|  |
| --- |
| IUBH |
| Hybrid Project Management in Digital Transformation |
| DLMADTHPDT01 |

Learning Objectives

The **Hybrid Project Management in Digital Transformation** course starts by providing an overview of the tasks and challenges that arise during the project management of digital transformation projects. These projects ensure that the strategic goals relating to digital transformation in companies and organizations are implemented. To this end, these projects introduce digital technologies, digitalize processes, connect suppliers and customers, and refine products and services in such a way that new, innovative business models are created.

There are various project management philosophies within project management: traditional and agile approaches are often understood to stand in opposition to one another. Thus, hybrid approaches in project management aim to integrate the best of these traditional and agile approaches. Accordingly, this course presents project management norms and standards and provides foundational knowledge regarding traditional and agile project management. Possible combinations based on this are illustrated and their implications for organizational structures, project teams, leadership styles, and tools used are shown. Finally, the application of this knowledge is demonstrated using practical examples from various industries and with different thematic focuses.

Unit 1 – Project Management and Digitalization

Study Goals

On completion of this unit, you will be able to ...

... comprehend how the understanding of project management changed due to digital transformation.

... explain and apply the definition and classification of projects.

... recognize the distinction between project portfolio management, multi-project management, and program management.

... understand the *philosophies* and basic approaches of project management.

... recognize tried-and-trusted and new forms of project management that are used in digital transformation projects.

1. Project Management and Digitalization

Introduction

To benefit from the opportunities and capabilities of digital transformation, many companies and organizations define their digitalization strategy and set up digitalization programs, or establish their own digital units to function like start-ups. These are designed and implemented in the form of projects. Project organization makes it possible to develop new digital solutions efficiently across divisions and departments, and even across companies. As a result, projects are the way in which work will be performed in the future: digitalized organizations work with customer-centric products and services in a project-focused and team-oriented manner (Reinhardt 2020, p. 133). As a result, they are clearly different from traditional organizations with their work structures based on functions and departments.

Project teams assume a central role in the implementation of digital transformation. They must handle the special challenges that such transformation projects involve and make the project goals a reality, in alignment with the digitalization strategy (Feldmüller/Rieke 2019, p. 9). This unit addresses these challenges and presents basic project management terminology.

* 1. Change in the Understanding of Project Management due to Digital Transformation

Digital transformation is fundamentally changing our economy and society. According to Krcmar/Oswald (2018, p. 5), digital transformation processes are inescapable, irreversible, of tremendous speed, and subject to high instability during execution. Our modern world is often described with the acronym **VUCA**, i.e., as volatile, uncertain, complex, and ambiguous (cf. Bendel 2019). Organizations face the challenge of actively shaping these transformation processes, with their task being to harness the potential of new, innovative technologies for themselves and their customers. The resulting effects on processes, products, services, and revenue models are fundamental and complex (Schallmo/Reinhart/Kuntz 2018, p. 53; Kirchner/Lemke/Brenner 2018, p. 28f.).

**VUCA**

The acronym VUCA stands for V (volatility), U (uncertainty), C (complexity), A (ambiguity).

Digital transformation must be moved forward by a company’s leadership as a strategic task (Kreutzer/Neugebauer/Pattloch 2017, p. 43f.). Hess/Barthel (2017, p. 314) describe this as the management level of digital transformation. A **digitalization strategy**, aligned with the company strategy and company culture, depicts the individual roadmap. It describes how the potentials and challenges of digital transformation are handled in a company and establishes clear goals (Ross/Sebastian Ina M./Beath 2018, p. 3; Hess/Barthel 2017, p. 317). In so doing, it focuses on the transformation of products, processes, and business models that new digital technologies make possible, and, indeed, necessary (Matt/Hess/Benlian 2015, p. 339f.; Fleischmann et al. 2018, p. 10).

**Digitalization strategy**

A digitalization strategy establishes the direction and guard rails for the company’s digital transformation.

Digital Transformation Projects

Now, the task lies in shaping the necessary transformation of a company. The digitalization strategy is put into practice by means of strategic programs and digitalization projects. Responsibility for implementing the digital transformation, i.e., for actually changing products, processes, and business models, thus lies with the transformation projects (Hess 2019, p. 6f.; Berger 2018, p. 256–259).

What is understood by a digitalization project or a digital transformation project greatly depends on the underlying understanding of *digitalization* and *digital transformation* (cf. Homann-Vorderbrück/Sauer/Schröder 2018, p. 64). The following definition takes up the aspects considered thus far and understands it to mean projects “for the initial or improved use of digital technologies in a company’s processes, products, and services, in interaction with the company environment, and for the development of corresponding competencies within the company” (Zimmermann 2017, p. 3).

**IoT**

The Internet of Things, or IoT for short, extends the traditional internet by linking physical objects with the virtual world. It is used, e.g., in production environments.

Digital transformation projects are diverse (Hess 2019, p. 6f.). Some are tasked with developing new, digital (or digitally enhanced) products and services quickly and flexibly, while others develop new, disruptive business models and implement alternative revenue models (Schallmo/Reinhart/Kuntz 2018, p. 61f.). Further projects aim to digitalize business processes across a company’s entire value chain (Fleischmann et al. 2018, p. 10f.). Projects that lay the foundations for digital services, e.g., by establishing an infrastructure for **IoT** (Internet of Things) or preparing and networking the required data, are not to be overlooked, either (Schneider/Wisselink/Czarnecki 2018). Digital transformation projects are more than traditional IT or organizational development projects (Hess 2019, pp. 93–95).

Project Management Challenges

A number of challenges arise when planning projects for digital transformation that require new practices and, in some cases, different competencies on the part of project managers and project staff (Wysocki 2019, pp. 20–23). According to a study by Homann-Vorderbrück/Sauer/Schröder (2018, p. 67f.), these challenges encompass the following aspects:

* **Change:** digital transformation projects require changes in processes and company culture. This can lead to anxiety among employees.
* **Lack of know-how:** the tasks in digital transformation projects usually have a high degree of novelty and require corresponding technical and IT knowledge.
* **Integration:** digital transformation projects affect the entire company. Many stakeholders from a variety of disciplines need to be involved.
* **Dynamics:** the scope of projects and the digital technologies used change at high speed.
* **Data security:** when developing and introducing digital solutions, the data security aspect must be taken into account, particularly in accordance with the applicable laws.

The challenges of dynamics, novelty, and interdisciplinarity in digital transformation projects are discussed in greater detail in the following. How these challenges are addressed with new forms of project management is explained later in this unit, where particular focus is dedicated to the fact that the nature of collaboration and communication is changing.

**Dynamics**

Digital transformation projects are often highly dynamic, i.e., technologies and project-specific boundaries such as customer requirements are characterized by a high rate of change (Homann-Vorderbrück/Sauer/Schröder 2018, p. 68). Particularly in long-running projects, there is a great risk that the end result will no longer meet the customer’s expectations. Digital transformation projects must therefore take into account the fact that customer requirements and boundaries can change at short notice over the course of a project. This requires process models that manage these changes constructively—that even welcome change (Wysocki 2019, p. 21). All the while, there is intense time pressure to bring new products and services to market faster than the competition. Accordingly, project management must abandon all tasks that do not add value to the project result (Wysocki 2019, p. 20).

Openness to new ideas, self-reliance, flexibility, and agility are important traits. In addition, customers expect new features on an ongoing basis—and this applies to both digital and traditional products. For example, Tesla customers are used to features being added regularly as over-the-air updates. Modern approaches to project management have a strong customer focus to ensure that projects can quickly and continuously create new customer benefits.

**Novelty**

Digital transformation projects often feature a high degree of novelty due to disruptive technologies and business models. The status quo is fundamentally challenged, meaning that there is no example to follow. For projects, this means that requirements cannot be specified in advance. The starting point is thus a product vision that is defined step by step. Furthermore, organizations often face the challenge of having little experience with the continually advancing technologies that need to be used (Fuchs et al. 2019, p. 198, Homann-Vorderbrück/Sauer/Schröder 2018, p. 68). Knowledge and skills must be built from scratch.

This challenge is met with an experimental approach. This means that new technologies, methods, and organizational forms are tested in various application scenarios using prototypes or a *PoC* (proof of concept). For this purpose, a small but representative range of use cases is selected, with valuable feedback expected from these areas. For example, an app is first tested with pilot customers before being rolled out to other intended audiences.

**Interdisciplinarity and a Diversity of Stakeholders**

Digital transformation projects often affect a company’s entire value chain, resulting in cross-divisional or even cross-company projects. Alongside specialist departments, the IT department, and a digitalization unit, if available, are involved to impart specialist and technical knowledge to the project team (Hess 2019, p. 92–94). Furthermore, there are also external partners who take on individual subtasks. This means that digital transformation projects must ensure that many different people and stakeholders are sufficiently involved (Homann-Vorderbrück/Sauer/Schröder 2018, p. 68). Particular attention must also be paid to those who are critical of a change, e.g., for fear of being overwhelmed or losing their jobs (Falkenreck 2019, p. 14). Digital transformation projects therefore place high demands on communication and collaboration among those involved in a project (Falkenreck 2019, p. 20). When forming project teams, it is also important to ensure that the project members are enthusiastic about digitalization-related topics and curious about new trends and technologies, since they act as ambassadors for digital transformation within the company (Hess 2019, p. 96).

Self-Check Questions

1. How do digital transformation projects differ from pure IT projects or organizational development projects?

*Digital transformation projects are not isolated projects to solve a single, specific problem, such as the replacement of a legacy system in IT. They lead to changes on cultural, process, and technical levels. To be successful, people from a wide range of areas must be involved in the project and contribute their specific know-how. Setting up projects within a single organizational unit is, therefore, no longer sufficient.*

## 1.2 Terminology: Project and Project Management

DIN 69901–05 defines a project as an “undertaking that is significantly defined by the uniqueness of its conditions overall, i.e., its goal or time, financial or personnel and other limitations, delineation from other undertakings, or project-specific organization” (DIN e. V. 2009b). The PMBOK Guide also focuses on the aspect of uniqueness: a project is a “time-defined and limited undertaking with the goal of creating a unique product, service, or result” (PMI 2021, Part 2, p. 246). This distinguishes projects from routine tasks and repeatedly performed processes.

### Project Characteristics

Projects have a number of characteristics in common (see Patzak/Rattay 2018, p. 22). They are:

* **Novel:** projects work on novel tasks that involve a high degree of uncertainty and risk. In other words, they are not routine operations. Rather, the challenge is to find specific or innovative solutions.
* **Goal-oriented and limited:** projects are initiated with a specific intention. The project goals are developed on this basis. These define the desired state after successful project completion (factual and performance goals) and limit the project in terms of the time parameters (time goal) and the available resources, e.g., the budget and the number of project staff (resource goal). Together, these three dimensions are also referred to as the **magic triangle.** a.k.a. iron triangle.If one of the dimensions changes, this has an impact on the other two dimensions. The organizational and legal structures represent additional limitations. This includes specifications and standards that must be considered in addition to various stakeholder groups with their respective, possibly even conflicting interests in the project.

**Magic triangle**

The magic triangle in project management refers to the three target dimensions of time, quality, and cost.

* **Complex and dynamic:** the tasks handled in projects are usually characterized by a high level of complexity. The individual tasks have many interdependencies on each other and on the environment. They are also highly dynamic, meaning that content and interdependencies change frequently.
* **Interdisciplinary:** experts from different fields and with different qualifications across disciplines work together in projects. Everyone contributes their own special expertise.
* **Significant:** projects are subject to high expectations from various sides. Potential customers and clients expect directly usable results of high quality. Departments provide budget and project staff and thus commit resources. The economic success and acceptance of the project results are therefore of great significance to them. Project staff also see their opportunity to develop professionally and take on new tasks and responsibilities.

The time limitation plays a major role in the project character: Every project has a beginning and a planned end. Accordingly, Patzak/Rattay (2018, p. 22) refer to projects as *temporary enterprises*.

