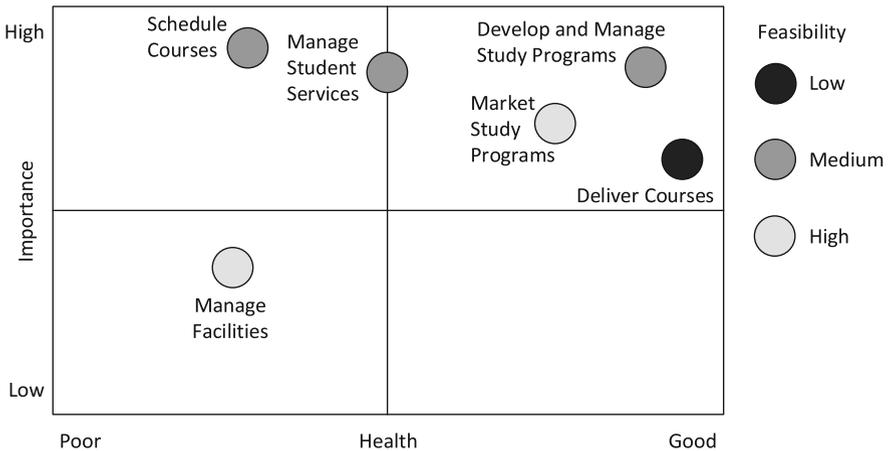

Fig. 2.12 Process portfolio of a university

2.6   Further Exercises

Exercise 2.11 Consider the university and its admission process that is described on page 5. To which category of processes in the internal perspective of Figure 2.1 does it belong? How does it influence different aspects of the customer perspective, how is it shaped by aspects of the learning and growth perspective?

Exercise 2.12 Consider the following organization.

> The University of West Holland provides education and services to its students. This starts with admission of students to the university. When regular students, i.e., students who come from a Dutch high-school, send in their admission form, they are registered by the admissions office. Subsequently, their eligibility to study in a certain program is checked based on the information that the student provided on the admission form. For students who arrive from another school, such as a polytechnic, the previous study that the student took, according to his admission form, must be examined in detail. Polytechnic students can either come to the university after completing 1 year of courses (propedeuse) or after receiving a polytechnic diploma. Students from universities in other countries are also accepted. Also for them, the studies that they took previously must be examined in detail. When students are considered eligible and the courses that they have already followed (if applicable) check out, they are enrolled at the university, which involves sending a letter that they are accepted and entering the details of their enrollment in the information system of the university. Once enrolled, the students eventually start their respective study program, e.g., law, medicine, or industrial engineering.
>
> After the students are enrolled, they can take courses or do projects and they can use the services that are provided by the university, which include: language training and sports facilities. Projects are done on an individual basis by a student together with a lecturer. The university recognizes part-time students who do their studies while they are working in a company. These students typically do projects of a more practical nature, and hence the processes for monitoring the progress of these students are not the same as the processes for monitoring the progress of regular students.

Design a process architecture as follows:

1. Identify the end-to-end processes that should appear in the process landscape model,
2. Identify the business processes of each end-to-end process,
3. For each business process, identify its major management and support processes.

Exercise 2.13 Consider the following organization.

> A consultancy firm provides consultancy, outsourcing and interim management services. The firm considers acquisition of projects as part of those services. Acquisition can be done both for existing clients and for new clients, because it concerns acquisition of projects rather than clients. Acquisition is typically started at 'networking events' by partners of the consultancy firm. It is handled according to a fixed procedure, but no standard document is used. When a client shows interest in a consultancy service, an intake is done with the client. To maintain a long-term relationship with clients as much as possible, the firm will always try to establish a framework contract with new clients during the intake. For existing clients a framework contract does not have to be established. As another form of relationship management, regular meetings are held with existing clients. During these meetings the client's organization is discussed with the client. This enables the client to decide whether additional work should be done to further improve the organization. At the same time this

enables the firm to bring in additional assignments. The intake and the regular meetings happen according to the same form, on which an inventory of the client's wishes can be made.

For consultancy and outsourcing services, a project team must be created directly after a project assignment was given to the consultancy firm. After a project team is created, there is a kick-off meeting with the client and after the kick-off meeting, the project is executed. The kick-off meeting is the same for each type of project, but the way in which the project is executed differs largely per type of service. At the end of the project there always is an evaluation meeting with the client as a means of quality control. The creation of the project team, the kick-off meeting, the execution of the project and the evaluation of the project happen according to a project plan.

The consultancy company has a services department, which takes care of market research for the consultants, manages the leasing of cars and provides secretarial services.