### Project Types

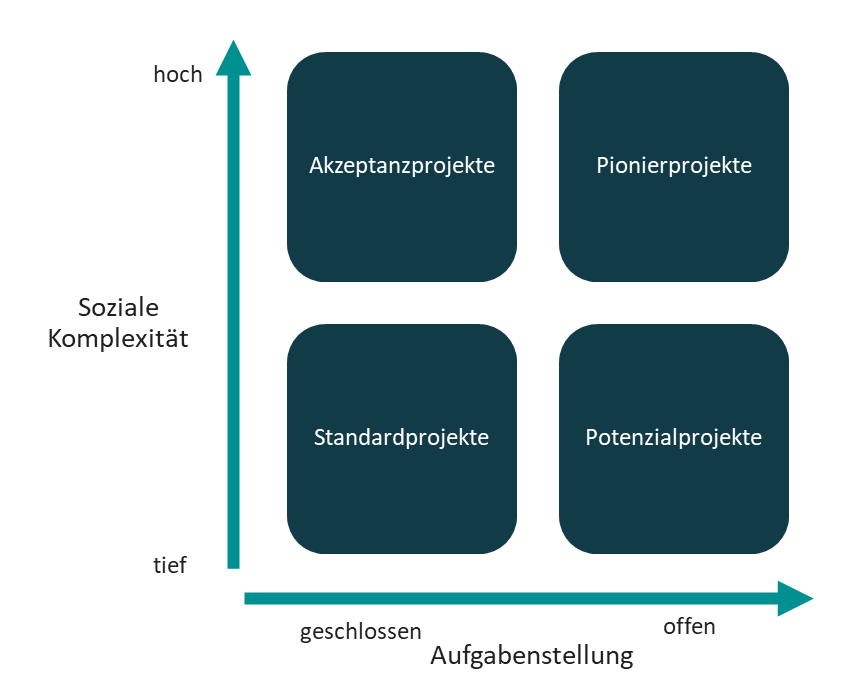
There are various approaches to classifying projects, e.g., according to their content, client (internal/external), risk, or the extent of structural and cultural change (Wysocki 2019, p. 17–20). In practice, it helps to systematically think through a new project according to such classification schemes in order to become aware of various aspects, which enables potential difficulties to already be explicitly considered during the planning and risk management of the project. Project procedures and methods can be chosen for particular purposes. In addition, the project team can be assembled in a targeted manner.

**Project risk**

According to DIN 69901-5:2009-01, a project risk is the probability that a specific, negative event will occur. Other definitions include opportunities in addition to risks (Romeike 2018, pp. 8-12).

Kuster et al. (2019, pp. 4–6) distinguish between four types of projects based on their task and social complexity. The four characteristics of projects differ significantly in their **project risk**. The task can either be closed, i.e., the task is clear and has limited solution options, or open-ended, i.e., the range of solutions is broad and allows for different methods and approaches. In each case, social complexity can be high or low. Interdisciplinary topics or those with great conflict potential and political explosiveness exhibit high social complexity. Themes with low social complexity are characterized by an unproblematic collaboration between fewer and homogeneous stakeholder groups. The combination results in what is known as the project types 4–field matrix, which is shown in the figure below:

Project Types 4–Field Matrix



Many companies have their own forms of such project classifications, e.g., in project classes A, B, and C. In addition, the project size and project costs usually play a significant role. According to the project types 4-field matrix, the following four project types are fundamentally distinguished between (Kuster et al. 2019, p. 4–6):

* **Standard project:** for standard projects, also called routine projects, there are proven, standardized procedures, since sufficient experience already exists. Such projects must be well structured and efficiently carried out There are often templates, checklists, etc. that the project team can use. Examples of standard projects include sales projects or advertising campaigns.
* **Acceptance project:** acceptance projects are characterized by their clear task definition combined with high social complexity. Here, information, communication, and meaningful involvement of stakeholders with their various interests are critical to success. Examples of acceptance projects are road construction projects, complex software projects, and the introduction of a new procedure for performance evaluation.
* **Potential project:** potential projects involve tasks with open-ended questions, but have a low risk because they (still) have a local effect and are not networked very well. Examples include feasibility studies or research projects.
* **Pioneering project:** pioneering projects generally lead to far-reaching changes. They affect many areas and are sometimes perceived as threatening because they challenge the status quo. Hardly any empirical values are available. Project risks are high and experienced project managers and change managers are needed here. Examples of pioneering projects are strategic realignments, mergers, or development projects such as for self-driving cars.

### Project Management

In the sense of a **management function, project management** is understood to mean the initiation, definition, planning, control, and completion of a project (DIN e. V. 2009b, p. 14). More generally, the PMBOK Guide defines project management as “the application of knowledge, skills, tools, and techniques to meet project activities” (PMI 2021, Part 2, p. 247). Professional project management contributes significantly to project success. It increases the likelihood that the project goals will be achieved in the required quality, by the agreed deadlines, and within the estimated costs. The management of a project includes the following aspects (PMI 2017b, p. 542):

**Project management**

Project management refers to all activities related to the organization, management, and control of a project.

**Management function**

The traditional five management functions according to Koontz and O’Donnell (1972) are planning, organizing, staffing, leading, and controlling.

* Identify and sharpen expectations and requirements for the project.
* **Stakeholder** management to identify and consider the needs of key stakeholders and identify potential conflicts at an early stage.

**Stakeholder**

Stakeholders are those individuals, groups, or organizations who are involved in the project or have an interest in the project or project results.

* Active communication with all stakeholders.
* Efficient use of available resources and utilization of existing synergies.
* Balance competing project limitations (content and scope, quality, deadlines, budget, resources, and risks).

### Self-Check Questions

1. Mark the correct answers.

* Projects are limited in terms of time and resources available. (T)
* Projects have a defined start date and a planned end date. (T)
* Projects are special assignments that are handled by one person. (F)
* Projects are characterized by the uniqueness of the conditions. (T)

1. What aspects and challenges must be considered in a pioneering project? Explain this using a specific project example.

*Pioneering projects are challenging in both dimensions: the project task is open-ended, and the social complexity is high. One example of such a project is the development of autonomously driven cars. The task is to develop a large number of functionalities that are new and interdependent in terms of subject matter and content. A wide variety of stakeholders must be involved and (partial) results must be communicated appropriately in a wide variety of forms—to experts as well as to the public.*

## 1.3 Project Portfolio, Multi-Project and Program Management

Companies do not typically only carry out one project at a time: rather, many projects are in progress simultaneously: of different sizes and complexity levels, in different departments, and on different levels. There are different methods for managing this high number of projects, such as project portfolio management, multi-project management, and program management. The goal is to select the right projects, group them into meaningful programs, and implement them through a consistent procedure so they make a clear contribution to realizing the organization’s strategy (Project Management Institute 2013, p. 4). According to Reinhardt (2020, p. 70), the *project patchwork* is one of the reasons for the failure of digital transformation projects in companies. This means that, although many digitalization projects are being carried out, they are not connected to each other. Silo thinking on the part of organizational units also leads to standalone solutions. This can be seen in practice, for example, when a company offers different, independent digital solutions for an intended audience that overlap in terms of functional scope, but differ greatly, e.g., in terms of user interface design. This leads to a lack of acceptance.

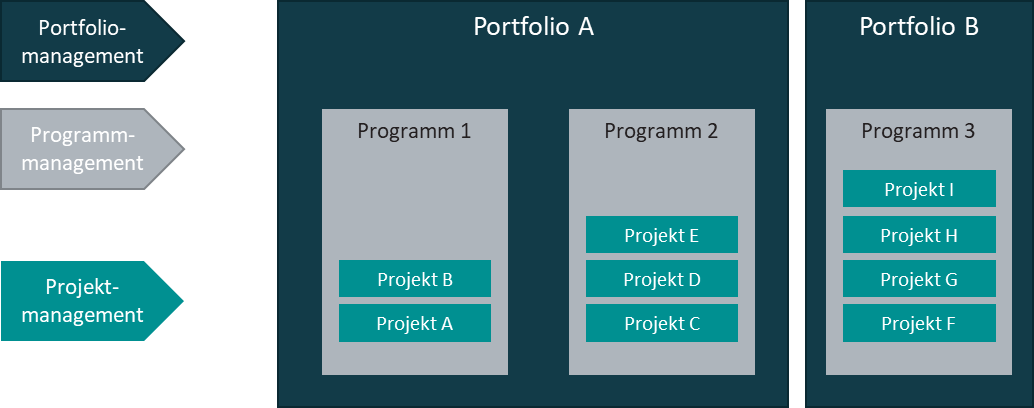
### Projects, Programs, and Portfolios

A program bundles together a number of individual projects as well as other tasks that pursue a common, overall goal (Association for Project Management 2019, p. 60; Patzak/Rattay 2018, p. 490f.). Projects within a program are often highly interdependent. As a result, they sometimes run in parallel and sometimes one by one. Like a project, a program is limited in time.

A project portfolio consists of several projects and/or programs that are jointly coordinated to thereby achieve the greatest possible benefit for the organization (Project Management Institute 2013, p. 3; Patzak/Rattay 2018, p. 489; Association for Project Management 2019, p. 62). To this end, the right projects and programs are selected from a strategic perspective (Buttrick 2020, p. 1f.). Operationally, the use of resources is optimized across all programs and projects (Buttrick 2020, p. 4). In contrast to individual projects, the project portfolio is not subject to a time limitation. Project portfolios often bundle together projects of the same type, e.g., all research and development projects or all IT projects (see Wagner 2016a, p. 4; Patzak/Rattay 2018, p. 489). These usually access the same resources or have the same clients. In principle, these are projects that are comparable with one another, i.e., key figures can be defined on the basis of which prioritization and monitoring can take place. Alternatively, a portfolio can also be formed to bundle together projects that are necessary to fulfill a specific company goal, e.g., comprehensive quality improvement in the company or specific goals in the context of digital transformation. For this purpose, process projects, investment projects, reorganization projects, personnel development projects, etc. are then considered collectively (Patzak/Rattay 2018, p. 490).

The figure below shows the relationship between projects, programs, and portfolios:

Projects, Programs, and Portfolios



### Project Portfolio Management and Multi-Project Management

**Project portfolio management**

Project portfolio management creates transparency regarding ongoing and planned projects and their status.

Just as the management of individual projects is necessary, the same need for program management and portfolio management also exists. In addition, there is the *multi-project management* concept. **Project portfolio management** includes all tasks for planning and prioritizing, approving, and controlling a project portfolio (cf. Scheuermann 2014, p. 3f.). The aim is to carry out the right projects correctly (cf. Buttrick 2020). In this process, one person or a body, e.g., a steering committee, is responsible for the management of the project portfolio. Central tasks are (cf. Zell 2017; Patzak/Rattay 2018; Wagner 2016b, p. 2f.; Kopmann et al. 2015, p. 33–36):

**Prioritization of programs and projects**

Prioritization is typically based on key figures such as strategic relevance, economic efficiency, and urgency.

* Generation and collection of project ideas for implementation within the portfolio.
* Evaluation and **prioritization of programs and projects** based on key figures in terms of their contribution to business success.
* Analysis of time and content interdependencies between projects and transparency regarding potential goal conflicts, e.g., if several projects are developing different solutions for the same customer group.
* Timing of individual projects, taking interdependencies into account.
* Efficient allocation of resources, taking priorities and interdependencies between projects into account.
* Monitoring and control of all programs and projects within the portfolio.
* Adaptation of projects, e.g., taking control measures when project or program goals are at risk or not met, up to and including their completion. Changes in the scope of other projects or their findings may also make it necessary to realign projects or programs.
* Evaluation of deliverables and project/program completions.
* Safeguarding of knowledge transfer between programs and projects and into the company.

#### Delineation

The terms *project portfolio management* and *multi-project management* are often equated with each other (cf. Kuster et al. 2019, p. 59). The term multi-project management is primarily found in German-speaking countries and is historically older. The German DIN standard, DIN 69909 Multi-project Management—Management of Project Portfolios, Programs and Projects, uses *multi-project management* as an umbrella term for the management of project portfolios, programs, and projects. International standards such as the PMBOK do not make a distinction and generally use the term *project portfolio management* (see Project Management Institute 2013; Association for Project Management 2019). Therefore, the term *project portfolio management* is used in the following.

### Program Management

Program management refers to the planning, management, and control of a program, i.e., a set of projects and tasks with a common, overarching goal (Project Management Institute 2013, p. 11). The program manager has overall responsibility for a program and thus for achieving the agreed program goals. They must maintain an overall view of the program. In turn, the individual projects within the program are the responsibility of project managers. A program manager has the following tasks (cf. Patzak/Rattay 2018, p. 500f.):

* Agree on communication, decision-making, and escalation rules, e.g., for communicating regular status reports from projects.
* Establish a program organization for efficient communication and collaboration.
* Manage the multiple interdependencies between projects in terms of content and time.
* Monitor the status and progress of individual projects and the program as a whole.
* Communicate with clients and report on program status.
* Program risk management.
* Design knowledge sharing within the program.

### Self-Check Questions

1. Complete the following sentence:

The aim of project portfolio management is to select and manage the *projects and programs* that best contribute to securing *business success* inthe medium or long term. One of the most important tasks is to *prioritize* projects and programs among themselves. To this end, all reported projects are evaluated on the basis of agreed *key figures*. This provides the basis for optimizing the *utilization of resources* across the entire portfolio.

1. Mark the correct answers.

* Common communication structures are agreed upon within a program. (T)
* Together with the project managers, the program manager is responsible for the successful execution of the program. (T)
* A program has no end date. It represents a continuous task. (F)
* Projects within a program share common goals and strategies. (T)

## 1.4 Project Management Philosophies: Traditional, Agile, and Hybrid

Different project management philosophies have emerged over the years. Each pursues its own ideas and approaches as to how a project is carried out successfully. After years of discussion about which approach is better, different approaches are now deliberately combined in practice (Komus 2017). This procedure is referred to as hybrid project management (cf. Timinger 2017, p. 241; Kuster et al. 2019, p. 18).

Even when advocates of one or the other project management philosophy present it as better, there is no one right approach: each approach has its advantages and disadvantages. Therefore, the appropriate approach must be selected for each project and, if necessary, approaches must be cleverly combined. Factors such as project type, project size, complexity, and novelty as well as other boundaries play a decisive role (Boehm/Turner 2003; Stacey/Mowles 2016; Wysocki 2019, p. 18).

### Traditional versus Agile Project Management—an Insurmountable Opposition?

The terms *classic* and *traditional* project management are frequently used as a contrast to agile project management.

#### Traditional project management: from the requirements specification to the finished product

A characteristic of traditional project management is that projects are carried out in defined and clearly delineated phases (Wysocki 2019, p. 42–45; Madauss 2020, p. 107; Alam/Gühl 2020, p. 65; Kuster et al. 2019, p. 22f.). The next phase is not started until the current phase is completed. The starting point is a **requirements specification**, which specifies the requirements, and a **functional specification,** which shows how the contractor plans to implement the requirements specification (Patzak/Rattay 2018, p. 91; Alam/Gühl 2020, p. 79–82). The requirements specification and functional specification serve as the basis for the contract and must be available before implementation starts. This is the basis for implementation. The customer is not involved in this: they only receive the agreed deliverable. Each phase is monitored and controlled in such a way that costs, time, and agreed scopes are adhered to as far as possible. This procedure has its disadvantages when requirements for the end product change during the project progression—which is often the case, particularly in digital transformation projects. Reverting to earlier phases jeopardizes the schedule and budget (Wysocki 2019, p. 42). Late change requests are expensive. In addition, traditional approaches reach their limits when the end product cannot yet be clearly specified at the start of the project (Wysocki 2019, p. 40). Traditional project management approaches have proven to be too rigid for these types of projects: they have earned a reputation for being outdated and no longer able to meet the requirements of modern software and product development (Walg/Kalvelage 2019; Cesarotti/Gubinelli/Introna 2019, p. 2). Agile project management has addressed these precise disadvantages.

**Requirements specification**

The specifications contain the requirements of the customer for the product to be developed or, more generally speaking, for the delivery result.

**Functional Specification**

The specifications describe the services that the supplier offers to fulfill the scope of the requirements specification.

Despite these disadvantages, there are many proven methods and mechanisms in traditional project management, particularly for keeping to schedule and budget. Examples include stakeholder management (Holloway/Bryde/Joby 2015), risk management (Rohrschneider 2006), and quality management (Zell 2017, p. 72–85), as well as methods for tracking project progress (PMI 2017b, p. 226–228; PMI 2017b, p. 260–268; Timinger 2017, p. 105–111; Madauss 2020, p. 346–350). Agile approaches also benefit from these.

#### Agile project management

Agile practices have a long history, with their approaches and concepts going back to the 1940s (Measey et al. 2015, p. 2). With the publication of the Agile Manifesto in 2001, a common understanding was created based on the defined agile values and principles (Beck et al. 2001a). In software development, agile practices are considered the means of choice when the end product cannot be precisely specified in advance or frequent and unforeseen changes are to be expected, in other words, when rapid responses to changing conditions are required. Well-known agile approaches include scrum (Schwaber/Sutherland 2020), kanban (Leopold/Kaltenecker 2018), and Extreme Programming (XP) (Beck/Andres 2004).

Agile practices are characterized by the fact that functioning (partial) products are developed in short cycles (Stellman/Greene 2015, p. 56; Preußig 2018, p. 45–50). In the agile practice of Scrum, this iteration usually takes two to four weeks. Each iteration focuses on specific goals and implements the scopes that offer the most added value to the customer. The result of each iteration is provided to the client and their feedback flows directly into the next iteration. The client is closely involved. As a result, new or changed requirements can be incorporated promptly.

Agile project management promotes open and direct communication within the project team, as well as with the customer and clients. Regular meetings are held to exchange information, such as a daily stand-up meeting (Measey et al. 2015, p. 75f.), or to review project results (Viscardi 2013, p. 113–126). A high level of transparency is continuously created with regard to completed and pending tasks. For example, kanban or task boards are used for this purpose (Preußig 2018, p. 76). In addition, agile approaches promote learning from experience, e.g., by regularly conducting retrospectives (Derby/Larsen 2006; Löffler 2014).

### Hybrid Project Management—the Best of Both Worlds?

The aspiration of hybrid project management is to combine the strengths of traditional and agile approaches (Kuster et al. 2019, p. 28f.). Other definitions see hybrid project management more broadly and include any combination of different approaches, i.e., agile-agile, traditional-traditional, and agile-traditional (cf. Timinger 2017, 242ff).

There are various ways to apply agile and traditional practices and methods simultaneously or to combine them cleverly (Timinger 2017, p. 246). For example, selected project phases or subprojects are handled differently. For instance, in a project to develop a new digital service, the first phase is agile because the requirements and the features to be developed are still unclear. A later phase, in which the digital service is specifically extended to include certain functionalities or is transferred to a further area of application, proceeds traditionally. Another option is to integrate agile methods and techniques into traditional process models. For example, daily **stand-up meetings** are taken from Scrum to plan and coordinate tasks for the next working day (Preußig 2018, p. 104f.). **Kanban boards** are also very popular (Preußig 2018, p. 94f.; Measey et al. 2015, p. 83f.). They visualize the pending and currently implemented tasks and thus facilitate coordination and the steady processing of tasks.

**Stand-up meeting**

A stand-up is a short, typically 15-minute meeting conducted while participants stand. This is to ensure that everyone is brief.

**Kanban board**

Kanban boards are used in agile projects to structure tasks and visualize the work that needs to be done on a daily basis.

Projects must be selected and integrated in a targeted manner for them to actually benefit from the combination of agile and traditional methods. This places high demands on the project manager, who must master the individual techniques and be able to assess their areas of application well (PMI 2017a, p. 119–121). They must also be able to smoothly switch between the different roles, the associated tasks, and the underlying understanding of leadership.

### Self-Check Questions

1. On what understanding is traditional project management based?

*Traditional project management assumes that the end result is described in concrete terms at the start of the project. To achieve this end result, a sequence of project phases is defined. Results, delivery dates, costs, and required resources are also defined at the start of the project. Changes during the process of the project are to be avoided, e.g., the consideration of new requirements, since they require reversions to phases already completed, which is time-consuming and costly.*

1. How would you rate the statement “Agile project management is more suitable for digitalization projects than traditional project management”?

*Neither agile nor traditional project management is better across the board. Many traditional project management methods have proven their worth. It is suitable if the result and its characteristics can be described in concrete terms before implementation begins, or even if project steps are to be implemented in a fixed sequence. Agile project management is advantageous if the project and the environment are highly dynamic. In development cycles, a potentially usable (partial) product is created in each case. In the development of an app, an initial function range can thus be made available early. New features are added successively. In order to benefit from the advantages of both approaches, traditional and agile project management are combined in practice to form what is known as hybrid project management.*

## 1.5 New Forms of Project Management in Digital Transformation Projects

Digitalization is not only affecting the number and type of projects, but is also changing project management itself, i.e., the way in which project managers and project teams carry out their work. The forms of organization and collaboration described below can be found in many digital transformation projects.

### New Forms of Communication and Collaboration

In addition to traditional **project management software** (GPM 2019, p. 277f.), which has supported the planning, control, and monitoring of projects and project portfolios for over 30 years, new, intuitively usable tools have become established in recent years. Typically, all the people involved in the project use these tools (GPM 2019, p. 279) and thus embody agile values and principles in everyday project work. Task management software, for example, supports project teams with working in a self-organized manner by allowing tasks to be defined, categorized, prioritized, and assigned to people for processing. The function range includes visualizations of the pending tasks, e.g., on a timeline or as kanban boards (Capterra n.d.; Albers 2016). Reports and evaluations show the processing time or the processed tasks in tabular and graphical form, for example. Many of these functionalities can now also be found in historically older tools.

**Project management software**

Traditional project management software offers a variety of functionalities for task, resource, and budget planning, as well as for monitoring project progress.

Communication platforms with functions such as (team) chats, forums, or comment functions offer new opportunities for personal communication and collaboration within the team and with customers (GPM 2019, p. 286f.; Klötzer/Hardwig/Boos 2017, p. 294; Flößer 2014). Information can be exchanged more quickly and in a more targeted manner. Teams that do not work together on one single site particularly benefit from this. This type of collaboration can even replace emails entirely. Young project teams especially appreciate the simple and straightforward way of staying in contact (Flößer 2014, p. 6).

In addition, these tools bundle together all project information in one place (Flößer 2014, p. 2). Notes from meetings are also stored or linked directly. This means that every team member has access to the current status, regardless of where they are currently working. In addition, modern project management software is networked with other systems, such as those for requirements management, ERP systems, and office applications. Due to the ever-increasing amount of data and information, the challenge of separating the insignificant and the transient/brief from the important increases.

### New and Changed Roles in Project Management

With the challenges of digital transformation projects, the requirements for the project manager, their role in the project and with the customer are changing in diverse ways. Digital tools simplify many tasks traditionally fulfilled by the project manager, such as time and resource planning, or even automate them completely. At the same time, new demands on the project manager are coming into focus. According to the study by Feldmüller/Rieke (2019, p. 14), digitalization is changing the requirements regarding the competencies of teamwork and personal communication, in particular. For example, in order to select the right digital tools for communication and collaboration for a project, project managers today must themselves be familiar with these tools and feel comfortable with using them (Creusen/Hackl/Gall 2017, p. 56). However, digital tools can only support communication—they do not solve problems on their own or prevent conflicts. Furthermore, it is important to communicate the project goals clearly and comprehensibly, to discuss solutions together, and to give each other appreciative feedback. The project manager is the role model for how digital tools are used in a project.

### A Changed Understanding of Leadership

New project management methods change the understanding of *leadership*. Leadership means more than the project manager distributing the tasks at hand to the employees and monitoring the work performed. Successful leadership involves focusing the project team on the project goals, inspiring them to take on the task, and supporting them where necessary (Sterrer 2014, p. 124). Feldmüller/Rieke (2019, p. 23f.) recognize the following challenges toward which project managers must align their leadership style:

* Teams are now often spread across various national and international locations, as well as in home offices or, generally speaking, *remotely*.
* In addition to internal colleagues, external project staff are often involved.
* Some employees work part-time or on several projects and expect to be able to work at times they choose themselves, e.g., in the evenings or on weekends. The approaches used have changed. New methods such as **design thinking** have become popular. Agile approaches are widespread beyond the area of software development and are efficiently combined with traditional approaches in hybrid project management.

**Design thinking**

Design thinking refers to a systematic, customer-oriented, and iterative approach to solving complex problems.

### Self-Organized Teams

The changed understanding of leadership and the new boundaries are accompanied by the fact that responsibility distribution is decentralized. One principle in the Agile Manifesto refers to this aspect: “The best architectures, requirements, and designs emerge from self-organized teams.” (Beck et al. 2001c, n.d.). This means that responsibility shifts from individuals, such as the project manager, to teams (Preußig 2018, p. 61). Scrum even dispenses with the role of the project manager. In digital transformation projects, a strictly hierarchical leadership style is therefore no longer required. Rather, leadership must create the boundaries for project teams to be able to work in a self-organized manner and for them to be equipped with the necessary decision-making authority so they can react quickly and flexibly to changes (Hess 2019, p. 96; Grab/Olaru 2021, p. 142f.). The project manager supports the project team in the role of coach and mentor.

### Collaboration with the Customer

In digital transformation projects, it is the rule and not the exception that customer needs change. This requires more intensive collaboration with the customer than has typically been the case in the past. Agile values explicitly emphasize the importance of collaboration with the customer (Beck et al. 2001a). The earlier and more intensively that a future customer is integrated, the lower the risk that the deliverable will not benefit the customer, will not solve their problems, and will therefore not be accepted (Reinhardt 2020, p. 166f.). As an example, workshops can be held with customers. Ideas and requirements are taken up directly and incorporated into the **product vision** and project goals (Pichler 2013a, p. 34).

**Product vision**

The product vision describes the common, overarching goal to be achieved with the product to be created.

Intensive communication should be maintained as the project progresses (Stellman/Greene 2015, p. 53–55). Requirements are no longer handed over just once by the customer, but are regularly updated and prioritized. The focus is on ensuring that new features deliver added value for the customer. Partial results are regularly presented to the customer, enabling the project team to learn first-hand what is important and what is unimportant.

### Self-Check Questions

1. What does modern software do for project management and how do the various project participants benefit from it?

*Project management software supports project managers (and their leaders) in all project management tasks from task and milestone planning to resource planning and project controlling. Alongside this, there is software that improves the collaboration of the entire project team. These tools focus on functionalities such as visualizations (e.g., kanban boards) and task management and communication tools, e.g., chats and forums. Of course, complete solutions are also available.*

1. How is the role of the project manager changing due to the new forms of project management in digital transformation projects?