Design a process architecture as follows:

1. Identify the end-to-end processes that should appear in the process landscape model,
2. Identify the business processes of each end-to-end process,
3. For each business process, identify its major management and support processes.

Exercise 2.14 Consider the following organization.

RentIT is an equipment rental company providing a wide range of construction equipment on demand, all the way from minor equipment items such as water pumps and drillers, to major equipment such as bulldozers, crawl dozers and cranes.

RentIT receives orders mainly from construction companies, with which it maintains long-term relations. To maintain these relations, sales representatives meet periodically with existing customers to understand their upcoming demand for construction equipment, to find ways of better satisfying their needs, and to negotiate special deals and discounts.

The main process at RentIT is the order-to-cash process, which starts when a new Purchase Order (PO) is received via its information system. The PO specifies the equipment to be rented and the rental period, among other details.

When a Purchase Order (PO) is received, a sales representative at RentIT checks the PO and the availability of the equipment requested in the PO. This may lead to one of three outcomes: (i) the PO is accepted; (ii) the PO is rejected and accordingly the customer is informed and the case is closed; or (iii) a question is sent to the customer. In the latter case, the customer should provide a response within 3 days. If the customer does not respond within this time, a reminder is sent by RentIT's information system, and if the customer has not responded 3 days after the reminder, the PO is canceled. When a customer responds to a question, the sales rep can accept the PO, reject it, or ask another question to the customer; in this latter case, the above 3-day delays for sending reminders and for canceling the PO are applied again.

Once the PO has been accepted, RentIT's information system marks the corresponding equipment item(s) as busy for the duration of the rental. The system also automatically schedules the delivery and pick-up of the equipment from/to the warehouse where the equipment is located. Deliveries and pick-ups are outsourced to an external logistics company.

A customer can send a request to cancel a PO, in which case the equipment is freed up and the delivery is canceled. A cancelation request must be received before the equipment is dispatched from RentIT's warehouse. Once the equipment has been dispatched (i.e., it has left RentIT's warehouse), it is no longer possible to accept the customer's cancelation request.

On the due date, the logistics company picks up the equipment from RentIT's warehouse and delivers it to the construction site. At the site, an engineer of the construction company (called a site engineer) checks the equipment together with the logistics agent. In general the delivery is accepted. Occasionally though, the site engineer rejects the delivery. There can be two reasons for rejection: (i) because of an error of the customer or because the customer changed its mind; or (ii) because of a defect in the delivered equipment or an error attributable to RentIT. In the former case, an invoice equivalent to the cost of 1 day of rental is sent to the customer and the payment procedure described below takes place. In the latter case, the sales rep is alerted by RentIT's information system. The sales rep contacts the customer immediately to negotiate an alternative arrangement. This may lead either to cancelling the PO, or scheduling a new delivery as soon as possible.

Normally, the equipment is picked up on the end date indicated in the PO. It may happen however that the customer asks for an extension to the deadline by sending an updated purchase order (also known as a PO update). When a PO update asking for a deadline extension request is received, the sales rep checks if it is possible to grant the extension. If so, the deadline extension is recorded in RentIT's information system. If an extension is not possible, the deadline remains unchanged. In both cases, the customer is informed.

Once the equipment has been picked up, RentIT issues an invoice for the amount indicated in the latest version of the PO. Invoices should be paid 14 days after they are issued. If payment has not been received within this time, a payment reminder is sent to the customer. If no payment has been received 14 days after the invoice was sent, the invoice is put on debt collection.

It may happen that the customer disagrees with an invoice. In this case, the sales rep contacts the customer, and amends the invoice if required. This leads to an amended invoice being issued. The customer has 14 days to pay after an amended invoice is issued (after which the same process as above for payment reminder and putting into debt collection is followed).

When an invoice falls into debt collection, the sales rep tries to negotiate a special repayment agreement with the customer. Generally, this leads to a repayment within a few weeks. In very extreme cases where the debt is still outstanding after two months of the invoice due date, the invoice is sold to a debt collection agency. The equipment that RentIT holds is stored in one of several warehouses. Every piece of equipment undergoes periodic maintenance. When an equipment is due for maintenance, a repairs and maintenance supplier comes to pick it up (there are several such service suppliers for different types of equipment). The same supplier delivers the equipment once the maintenance is completed. The same applies when a piece of equipment breaks. In some cases, the equipment breaks while it is located at a customer's premises. In this case, the repairs service supplier picks up the broken equipment from the customer's site, or in some cases, it performs an on-site repair. If the equipment becomes unavailable while it is in use by a customer, the sales rep dispatches an alternative piece of equipment to the customer site. If this is not possible, the original purchase order is updated accordingly, in such a way that the customer is only billed for the days the equipment was in use. The sales rep might apply a special discount in case an equipment breaks while in use.