*With new forms and approaches in project management, the leadership tasks of the project manager and the collaboration with the project team are changing. The central focus is on a greater proximity to the customer, decentralization of responsibility from the project manager to the entire project team, and the increasing use of digital project management tools throughout the project team.*

Summary

The digital transformation has increased the importance of projects in companies and organizations. Projects represent the way in which work will be carried out the future. They are characterized by the fact that the project itself and its scope are unique. Projects have a goal, as well as limited financial and human resources. In order to coordinate projects efficiently in the scope of digital transformation, they are bundled together in programs and project portfolios. Programs comprise several projects that work toward a common goal. The aim is to identify and manage their interdependencies in terms of time and content. In portfolio management, programs, and projects are prioritized and the use of resources optimized.

Digital transformation projects face a number of challenges in this regard, particularly due to the novelty, dynamism, and complexity that digital transformation involves. To meet these challenges, project management approaches have been further developed and new forms of organization and collaboration have been tested. There is no *one* right approach to project management: rather, it is important to select the right one for the goal at hand and to combine it appropriately.

# Unit 2—Norms, Standards, and Certification Models in Project Management

Study Goals

On completion of this unit, you will be able to ...

... explain the benefits of norms and standards in project management.

... classify internationally recognized standards for project management.

... assess the content and focus of these standards.

... recognize the certifications for the respective standards.

... explain the differences between certification models.

# 2. Norms, Standards, and Certification Models in Project Management

### Introduction

Even though no two projects are alike, all projects have certain things in common. Projects are planned, carried out, and then—hopefully successfully—completed. Projects involve people in a variety of recurring roles. A project manager who begins planning their project can therefore draw on a proven set of methods and processes. The nature of these proven methods and processes is developed as a consensus among many subject matter experts—nationally and internationally—through various standardization projects. Such norms and standards are usually still adapted to specific organizations in large organizations. The following unit presents the current, most significant norms and standards in project management.

If project teams can fall back on a sound knowledge of standardized processes, they save time because they can use tried and tested approaches in the sense of an “if-then” construct, e.g., “If the project order is approved, then I can start the following tasks:...”. This gives more time again for the actual challenges in the project. Alongside this, it serves the purpose of quality assurance because the project team knows that it has not overlooked anything significant by following the standardized procedure.

There are a variety of certification options toward proving one’s own competencies in successful project work, as well as a sound knowledge of methods and processes. Since most certifications are very time-consuming and cost-intensive, the benefits of certification in one’s own current and planned professional context must be weighed up carefully (Brecht-Hadraschek 2014a; Brecht-Hadraschek 2014b; Handelsblatt Online 2020; Neumann 2020). This unit provides an overview and serves as an initial guide for selecting a suitable certification.

## 2.1 DIN 69901 and ISO 21500

DIN 69901 and ISO 21500 are two standards for project management. Standards are developed and approved by national, European and international institutions. In Germany, the German Institute for Standardization (DIN) is the recognized body. Standards published by DIN are marked accordingly with the abbreviation DIN. Internationally, ISO, the International Organization for Standardization, is such a recognized institute. Standards are developed by consensus of subject matter experts (DIN e. V. n.d.). The aim is to achieve a common understanding of the content that will find broad acceptance. A standard should always be based on current academic knowledge.

**Standard**

A standard defines requirements, rules and guidelines for activities and their results.

### DIN Standards for Project Management

In Germany, there are several standards that describe the basics, terms, processes, and methods for project and portfolio management (Timinger 2017, p. 15). In early 2009, the German Institute for Standardization (DIN) published DIN 69900 Project Management—Network Planning Techniques; Descriptions and Terms and the five-part DIN 69901 Project Management—Project Management Systems (DIN e. V. 2020b). The latter comprises the following standards:

* DIN 69901–1 Part 1: Basics
* DIN 69901–2 Part 2: Processes, Process Model
* DIN 69901–3 Part 3: Methods
* DIN 69901–4 Part 4: Data, Data Model
* DIN 69901–5 Part 5: Terms

The following standards on multi-project management—management of project portfolios, programs and projects were added in 2013 and 2015 respectively:

* DIN 69909–1 Part 1: Basics
* DIN 69909–2 Part 2: Processes, Process Model
* DIN 69909–3 Part 3: Methods
* DIN 69909–4 Part 4: Roles

These standards create uniform terminology by defining the essential terms in project management. If all project participants use terms according to their definition in the standard, this facilitates a common understanding.

In addition, the standards define processes for the central activities in projects. The aim of the **process orientation** ofDIN 69901 is to improve the efficiency and effectiveness of projects. To this end, the standards regulate the cooperation of those involved in the project, show the interfaces to upstream and downstream processes, and agree on (interim) results (DIN e. V. 2020b). Misunderstandings regarding the tasks to be performed are thus to be avoided. However, the standards do not provide detailed process models and are usually adapted for an organization or even a project. The DIN standard supports this in several ways, including by labeling certain processes as mandatory.

**Process orientation**

Process orientation describes a fundamental attitude that aligns all operational actions with processes.

The currently valid versions do not contain any aspects relating to agile project management. DIN 69901 follows a traditional understanding of projects with successive project phases.

### ISO Standards for Project Management

At the international level, ISO published the ISO 21500 Guidance on Project Management Standard in 2012 (ISO 2012). The German translation was published in 2016 as DIN ISO 21500:2016–02 Leitlinien Projektmanagement (Guidance on Project Management). Experts from Germany, among others, were also involved in the development of ISO 21500, contributing their experience from DIN 69901. The PMBOK Guide from the Project Management Institute, the current edition of which (PMBOK 2021) is presented below, was also incorporated into the development of the standard in its version at the time.

ISO 21500 particularly defines the processes required for the management of an individual project from project start to project completion and assigns them to process groups or subject areas (Wagner 2012, p. 5). Process descriptions explain the process purpose and practice, and central inputs and outputs of the processes. It is thus also process-oriented, much like DIN 69901.

ISO 21500 is particularly relevant for internationally active companies, as it provides a common basis for communication and collaboration (Angermeier 2002; Wagner 2012). Project participants can use this global standard to synchronize their practices and the project results to be delivered. Linguistic and cultural understanding is made easier using this as a basis.

### Potential Applications

Organizations can design their general approach to project management on the basis of standards such as DIN 69901 or ISO 21500 (Wagner 2012). For this purpose, it is common to adapt the standards—particularly the processes they contain—to the specific needs of the company. Further project-specific adaptations can also be made. **Process tailoring** may be necessary, e.g., to comply with certain company specifications or guidelines of the client in the processes. In general, the standard sees it as the task of the project manager, with their project team, to determine the processes suitable for the project and their chronology.

**Process tailoring**

Process tailoring is the modification or adaptation of process descriptions for a specific purpose.

Norms and standards can also be used to further develop project management in an organization in a targeted manner (Wagner 2012). A comparison of one’s own project management processes with the processes defined in the standard can reveal gaps and potential for improvement.

## Self-Check Questions

1. Mark the correct answers.

* DIN 69901 defines essential terms for project management and thus ensures a uniform understanding among all project participants. (T)
* DIN 69901 describes the central processes for the implementation of projects. (T)
* DIN 69901 includes templates, project plans, checklists, and similar for efficient project execution. (F)
* DIN 69901 can serve as a blueprint for project-specific specifications. (T)

1. Complete the following sentence:

The use of norms and standards in project management, such as ISO 21500 or DIN 69901, promotes efficient communication by defining and standardizing *terms*. In projects with multiple project participants, these standards provide a basis for coordinating *processes*.

## 2.2 International Project Management Association (IPMA)

The International Project Management Association, abbreviated IPMA, is the umbrella organization for more than 70 national project management associations worldwide. IPMA was founded in 1965 and is based in the Netherlands. Its aim is to promote the competences required for projects to be successful (IPMA n.d.). To this end, it creates synergies in the global network of member associations and members. The member associations from German-speaking countries are the Gesellschaft für Projektmanagement e. V. (GPM) in Germany, the Swiss Association for Project Management (spm) in Switzerland, and the pma (Projekt Management Austria) in Austria.

### IPMA Individual Competence Baseline

IPMA certifications are based on the Individual Competence Baseline, abbreviated ICB (GPM 2019). The IPMA ICB defines neither methods nor processes, such as ISO 21500, the PMBOK Guide, or other process-oriented standards. Rather, it focuses on the **competencies** needed for successful project work (Thyssen 2016, p. 1). That is, the IPMA ICB defines WHAT someone must be able to do, not HOW something is done in the project. They are not restricted to a specific application area or specific project types. The requirements regarding agile practices have also been incorporated into Version 4.

**Competence**

According to the IPMA ICB, competence means using knowledge, skills, and abilities in such a way that the intended results are realized (GPM 2017, p. 17).

Version 4 (ICB4) of the ICB has been valid since 2015. The national member associations adopt the ICB, translate it, and adapt it nationally as required, e.g., to take account of cultural peculiarities. The German-language ICB4 (GPM 2017) is a one-to-one translation.

The ICB4 defines three competence areas as the “Eye of Competence”:

* perspective (contextual competences),
* people (personal and social competences), as well as
* practice (technical competences).

A total of 29 competence elements are assigned to these three competence areas. These apply not only to project management, but also to program and portfolio management.

Projects, programs, and portfolios are always carried out in a specific organizational, social, and policy context. Thus, various formal and informal influencing factors exist. The *perspective* competence area looks at the competencies that an individual needs in order to recognize these influencing factors and to interact appropriately with the respective internal or external stakeholders.

The *people* competence area includes basic personal characteristics, competencies regarding communication with others, leadership skills, and other competencies that an individual must possess in order to successfully participate in or lead projects, programs, or portfolios.

The *practice* competence area looks at the methods, tools, and techniques necessary to successfully plan, control, and carry out projects, programs, and portfolios.

Competence indicators are defined for each competence element (GPM 2019), which describe what behavior would be observable in a person in a project who possesses this competence.

The IPMA ICB thus defines a comprehensive inventory of competencies that every project employee or project manager should have at their disposal or that they should build up and develop in a targeted manner. The competence inventory is also well suited for self-assessment (Thyssen 2016, p. 3).

### The IPMA Certification System

The ICB is the basis for all certifications by IPMA and their respective national certification bodies. The German translation of the ICB4 is therefore the current basis for all qualifications and certifications by GPM. Certification is intended to certify that a person has the competencies required to successfully perform certain project management tasks.

IPMA defines a four-level certification model, starting with Level D for prospective project managers up to Level A for the management of strategic projects in a highly complex environment (GPM 2019). Depending on experience, direct entry into a higher level is possible. This experience must be proven and is a prerequisite for certification. Depending on the level, a project report, a written exam, participation in a workshop (simulation), and an interview are required for certification. Regular re-certification is required. In addition, GPM offers a certification for beginners in the form of the Basic Certificate in Project Management.

Certifications in the GPM Competence Model

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| GPM | IPMA | | | |
| Basic certificate | IPMA Level D – Certified Project Management Associate | IPMA Level C – Certified Project Manager | IPMA Level B – Certified Senior Project Manager | IPMA Level A – Certified Project Director |
| Beginners, students, project staff, PMO | (Prospective) (Partial) Project managers, persons responsible for work packages | (Partial) Project Manager, Head of PMO | Experienced project managers, program and portfolio managers | Highly experienced project managers, program and portfolio managers, particularly for large strategic projects |

In addition, there is the Hybrid+ supplementary certificate (GPM), which certifies that the certified person uses agile and traditional methods in projects in a targeted and profitable manner. The admission requirement for obtaining this certificate is an existing IPMA Certificate Level D—A.

### Self-Check Questions

1. The International Competence Baseline (ICB) defines the competencies required for the successful management of projects. Into which three competence areas are these competence elements structured?

*The competency elements are grouped into the three competency areas of perspective, people, and practice.*

1. Mark the correct answers.

* The International Project Management Association (IPMA) offers certifications for project managers at several experience and career levels. (T)
* The International Project Management Association (IPMA) does not offer certifications for prospective project managers. (F)
* All IPMA certifications require proof of a certain number of years of practical work experience. (F)
* The International Project Management Association (IPMA) offers certifications for program and portfolio managers. (T)

## 2.3 Project Management Institute (PMI)

The Project Management Institute, abbreviated PMI, has existed for more than 50 years. It was founded in the USA as a non-profit technical and professional association and aims to promote the science and practice of project management for practitioners and organizations (PMI n.d.a). As of 2022, it has more than 650,000 members worldwide, who exchange ideas and network both as an online community and in local chapters (PMI n.d.b). Germany is also home to a chapter and more than 20 local groups (PMI n.d.c) .

PMI is the publisher of the PMBOK Guide. PMBOK stands for Project Management Body of Knowledge. The PMBOK Guide is recognized worldwide as a reference work on all aspects of project management. The original version is in English. There are also translations into several languages, including German. The Guide is formulated in an industry-neutral way. The aim is that it can be used for all projects—regardless of size, scope and area of application. The PMBOK Guide is updated regularly. Its first edition was published in 1969 and the current edition, namely the 7th edition, was published in 2021 (PMI 2021). The PMBOK Guide is the basis for certifications by the PMI. In addition to the Guide, there are other PMI publications, such as the Agile Practice Guide (PMI 2017a), which PMI published together with the Agile Alliance.

The American National Standards Institute (ANSI) has recognized PMI as a Standards Development Organization. This means that PMI standards can also become ANSI standards. The second part of the PMBOK, “The Standard for Project Management,” has been classed as such an ANSI standard since 1999 (Holtzman 1999). In the seventh edition, the standard has moved to the front and is its own “book within a book” (Wuttke 2021, p. 5). PMI is also actively involved in ISO’s standardization activities in the area of project management. During the development of ISO 21500, it contributed the PMBOK Guide in the version valid at the time as input for the ISO standard. In particular, the process model of ISO 21500 is heavily based on the PMBOK Guide (cf. Tavan/Hosseini/Mokhtar 2016; Wagner 2012, p. 12). The IEEE (Institute of Electrical and Electronics Engineers) had also recognized the Guide as a standard until the fourth edition (IEEE 2011).

### The PMBOK Guide Structure

The PMOBK Guide changes fundamentally in the 7th edition from 2021. First, this concerns the structure. As the full name “The Standard for Project Management and a Guide to the Project Management Body of Knowledge” itself shows, the standard itself is now right at the beginning rather than in the appendix. Second, there are major changes in content. The processes, process groups, and knowledge areas known from previous editions are omitted in the seventh edition. Rather, the focus is now on what is known as the principles. The PMI substantiates this shift of focus by stating that the principles direct the reader’s focus toward the results to be achieved with the project (PMI 2021, p. x-xi). This acknowledges that different approaches in project management—from plan-driven to agile approaches and their hybrid forms—have their justification/substantiation and should be selected specifically depending on the project and context (Wuttke 2021, p. 2).

The interactive digital platform PMIstandards+ is also a new addition to the seventh edition. In the future, it will contain more detailed information and best practices. In particular, further developments and innovations in project management are to be incorporated quickly (PMI 2021, p. xii).

In the following, important concepts from both parts of the PMBOK Guide are presented, i.e., from both the standard and the actual guide.

**Value creation system**

The PMBOK Guide defines the value creation system as a set of strategic business activities that contribute to building, sustaining, or developing an organization (PMI 2021, Part 1, p. 5).

#### The value creation system

The standard for project management places what is known as the **value creation system** at the beginning. It emphasizes that projects create value in various ways, such as in the form of new products or new services that create added value for the clientele. Positive contributions with regard to our society or the environment also represent this kind of value. Furthermore, the standard lists the improvement of factors such as profitability or productivity as possible value, as well as transformations of organizations or the maintenance of aspects that create value today (PMI 2021, Part 1, p. 8). Overall, an organization’s value creation system may be composed of one or more projects, programs, portfolios, and the organizational processes (PMI 2021, Part 1, p. 8–10). For projects to contribute to value creation in this context, project stakeholders perform certain functions. Examples of such functions include coordinating work assignments, communicating goals, performing tasks on the project, or providing resources (PMI 2021, Part 1, p. 12–16).

#### The twelve principles of the standard for project management

The standard for project management defines twelve principles of project management that are intended to serve as a behavioral guide during a project. They are aligned with the four core values of responsibility, respect, fairness, and honesty, which are anchored in the PMI Code of Ethics and Professional Conduct. The principles are as follows (PMI 2021, Part 1, p. 21):

* Be a diligent, respectful, and steward.
* Create a collaborative team environment.
* Effectively engage stakeholders.
* Focus on value.
* Recognize, evaluate, and address systemic interactions.
* Demonstrate leadership behaviors.
* Tailor based on context.
* Build quality into processes and deliverables.
* Navigate complexity.
* Optimize risk responses.
* Embrace adaptability and resilience.
* Enable change to achieve the envisioned future state.

#### The performance domains according to PMBOK

The actual PMBOK Guide defines eight performance domains that are to be observed during the implementation of a project and ultimately contribute to achieving the intended result. The principles from the standard, which have already been explained, provide guidance on how to work in these performance domains in principle (PMI 2021, Part 2, p. 4). The following are the performance domains of a project (PMI 2021, Part 2, p. 7ff):

* **Stakeholder**: this performance domain includes all activities related to the people, groups, or organizations that may affect the project or be affected by the results. An example is establishing a productive working relationship with stakeholders.
* **Team**: this performance domain describes the activities required to form a well-functioning project team and to promote its level of performance. Aspects concerning the leadership of a project team and the promotion of the project team’s culture are relevant here.
* **Development approach and life cycle**: this performance domain includes activities related to the development approach. This means that a suitable process model must be selected and developed for the project, e.g., with regard to the project phases.
* **Planning**: this performance domain includes activities for organizing and coordinating the work to be performed in the project so the deliverables to be achieved are created. If requirements or boundaries change, planning must also be adapted.
* **Project work**: activities in this performance domain ensure that the project team can work through its tasks smoothly. To this end, project processes are defined, progress is evaluated, information is distributed, and change requests are coordinated, among other activities.
* **Delivery**: this performance domain describes the activities required to ensure that the promised services are met in terms of content, scope, and quality. A clear understanding of the requirements on the part of the project team and the acceptance of the results by the stakeholders is essential here.
* **Measurement**: activities in this performance domain ensure that performance is evaluated and appropriate action is taken when needed so the expected outcome can be achieved.
* **Uncertainty**: this performance domain focuses on the fact that projects operate in a context that is associated with uncertainty. Among other elements, risks and opportunities must be identified, evaluated, and the appropriate measures respectively taken.

### Certifications by PMI

PMI offers certifications at various levels of experience and training and is thus aimed at different roles in the project, such as project staff, project managers, and program and portfolio managers. In addition, there are certifications for specific project management topics, such as risk management. All certificates are recognized worldwide. The PMBOK Guide provides the binding structure in terms of terminology and methodology. A certain number of hours of project work, as well as specific trainings and exams, must be proven for most certifications. Certificates must be regularly renewed through recognized training.

The most common PMI certification is the Project Management Professional (PMP) certification, which project managers worldwide use as evidence of their competencies and experience (PMI 2020b). For newcomers to project management, such as project staff or prospective project managers, there is the Certified Associate in Project Management (CAPM) certificate (PMI 2020a). The PMI Agile Certified Practitioner (PMI-ACP) certification, which certifies in-depth knowledge of various agile process models and methods, is also becoming increasingly significant. In contrast to the Scrum certifications, which will be discussed later, it does not focus on a single agile practice, but rather is broad-based and particularly supports the introduction of agile methods in larger organizations (Reineke 2013). It is especially interesting as an add-on to PMP certification, since only a certain number of hours of experience in agile project work must be demonstrated in this case. Further certifications on roles in agile teams are also offered.

### Self-Check Questions

1. Mark the correct answers.

* The PMBOK Guide was initially developed for projects in the banking and insurance sectors and contains methods specifically for these application areas. (F)
* The PMBOK Guide is formulated in an industry-neutral way. (T)
* The processes defined in the PMBOK Guide are focused exclusively on complex large projects. (F)
* The PMBOK Guide provides guidance that can be expressed in project-specific terms. (T)

1. Name two principles of project management described by the “Standard for Project Management and A Guide to the Project Management Body of Knowledge,” abbreviated PMBOK Guide.

E.g., (1) Focus on value, (2) Align processes and deliverables with quality, or (3) Enable change to achieve the desired state.

## 2.4 PRINCE 2

PRINCE stands for “Projects IN Controlled Environments.” It was originally developed in the UK as a government standard for IT project management and as part of what is known as the Best Management Practice portfolio. PRINCE was further developed for use outside of IT projects and published in 1996 under the name PRINCE2. PRINCE2 and its associated qualifications and certifications have been published by the British company Axelos Ltd since 2014. In addition to the application of PRINCE2 in the UK, it has also gained worldwide recognition. The currently valid version is the PRINCE2 version from 2017 (AXELOS 2017).

PRINCE2 is designed as a framework that can be flexibly applied in different types of projects. It does not impose any restrictions on project size, duration, complexity, and scope. With PRINCE2 Agile, the PRINCE2 framework has been extended into a solution for agile project management (AXELOS 2019; Cooke 2016). The goal of this is to combine the flexibility and rapid responsiveness of agile practice with the sound project planning and control of PRINCE2. PRINCE2 Agile is therefore concerned with how to adapt PRINCE2 in an agile context. It does not specify which agile concept is to be used.

### PRINCE2 Structure

Key elements of PRINCE2 are its basic principles, topics, and processes (AXELOS 2017).

#### Basic principles

PRINCE2 defines seven basic principles that apply to all project work—traditional and agile. If even one of these principles is violated, then it is no longer a PRINCE2 project. These basic principles are as follows (AXELOS 2017, p. 9–14):

* **Continued business justification:** there must be a legitimate reason for each project for it to be initiated. It must be ensured that this justified reason continues to exist over the duration of the project.
* **Learn from experience:** project teams learn from their mistakes and problems, as well as from their successes. Lessons learned are therefore an important tool for continuous development.
* **Define roles and responsibilities:** project teams should have a clear organizational structure in which all project team members are assigned to the right role based on their knowledge and experience.
* **Control via management phases:** projects should be planned, monitored and controlled in phases.
* **Lead according to the management by exception principle:** each project member should make decisions on their own responsibility within their area of competence and only contact their project management superior in exceptional cases.
* **Product orientation:** projects are focused on defining and delivering products, while upholding all quality requirements.
* **Adapt to the project environment:** for each project, it is necessary to determine how the PRINCE2 methodology will be used. Adaptations are made, e.g., to the processes or role descriptions that are logical for the specific project. In addition to the project size, significance, scope, and complexity, factors such as company standards, company culture or even the experience level of the project team can play a role .

**Business case**

The business case of a project is used to assess how and in what timeframe the project results justify the investment (see Angermeier 2018).

#### Themes

PRINCE2 defines the following seven topics (AXELOS 2017, p. 15–18):

* **Business case:** the business casemotivates and justifies *why* a project should be undertaken and what benefits are expected.
* **Organization:** the organizational structure defines who is involved in the project, in which role, and with which responsibilities.
* **Quality:** quality describes *what* is expected as the product to be delivered, what the quality requirements are, how they are measured, and what must be carried out in the project to meet them.
* **Plans:** plans describe *how* the project will proceed, *how many* steps are necessary, and *when* they will be carried out. The techniques to be used from PRINCE2 are also specified.
* **Risks:** the risks and opportunities associated with the project must be identified. Planning for what happens if they occur must be made.
* **Changes:** for change requests, project management must evaluate *what the effect* is and decide how to handle it.
* **Progress:** the progress of a project is reviewed regularly in the sense of where things stand*.* Whether and how the project should be continued must be evaluated on this basis.

#### Processes

PRINCE2 is structured in a process-oriented manner, i.e., it provides a set of processes that can be used to orientate a specific project. PRINCE2 defines the respective activities and results for each process. In doing so, PRINCE2 provides detailed specifications on the roles involved and their responsibilities and shows how a process can be adapted to the requirements of a specific project at hand (AXELOS 2017). The following seven processes map the entire life cycle of a project (AXELOS 2017, p. 111–118):

* Prepare a project.
* Lead a project.
* Initiate a project.
* Control a phase.
* Manage product delivery.
* Manage phase transitions.
* Complete a project.

### PRINCE2 Certifications

There are two certifications for PRINCE2 at different qualification levels, namely PRINCE2 Foundation and PRINCE2 Practitioner (ILX Group 2021a). In some sources, the Professional level can still be found, but Axelos has not offered this since 2018.

The Foundation certification (ILX Group 2021b) certifies a basic knowledge of the principles and terminologies of PRINCE2, meaning that the certified person can confidently apply the methodology as a member of a project team. The Practitioner certification (ILX Group 2021c) certifies a comprehensive knowledge of PRINCE2 and enables the certified person to adapt the methodology for a specific project in a targeted manner. Certification as a Practitioner requires PRINCE2 Foundation, certification from the International Project Management Association IPMA Level D—A or by the Project Management Institute PMI CAMP or PMP. In contrast to the certifications by IPMA and PMI, no practical experience in project management must be proven for these two certifications. All certifications must be updated after three years. In addition, there is also the PRINCE2 Agile™ certification, which covers the use of agile concepts in projects carried out according to PRINCE2 methodology.

### Self-Check Questions

1. Mark the correct answers.

* PRINCE was originally developed for the project management of IT projects. (T)
* PRINCE2 is designed exclusively for the project management of IT projects. (F)
* PRINCE2 is basically formulated in an industry-neutral way, but contains many special features for projects in the IT industry. (F)
* PRINCE2 is formulated in an industry-neutral way and can therefore be used in projects in all industries. (T)

1. What does the PRINCE2 basic principle of “adapt to the project environment” entail?

*Adapting PRINCE2 to the specific project environment is an important aspect of working with the method. For example, topics can be adapted to the scope and nature of the project. Renaming is possible. Roles can also be reduced and processes adapted. With PRINCE2, only the principles may not be changed.*

## 2.5 Agile Standards

Agile standards and certifications have been developed in recent years. The standards and certification models presented thus far in this section, which follow a traditional understanding of project management, have also adapted to this development and as described above, have additionally included agile or hybrid certifications in their program (Ammer 2019, p. 3).