RentIT needs to handle inbound invoices from repair service providers and logistics providers in addition to invoices arising from indirect procurement. RentIT also needs to make recurrent payments for equipment leasing. In order to optimize cash flow, RentIT does not actually own the equipment it rents out but it rather sources it via equipment lessors. The Chief Financial Officer (CFO) and his team are responsible for strategic sourcing of equipment, which involves planning new equipment acquisitions, retirement of older or broken equipment and negotiation of terms with the equipment lessors. The CFO and his team are also responsible for financial planning and budgeting, financial monitoring, approval of major expenses, and compilation of the quarterly and annual financial reports. On the other hand, the team of the Chief Operations Officer (COO) oversees the management of the warehouses, human resources, IT systems, office facilities, and relations with logistics service providers and repairs and maintenance service suppliers.

Finally, the Sales and Marketing Director oversees all sales representatives, and together with her team, she oversees all activities related to marketing, acquisition of new customers, and strategic development of relations with the large customers.

Design a process architecture as follows:

1. Identify the end-to-end processes that should appear in the process landscape model,
2. Identify the business processes of each end-to-end process,
3. For each business process, identify its major management and support processes.

2.7 Further Readings

One of the first authors to shed light on the importance of process identification is Davenport [30], while a similar perspective is offered by Hammer & Champy [62]. Sharp & McDermott [161] give practical advice on exploring the process landscape. Another practical book covering process architecture design is that of Ould [124]. One of the questions left open by these books is to what extent it pays off to identify and delineate processes in a company-specific manner as opposed to adopting standardized reference models for this purpose.

Dijkman [38] provides a survey of popular process architecture approaches. One of the findings is that practitioners tend to apply a mix of styles to derive process architectures and that no single approach is followed systematically. Some research has been conducted in this area in recent years. The works by Frolov et al. [50] and Zur Muehlen et al. [198] emphasize the importance of a hierarchical process architecture. Malinova and Mendling investigate various approaches for high-level modeling of processes and propose an integrated meta-model for process landscape modeling [99]. The same authors find connections between process architecture design quality and BPM success [100]. Various empirical insights into the quality of process landscape models are presented in the PhD thesis of Malinova [97].

Different frameworks have been proposed for capturing the various perspectives of an enterprise architecture, including the previously mentioned TOGAF framework developed by the Open Group. This standardization body also provides a modeling language, namely ArchiMate,[9] to support the modeling of enterprise architectures according to TOGAF. An alternative framework is the Zachman Framework. Originally developed by Zachman in the eighties, this framework has evolved over time and is currently maintained by Zachman International.[10]

The concept of value chain—which generally appears at the top of a process architecture—was popularized by Porter [128]. Related and to some extent complementary to the concept of value chain is the organizational performance framework

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[9]https://publications.opengroup.org/c179.

[10]https://www.zachman.com/about-the-zachman-framework.

of Rummler & Brache [153]. In this framework, organizations are viewed as systems whose purpose is to produce value within a certain environment, which includes competitors, suppliers, capital markets, labor markets, regulations and other external factors. Rummler & Ramias [154] describe a variant of Rummler & Brache's framework, namely the Value Creation Hierarchy (VCH). In this framework, the system that transforms resources into products or services is called the Value Creation System (VCS). The VCS is decomposed into processing sub-systems, which in turn are decomposed into end-to-end processes and then into sub-processes, tasks and sub-tasks. The VCH thus provides a conceptual framework that goes all the way from the organizational context to the lowest level of a process architecture. Another important framework that uses value chain models is the Architecture of Integrated Information Systems (ARIS) proposed by Scheer [156]. Process models are at the center of it, complemented by different views including the organizational view, the functional view, the data view, and the product view.

The balanced scorecard concept was proposed by Kaplan & Norton in 1992 [73] and quickly gained popularity thereafter as a tool to define organizational strategy and performance measures. Harmon [65] argues that the traditional approach to apply the balanced scorecard leads to a bias towards functional units (i.e., performance measures are defined for company departments). To address this bias, he elaborates an approach to apply the balanced scorecard along the process architecture rather than the functional architecture. Fürstenau [51] gives a more detailed overview of approaches to process performance measurement all the way from the identification of performance measures using the balanced scorecard, to their implementation in the context of IT-enabled processes.