There are various certifications on the market for Scrum as a widespread process model (ibid.). The two most well-known certification bodies are the Scrum Alliance and Scrum.org. Both are globally recognized. There are differences in the certification levels, course content, and examination forms. Each certification is based on the **Scrum Guide** (Schwaber/Sutherland 2020), which was initially published in 2010 by Ken Schwaber and Jeff Sutherland, the founders of Scrum, and has been continuously developed since then.

**Scrum Guide**

The Scrum Guide defines scrum and its associated framework as the minimum framework.

### Scrum Alliance

The Scrum Alliance was founded in 2001 as a professional association and certification body in the agile field (ScrumAlliance n.d.a). In the meantime, it has issued over one million certificates worldwide. The Scrum Alliance offers certifications for the most important Scrum roles via the following three tracks (ScrumAlliance n.d.c):

* **Scrum Master Track:** the Certified ScrumMaster (CSM) is the entry level into the role of Scrum master. The two certificates Advanced Certified ScrumMaster (A-CSMSM ) and Certified Scrum Professional ScrumMaster (CSP-SM) build upon this. The entry requirements for the advanced certificates are the previous level and proof of 12 or 24 months of practical project work as a Scrum master. In addition, training and performance certificates corresponding to the level are required.
* **Product Owner Track:** the certifications for the product owner are structured in three levels analogous to the certifications for the Scrum master role, namely Certified Scrum Product Owner (CSPO), Advanced Certified Scrum Product Owner (A-CSPOSM ) and Certified Scrum Professional Product Owner (CSP-PO).
* **Developer Track:** there are only two levels for developers in a Scrum team. The Certified Scrum Developer (CSD) is the entry-level certification. The Certified Scrum Professional (CSP) builds on the CSD and requires at least 36 months of experience in Scrum projects.

Certifications must be refreshed every two years to remain valid.

In addition to these three tracks, the Scrum Alliance offers the Certified Agile Leadership (CAL) certification series (ScrumAlliance n.d.b). It is aimed at formal and informal leaders in an agile environment and provides competencies to introduce and spread agility within organizations.

The Guide Level certifications were developed for people who already have a Professional certification from the Scrum Alliance and who now want to prove their knowledge as a coach (Certified Agile Coach) or trainer (Certified Scrum Trainer) (ScrumAlliance n. dc).

### Scrum.org

In 2009, Scrum.org split from the Scrum Alliance (Scrum.org n.d.a). Scrum.org placed a strong focus on the use of Scrum in software development projects, whereas the Scrum Alliance took different types of projects into consideration. Like the Scrum Alliance, Scrum.org offers certifications for the different roles in Scrum projects, but unlike the Scrum Alliance, the course and exam content are more standardized. The exams are each taken as online tests which are prepared for via self-study (Ockerman/Reindl 2019; Doshi 2016; Pitts 2018 as basic literature). The Professional Scrum Competencies (Scrum.org n.d.c) also provide orientation on the required personal competencies. Participation in a training course is not mandatory. The certifications are valid for an unlimited period of time. The most important certifications are (Scrum.org n.d.b):

* **Professional Scrum Master**, as certification for Scrum master at three levels (fundamental, advanced, and distinguished).
* **Professional Scrum Product Owner**, as certification for product owner analogous to Scrum master.
* **Professional Scrum Developer**, for developers in a Scrum team.

In addition, there are the more specialized certifications Scaled Professional Scrum, Professional Agile Leadership, Professional Scrum with Kanban, and Professional Scrum with User Experience.

### Scaled Agile Framework (SAFe)

In recent years, various frameworks have been defined in order to scale Scrum or agile practices and thus to be able to use them in large organizations and across teams. The Scaled Agile Framework (SAFe) (cf. Knaster/Leffingwell 2020), with its certification series, is listed here as an example (SAFe n. d.). It offers certifications for both beginners and advanced users with appropriate experience in the various roles (Scaled Agile, Inc. n. d.). The following certifications are at the Foundation level:

* Certified SAFe Agile Product Manager.
* Certified SAFe Lean Portfolio Manager.
* Certified SAFe Agile Software Engineer.
* Certified SAFe Government Practitioner.
* Certified SAFe DevOps Practitioner.
* Certified SAFe Product Owner/Product Manager.
* Certified SAFe Agilist.

Further certifications are available at the Intermediate and Advanced levels. Usually, a student prepares for the certification exam by means of training and in-depth self-study.

### Self-Check Questions

1. Mark the correct answers.

* The certifications of the Scrum Alliance and Scrum.org build on each other. (F)
* The certifications of both the Scrum Alliance and Scrum.org are based on the Scrum Guide. (T)
* Scrum Alliance and Scrum.org offer certifications for the different roles in a Scrum project, such as Scrum Master. (T)
* Scrum Alliance and Scrum.org do not offer certifications at entry level. Several years of experience in Scrum projects is always required. (F)

Summary

There are a number of national and international norms and standards for project management. In particular, these are DIN 69901, ISO 21500, and parts of the PMBOK Guide. The aim of these standardization efforts is to improve the quality of projects and their results. Among other aspects, standards therefore aim to standardize terminology, processes, and methods in such a way that all project participants work together efficiently toward the project result.

In addition to these standards, several internationally recognized certification models for project managers have emerged. They each have a different focus. PMI and PRINCE2 certifications focus on knowledge of proven methods and standardized processes. In contrast, IPMA certifies project managers based on their competencies and soft skills for successful project work. All three certification models offer several certification levels that take the experience level of the person being certified into account. There is typically a basic certification that does not require any practical experience as a prerequisite for admission to the exam. It is particularly suitable for project members and prospective project managers, e.g., in a junior position, and confirms basic knowledge of project management methods and processes or a basic level in the competencies required in a project manager.

In recent years, a large number of certifications for agile methods in project management have been added. The certificates of the Scrum Alliance and Scrum.org for the various roles in agile projects are particularly noteworthy here. The providers of traditional certification models such as IPMA, PMI, and PRINCE2 have also expanded their offerings accordingly.

# Unit 3—Traditional Project Management

Study Goals

On completion of this unit, you will be able to ...

... explain the importance of process models for project management.

... explain typical representatives of traditional process models.

... classify the process model of a specific project as sequential, concurrent, or repetitive.

... explain the roles and responsibilities of project management throughout the course of a project.

# Traditional Project Management

### Introduction

Many project management methods and practices go back to the large projects of space travel, such as the Apollo program, and plant engineering in the 1950s (cf. Morris 2013, p. 10; Madauss 2020, p. 7f.; Kuster et al. 2019, p. 1; Berkun 2008). Since then, they have been used in a huge number of projects and have been further developed and in some cases, standardized on this basis (cf. ISO 2012; AXELOS 2017; PMI 2021). In this process, project goals are usually defined before the project start and project plans that defined or predicted the future project progression are created. These are implemented step by step and deviations between what is actually achieved and the target state are minimized. Over the course of a project, work is carried out step by step according to these plans, i.e., plan-driven. Today, these plan-driven practices are referred to as *traditional* (cf. Timinger 2017, p. 29). In addition, the terms *classic* and *conventional* can also be found. Even though agile and hybrid process models are currently on the rise in project management (Komus et al. 2020, p. 3), a fundamental understanding of traditional project management is indispensable, particularly of the methods used to reduce complexity and reduce the risk of incorrect decisions.

## 3.1 Classification of Traditional Process Models

Various process models in traditional project management have developed over the decades. Process models compile methods, techniques, processes, and phases for a standardized project process (Timinger 2017, p. 30). In the following, a basic understanding is first established before various types of process models are considered.

**Milestone**

A milestone is a point in time in the project at which an intermediate result must be achieved or a decision must be made.

### Process Models and Their Components

Important components of process models are their phase model and **milestones** (Timinger 2017, p. 30).

#### Phases in the project life cycle

**Project phase**

Phases divide the project life cycle into clearly defined, manageable stages from the initiation of the project to its completion.

In traditional project management, there are **project phases** that are logically and temporally separated from one another (Wysocki 2019, p. 42–45; Madauss 2020, p. 107; Alam/Gühl 2020, p. 65). They form the basic framework for managing a project. Each phase has a defined beginning and end. The results to be delivered and the degree of completion at the end of each phase are agreed in advance (PMI 2021, Part 2, p. 42f.). Process models differ in the number, naming, and content of their phases. Essentially, the way in which phases are run through varies by project, e.g., whether sequential, concurrent, or repetitive (Wysocki 2019, p. 43–45). The clear structure of these process models provides orientation for the project team and regulates collaboration with the client.

The decision as to which process model is selected and which phases are necessary depends on the type, scope, significance, and risk of the project (cf. Kuster et al. 2019, p. 18). Smaller projects may be carried out with fewer phases than large projects. Conversely, phases can also be added. For example, a feasibility study can be added upstream.

#### Milestones and quality gates

Milestones are important points in the course of a project (PMI 2021, Part 2, p. 244). They are usually located at the end of each phase. However, additional milestones can also be defined within phases. The timely delivery of the agreed **deliverable** is verified on the respective date.

**Deliverable**

A deliverable is a specific, verifiable result within a project that is handed over to the client.

A quality gate (also phase gate or stage gate) is a milestone at which a decision is made on the release for the next step (cf. PMI 2021, Part 2, p. 245; Angermeier 2004). The principle is that the next phase may only begin when the *gate* at the end of the previous phase has been successfully passed. Reworking is necessary if it is not met. Generally speaking, there is also the possibility of terminating the project. It is important that the deliverables and the quality requirements placed on them have been specifically agreed in advance (Timinger 2017, p. 39).

The stage gate process developed by Robert G. Cooper uses a similar principle in a larger context. For projects, whether the project is still the right project for the company and whether it should be continued is checked at each gate along an innovation process (cf. Cooper 2017; Edgett 2018).

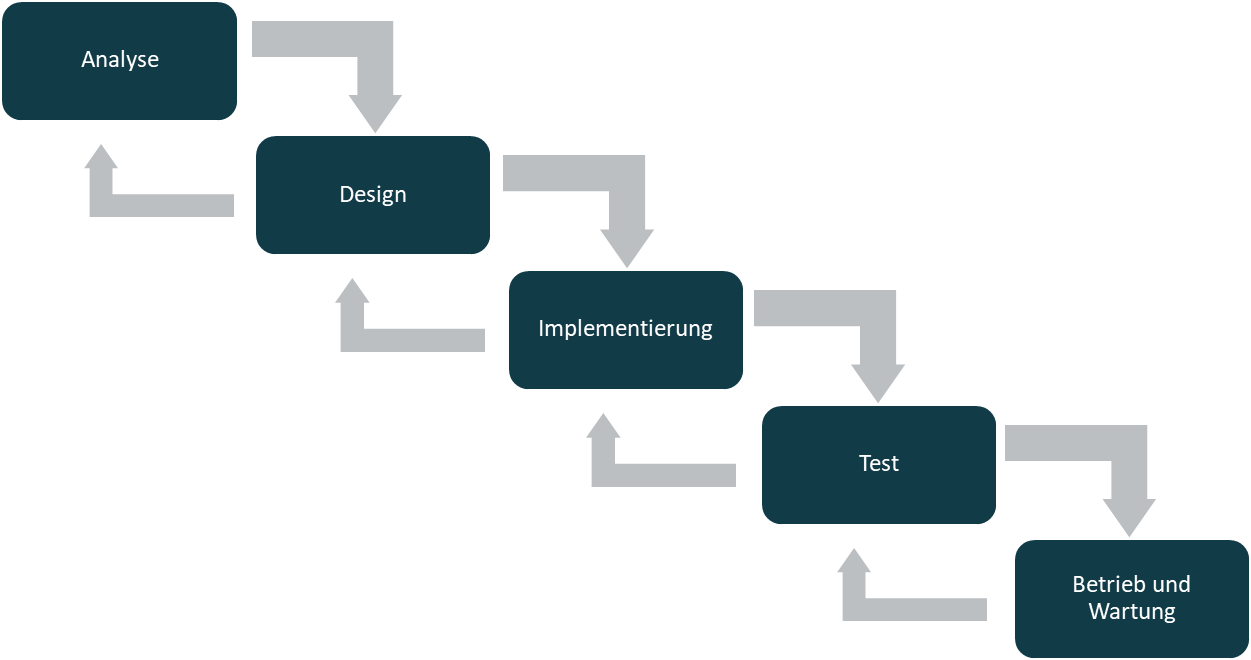
### Sequential Process Models

In sequential (or linear) process models, all phases are processed one after the other (Wysocki 2019, p. 43f.). Applied consistently, this means that a phase must first be fully processed and formally completed before the next phase can start (Timinger 2017, p. 38). Two of the best-known sequential process models are presented below.

#### Waterfall model

The waterfall model is one of the best-known process models and is intuitively understandable (Timinger 2017, p. 38). Its origins are attributed to various people. Wolff (2020) has traced its history. The waterfall model follows the principle of “one step at a time.” The phases are often represented as a cascade, with the results of one phase “flowing” into the next phase, which has given the model its name. This gives the project a very clear structure. A reversion to the previous phase only occurs if a phase cannot be carried out as planned.

The Waterfall Model as a Sequential Process Model



**Stakeholder**

Stakeholders are individuals, groups, or organizations who have a stake in the project or an interest in the project and its outcomes (PMI 2021, Part 2, p. 251).

The variations of the waterfall model differ in the number and naming of phases. For example, the following structuring is typical of a software development project (Balzert 2008):

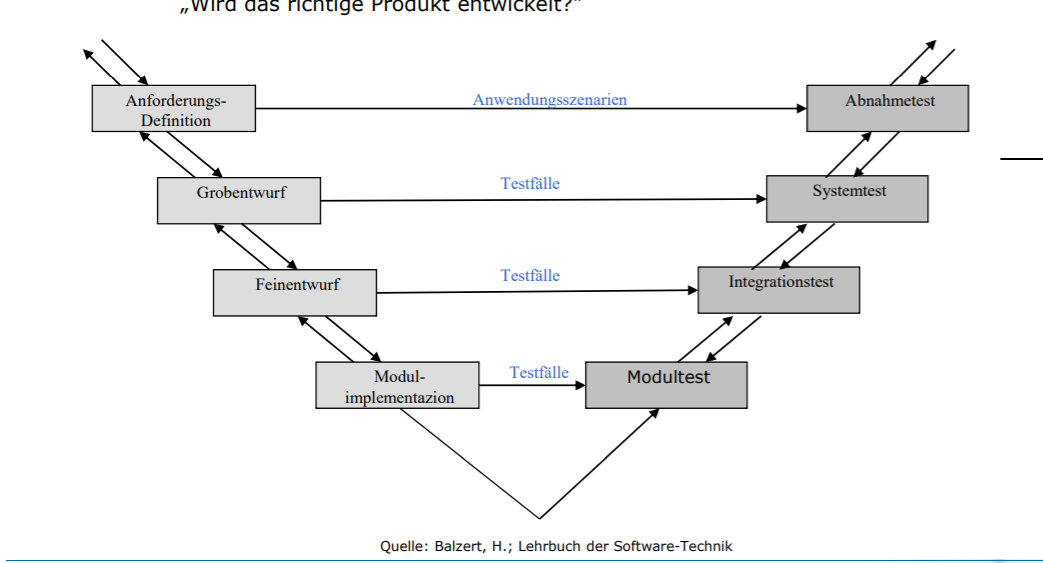
* **Analysis:** in the analysis phase, the problem to be solved is described. Requirements are recorded with the various **stakeholders**, i.e., the people who have an interest in the project progression and its results. These requirements are analyzed and consolidated. For this purpose, the analysis phase is often detailed further, e.g., for the recording of system requirements, the recording of software requirements, and the analysis and verification of these requirements (Boehm 1984; Royce 1987).
* **Design:** in the design phase, a rough concept and then a detailed concept are created based on the requirements. The system architecture is developed. The individual components and their interfaces are defined.
* **Implementation:** the project scopes are implemented according to the specifications developed in the design phase. Only now does the specific programming begin.
* **Testing:** oncedeveloped, the software is tested in the target environment. This involves examining whether the requirements specified in advance have been implemented.
* **Deployment and maintenance:** the software is released for productive use. This phase also includes the delivery, maintenance, and improvement of the software.

If a project works according to the waterfall model, the phases, their content, and results are already planned in advance. This is eminently possible for projects in which the requirements can be specified precisely and change only slightly as the project progresses (cf. Mirwald 2019, shown using the example of the introduction of CRM software, i.e., software for customer relationship management). Conversely, this fixed planning can be a major disadvantage (Kuhrmann 2012): potential users are only involved in the early phase. Requirements are difficult to change during development. Errors in analysis, design, or development are typically only noticed in later phases and are difficult to correct, since there is no provision for reversion, e.g., from the testing phase to the analysis phase.

#### V-model

Like the waterfall model, the V-model is a prominent representative of the sequential process models. It represents an extension of the waterfall model by explicitly integrating quality assurance (Balzert 2008). It is also referred to as the Validation or Verification Model. The “V” in its name is reflected in the V-shaped arrangement of the phases. The left branch comprises the step-by-step specification of the project object from the rough draft to the detailed design, as well as the actual implementation. The right branch describes the testing to be conducted as well as the verification and is implemented from bottom to top. First, all the developed components are tested individually, then in their composition as a subsystem, and finally as an overall system. Each phase in the left-hand branch of the V-model has a corresponding phase in the right-hand branch, so everything that has been designed is also tested.

The V-Model in Software Development



The term *V-model* can easily lead to confusion since different models can be hidden behind it:

* **V-model XT:** the V-model XT (cf. Friedrich et al. 2009) and its predecessor V-model 97 (cf. Dröschel/Wiemers 2000) are required in Germany as the standard process model for public tenders for IT projects. XT stands for eXtreme tailoring, which means that the process model should be tailored to the needs of the project. V-model XT Bund is the version of V-model XT adapted to the requirements of the German federal administration (Informationstechnikzentrum Bund 2019).
* **Systems engineering V-model:** in systems engineering (SE), the V-model describes a development methodology for mechatronic systems and is included, for example, in the VDI 2206 guideline (cf. VDI 2004). In systems engineering, it is also referred to as the Vee model (cf. Walden et al. 2015, p. 33f. ) and focuses on the aspects that are important for systems engineering: while the V-model XT is designed for software development, the Vee model focuses on system development, particularly the development of systems that combine hardware and software.

### Concurrent Process Models

The aim of concurrent process models is to shorten the project duration. The project is accelerated by carrying out work in parallel, which is why the term *parallel process models* is also common (Timinger 2017, p. 38). One of the best-known representatives of concurrent process models is **simultaneous engineering** (SE), which is used in product development. In practice, it is often found as a standard process model in the automotive industry within the product development process (Rudert/Trumpfheller 2015 for Porsche AG). In simultaneous engineering, technical/logical downstream processes do not start only when the upstream process is completely finished, but rather as soon as enough information is available in sufficiently good quality (Timinger 2017, p. 42f.). Successful project implementation requires intensive and targeted communication between the project participants, with interim results needing to be exchanged on a regular basis. This is ensured by a cross-functional SE team (Dixius 1998, p. 44–52). Partial results developed in parallel must be combined into an overall package at defined synchronization points. It also requires well-functioning change management so adjustments can be made as quickly as possible in all affected, parallel activities.

**Simultaneous engineering** Simultaneous engineering (SE) refers to the

parallel development of products and processes with the aim of reducing the overall development time.

### Repetitive Process Models

Repetitive process models run through project phases several times. In contrast to sequential process models, in which a phase is repeated if the delivery result was incomplete or faulty, repetition is explicitly scheduled here. In this process, selected phases or all phases can be carried out multiple times. The goal is to ensure that experience and lessons learned from the previous run are incorporated into the next repeat. The project result is developed step by step with this procedure (Timinger 2017, p. 38). The **spiral model** is an example of such a process model. Repetitive process models are particularly suitable if certain aspects are still very unclear, little experience with them is available, or the requirements are unstable (Timinger 2017, p. 44).

**Spiral model**

The spiral model describes a cycle with four steps that is run through as often as necessary until the final product is developed. It has the goal of controlling and minimizing the project risks.

### Self-Check Questions

1. What is meant by a sequential process model?

*In sequential process models, the project team works in successive, self-contained phases. The result of each phase is, in turn, mandatory input for the next phase. Examples of phase results are documents such as a requirements specification or a created software. The project team must first complete a phase before it is allowed to start the next phase. Reverting to earlier phases is not permitted.*

1. Provide an example of sequential, concurrent, and repetitive process models.

*The waterfall model is the best-known representative of sequential process models. Simultaneous engineering is an example of concurrent process models. A repetitive process model is, e.g., the spiral model.*

## 3.2 Phases in Traditional Project Management

The DIN standard 69901–2:2009–1 on project management introduced the concept of project management phases to structure the tasks arising in project management (DIN e. V. 2009a). The five project management phases are initialization, definition, planning, control, and completion, which refer only to the tasks of project management and are not to be confused with the project phases.

A similar concept, but without the aspect of time progression, can also be found in other project management standards (Angermeier 2009). The PBMOK Guide, for example, makes a division into what are known as process groups (PMI 2017b, 561ff). PRINCE2 defines processes and sub-processes for project management (AXELOS 2017). In addition to tasks that occur at specific times during the project, there are also tasks that are performed continuously throughout the entire project life cycle. This unit follows the classification of the project management phases of the DIN standard 69901–2:2009–1 further and elaborates the aspects that occur continuously.

### Project Initialization

While immediate implementation is preferred for many projects, project initialization must not be neglected. This is where the foundation for the success of the project is laid (Wysocki 2019, p. 153f.). Project initialization is carried out by the project initiator or a person they designate, who may be the future project manager. Together with affected persons and organizational units, the project initiator works out what problem is to be solved and what the situation should be after successful project completion (for a practical example, see Pratt 2015, p. 43–46).

**Project profile**

The project profile contains a concisely formulated project description, project goals, participants, deadlines, costs, and risks. The project profile is also referred to as a project charter.

#### The project profile

In this phase, the project idea, which is still very vague at the beginning, must be concretized in such a way that a decision can be made as to whether the project should be pursued further or not. For this purpose, a **project profile** is developed that compactly presents information about the project on one page (known as a one-pager) (cf. Timinger 2017, p. 54; Martinelli/Milosevic 2016, p. 71–78). As the following illustration of a template for a project profile shows, this also contains an initial schedule and an estimate of the effort and expense involved:

Project Profile

**Project name:** Name of project

**Initial situation:** Description of the initial situation and the

motivation behind implementing the project

**Project goals:** List of project goals

**Stakeholders:** List of key stakeholders

**Delineation:** Description of non-goals

**Project risk:**  Description of project risks

**Project start:**  Planned start date

**Project end date:**  Planned end date

**Project costs:** First estimation of project costs

**Project initiator:** Last name, first name (department)

**Customer/user:** Internal or external customer

The sponsors, stakeholders and customers of a project are closely involved in order to develop a common understanding of a project and the expected results (Habermann 2014, p. 572f.). Important aspects regarding stakeholder management can be found in the continuous tasks of project management, which are discussed below. A graphical representation as a **project canvas** is also suitable for the sharpening and communication of the project goals and project content (Habermann 2014, p. 575–577; Schloss 2019).

**Project canvas**

A project canvas outlines a project and its key aspects in the form of a pre-structured poster.

#### Goal definition

**Project goals**

Project goals describe the planned state after the project has been implemented.

Before a project is started, the **project goals** should be defined (cf. Timinger 2017, p. 56; Peterjohann 2012, p. 1). These are divided into cost, dates, and performance goals and are mutually represented in what is known as the magic triangle of project management (Lock 2013, p. 23–26; Timinger 2017, p. 56). Time, costs, and quality form the cornerstones of the triangle. If one of the three factors changes, the other factors must generally compensate for this change.

There are various techniques that help to formulate good goals (cf. Javorsky 2019, p. 4–8; Peterjohann 2012). With the help of the SMART formula, goals are formulated so they are specific, measurable, attractive, realistic, and time-bound (Locke/Latham 1990; Locke/Latham 2002). Establishing a hierarchy of goals can also be helpful in structuring goals and identifying interdependencies. In addition, the project team should know which stakeholders have an interest in which goal.

### Project Definition

In this phase, the project is concretized so there is a clear idea of the project scope and project approval can be obtained ( Patzak/Rattay 2018, p. 90f.; Timinger 2017, p. 52; Angermeier 2012). Depending on the project size, the (future) project manager may already have a core team as support. In order to have a clear understanding of the client’s expectations, traditional project management uses the **requirements specification** (or a list of requirements) created by the client or the project initiator (Patzak/Rattay 2018, p. 91).

**Requirements specification**

The specifications contain the client’s requirements for the product to be developed or, more generally speaking, for the delivery result.

#### Development of the business case

Every project represents an investment for a company. A business case is used for a well-founded analysis of costs and benefits (Martinelli/Milosevic 2016, p. 68–71; Taschner 2017, p. 6). The business case breaks down the costs to be incurred in the coming years and compares them with the expected benefits. In doing so, the expected benefits are quantified. For example, if the project is expected to lead to time savings, the amount of working time that can be saved must be shown.

#### Obtaining the project order

**Project order**

The project order is akin to a contract. It is signed by the project manager and the client.

The **project order** is the formal confirmation of the project (Timinger 2017, p. 54f.; Martinelli/Milosevic 2016, p. 71; Alam/Gühl 2020, p. 77–79). An important component of the project order is the requirements specification, which describes how the requirements set out in the specifications or the services to be provided are to be implemented in specific terms (Patzak/Rattay 2018, p. 91). These criteria are examined during acceptance at the end of the project.

Generally speaking, project approval is granted by a specific committee within the company. A presentation to such a body requires the project to be presented in such a way that presents all the important technical, organizational, and economic aspects in a structured manner (Martinelli/Milosevic 2016, p. 72–76; Javorsky 2019, p. 1). The project receives the required resources upon the project order, i.e., it is provided with the approved budget, employees, and work equipment. Projects are often embedded in existing programs and project portfolios within the company (Patzak/Rattay 2018, p. 489; Association for Project Management 2019, p. 62). If project approval has been granted, the project can officially start with the first joint meeting, the kick-off meeting (Timinger 2017, p. 54f.).

### Project Planning

After the question of what should be done and why this is important has been answered in the first phases, how the project should be processed is the next aspect considered in detail (Wysocki 2019, p. 191f.; PMI 2017b, p. 565). The project scope is defined and time, cost, and resource plans are created. Measures and plans for communication, quality and risk management, and stakeholder management are also developed. These are detailed under cross-phase tasks.

#### Phase and milestone planning

Each process model defines project phases and milestones in a specific way. Therefore, the decision for a process model must be made at this point. This must then be defined for the specific project. For example, the dates and delivery results are specified for the milestones (Timinger 2017, p. 66–70).

#### Creation of a work breakdown structure

Now the entire project content to be worked on is divided into work packages and arranged hierarchically in a tree structure (Timinger 2017, p. 79–86; Martinelli/Milosevic 2016, p. 126–143; Madauss 2020, p. 305–323). The goal is to cover the upcoming work as completely as possible. This plan is called a **work breakdown structure** (WBS).

**Work breakdown structure**

The work breakdown structure (WBS) is a hierarchical list of all project activities.

**Gantt Chart**

A Gantt chart clearly depicts project activities, their chronological sequence, and their interdependencies in the form of bars on a time axis. It is named after Henry Gantt, who developed this representation.

#### Preparation of the schedule and timetable

In addition to the work breakdown structure, the schedule shows the temporal and logical sequence of the project activities (Timinger 2017, p. 87f.), forming the basis for time and schedule planning. The duration of the individual activities is now estimated and buffer times are planned. **Gantt charts** or networks are often used for this purpose. Gantt charts, or bar charts, use bars to represent the chronological sequence of the work packages (Martinelli/Milosevic 2016, p. 146–150; PMI 2021, Part 2, p. 189). For small projects, the Gantt chart provides a good overview of the upcoming tasks, their duration, and the planned completion date. A network diagram presents all work packages in a chain, based on their interdependencies (Timinger 2017, p. 87–94; Madauss 2020, p. 329–340). On this basis, critical paths can be identified and buffer times can be built in. The critical path describes the activities whose delay would result in the project’s final deadline no longer being met. However, the creation of a network plan is very time-consuming. Whether this effort and expense is in proportion to the expected benefit must be weighed up in each individual case. Small or short projects therefore tend to work with a Gantt chart rather than a network plan.

#### Resource and budget planning

An essential part of project planning is determining the resources required for project implementation (Timinger 2017, p. 94-101). Resources include personnel, operating resources, material resources, and other services such as external services. In most projects, personnel is the most significant resource. Therefore, which project staff with which competencies are needed for which project tasks must be planned with precision. The comparison of resource requirements with existing capacities often leads to the need for adjustments and optimization (Association for Project Management 2019, p. 178f.). Necessary resources are allocated for the work packages defined in the WBS. When the project is being executed, the project manager hands these work packages over to the designated team members. The responsibility for completing the task then lies with the respective team member responsible. The project manager monitors and controls the handling of the work packages.

Detailed budget planning is used to determine the costs for each work package and consequently for the entire project (Association for Project Management 2019, p. 180f.). The costs for the required resources are calculated by multiplying the required quantity (e.g., the number of person days estimated for a work package) by the price or cost rate (e.g., the daily rates of the required employees). Financial and budget planning is based on this data.

#### Project organization

In project organization, the questions arise as to how the project is integrated into the company organization and how the project team itself is to be organized. A widely used form of organization is the **matrix organization**. Roles are determined and their tasks, competencies, and responsibilities are defined (Timinger 2017, p. 70–73). The type of collaboration between the project team and specialist departments should also be considered (Madauss 2020, p. 147–151).

**Matrix organization**

A matrix organization is an organizational structure in which organizational units such as departments form one dimension and projects form a second dimension.

### Monitoring and Control

During project implementation, it is the task of project management to monitor the progress of the project, to compare it with the project plans, and to initiate any necessary corrective measures (PMI 2021, Part 1, p. 34–35; Timinger 2017, p. 101). The project status, risks, and measures are reported to the clients.

#### Progress control and analysis

The plans created in the planning phase, such as the Gantt chart and the budget, are used to continuously check whether the planned tasks have been implemented within the specified time and cost (Madauss 2020, p. 346–350). There are various techniques for analyzing the project status, such as milestone trend analysis or earned value analysis (PMI 2021, Part 2, p. 104f; Timinger 2017, p. 105–111). For this purpose, the degree of completion is determined, e.g., by comparing completed partial products, hours worked, and costs incurred. In some cases, the original planning must be revised. Project plans are adjusted accordingly. In general, however, these progress monitoring techniques do not replace communication between project management and the project team.

#### Control

It is important to identify deviations early on, i.e., not only when deadlines and milestones have not been met and the entire project is delayed. In this context, risk management also plays an important role, which will be introduced later in the unit. The earlier a possible delay is identified, the easier it is to counteract it (Timinger 2017, p. 110f.). The planning must be fundamentally revised in the event of major deviations. Measures then include, e.g., using additional resources, reducing requirements, or postponing deadlines.

**Steering committee**

The steering committee, also called steering board, is the superordinate body of a project. It decides, e.g., on whether to continue with or terminate the project.

#### Reporting

Project management regularly reports to the client or **steering committee** on theproject status (Wysocki 2019, p. 335–338). In most cases, standardized reports are used, in which the planned and actual deliverables, costs, and deadlines are compared for each work package. Key figures from earned value analysis are also used here. A **traffic light status** is also frequently shown in this report (Timinger 2017, p. 112f. ). Green stands for *everything in order*, yellow warns of deviations, and red indicates that it is no longer possible to achieve the goal under the current circumstances. In addition to these reports, the other stakeholders must also be kept up to date in an appropriate form.

**Traffic light status**

The traffic light status clearly depicts the status of a task, a work package, or an entire project using the traffic light colors red, yellow, and green.

### Project Completion

The final phase of the project is about formally concluding the project, *conserving* experiences from the project, and ultimately dissolving the project organization (Timinger 2017, p. 112–114; Wysocki 2019, p. 343).

**Change request**

In a change request, a request for change is recorded in a structured manner and includes the particular motivation for the change, the associated services and costs, and any resulting deadline postponements.

#### Acceptance by the client

The delivery results agreed in the project order must be accepted by the client at the end of the project (Timinger 2017, p. 114; Wysocki 2019, p. 345f. ). The prerequisite for quibble-free acceptance is that the acceptance criteria were clearly agreed at the start of the project, since acceptance now occurs on the basis of these criteria.

If specified criteria are not implemented or are implemented differently without a **change request** having been approved, the client can refuse acceptance and demand a rework. This aspect will be discussed in more detail in the context of documentation, configuration and change management later in the unit. Acceptance, including any rework to be carried out, is documented in an **acceptance report** that is signed by the project manager and the client.

**Acceptance report** The acceptance report documents the acceptance of a deliverable by the client.

#### Final analysis and project completion report

**Lessons learned**

Lessons learned are used to reflect on the collaboration and to develop improvement measures.

In addition to formal acceptance, the question arises as to whether the project was successfully completed (Wysocki 2019, p. 349–351; Timinger 2017, p. 115–117). For this purpose, the project team discusses, e.g., in the context of **lessons learned,** whether ...

* ... the agreed goals in terms of time, quality and cost have been achieved.
* ... the client or the customer is satisfied with the project results.
* ... the project team is satisfied with the project progression, the project results, and the collaboration.

The findings are often documented in a **project completion report**, which shows how the project goals were achieved and what specific results were delivered (Schreckeneder 2004). With regard to deadlines and costs, planned and actual values are compared and deviations are presented. In addition, the project process and the collaboration with the various stakeholders are analyzed. It is important that the findings from which other projects can benefit are actually shared (Wysocki 2019, p. 347–349), e.g., in the form of templates and checklists. This can be used, e.g., to further develop the process model used within the company.

**Project completion report**

The project completion report describes the overall result of the project. The aim here is to pass on experience.

#### Dissolving the project organization

The project organization is dissolved in the closing phase. Employees who have completed their tasks move to other projects or back to their original function (Timinger 2017, p. 118). Rather than a project team simply disintegrating, the project completion should be celebrated together and appreciation for the work the team has achieved should be expressed (Wysocki 2019, p. 352). In this phase, the project manager must also ensure that the remaining tasks are completed carefully and efficiently, even if some employees—and perhaps they too—are already mentally engaged in the next project. Documentation must also not be neglected. Otherwise, there is a risk that necessary information will be missing if errors occur later or features are to be expanded.

### Self-Check Questions

1. What project management tasks take place during the project planning phase?

*Project planning lays the foundation for the implementation of the entire project. The overall project is divided into subprojects and work packages. The work packages are placed in a logical, chronological order and the time required for the individual work packages is estimated. The expected project duration can be determined from this. In addition, the resources required to process the work packages are determined and the requirements are compared with the available capacities. The costs for the required resources are determined and the overall budget is planned.*

1. Complete the following sentence:

In parallel with project implementation, the project manager *monitors* and *controls* all relevant project activities. They monitor compliance with the *budget* and ensure that deliverables are delivered *on time*. Theyalso update the *project plans*. They report to the client on the *progress of the project*.

1. What is the purpose of project status reports? Mark the correct answers.

* *They show the progress of a project.*
* *They support the project team in recording the progress of their work as objectively as possible.*
* *They indicate deviations from the project plans.*
* They provide project staff with the opportunity to decide how to proceed with the project. (F)

## 3.3 Continuous Tasks in Traditional Project Management

Some tasks in project management are performed continuously throughout the course of the project, namely stakeholder and risk management, quality management, as well as documentation, configuration, and change management (Timinger 2017, p. 120). These tasks are considered in detail in the following. Other cross-phase tasks include project marketing, which is closely related to stakeholder management (cf. Timinger 2017, p. 132–135; Patzak/Rattay 2018, p. 199–202), as well as contract and claim management (cf. Timinger 2017, p. 149–153).

### Stakeholder Management

Stakeholders are all the individuals or groups of people who are involved in a project, who have an interest in a project and its results, who can influence a project or who are affected by it (Timinger 2017, p. 121). They all bring their own ideas, values, qualifications, and prior experience (Martinelli/Milosevic 2016, p. 423). This is not only about the stakeholders who support the project, but also those who view it critically or even reject it. If stakeholders are overlooked or neglected, this endangers the success of the project. The **project sponsor** is also an important stakeholder. As a representative of middle or upper management, they have a certain amount of power and influence in the company (Holloway/Bryde/Joby 2015, S. 11–28).

**Project sponsor**

The project sponsor supports the project by ensuring acceptance for the project.

**Stakeholder analysis**

Stakeholder analysis is used to determine which internal and external people have an effect on the project.

**Stakeholder analysis** is a technique to identify the stakeholders of a project and assess their importance to the project, as well as their influence (Schibi 2014, p. 83–85). It is also referred to as environment or force field analysis. Important steps here are:

* **Gather stakeholders:** all individuals or groups of people who might be interested in the project in some way are identified (Martinelli/Milosevic 2016, p. 424f.; PMI 2021, Part 2, p. 10–12; Schubert 2021). Both internal and external stakeholders are considered. Suppliers, competitors, and customers can also be relevant.
* **Evaluate stakeholders:** all stakeholders are evaluated in terms of their attitude to the project (positive/negative) and their influence (high/low) on the project’s progression (Martinelli/Milosevic 2016, p. 425–427, 2021, Part 2, p. 12). An overview of all stakeholders with interests and influence can be visualized in a **stakeholder matrix** or a stakeholder map **(**Schibi 2014, p. 87–91). This is the basis for planning measures, e.g., for communication.

**Stakeholder matrix**

A stakeholder matrix represents the most important stakeholders in an XY graph.

* **Plan measures:** appropriate measures should be taken and implemented on this basis (Timinger 2017, p. 124f.; Schibi 2014, p. 108–111; PMI 2021, Part 2, p. 12–13).

The list of stakeholders and their evaluation should be reviewed throughout the course of the project and updated, if necessary, since opinions and influencing factors can change (PMI 2021, Part 2, p. 14). In addition, misevaluations can be corrected.

### Risk Management

According to the understanding of DIN 69901–5:2009–01, project risks are specific, explicitly negative events that can occur in the project progression with a certain probability (cf. DIN e. V. 2009b). Other approaches have a broader understanding and speak of opportunity and risk management, i.e., in addition to risks, opportunities for a project are also systematically recorded and seized (Romeike 2018, p. 2–13; Rohrschneider 2006, p. 9).

Risks must be identified early on so the probability of their occurrence can be reduced and the potential damage limited (Martinelli/Milosevic 2016, p. 377). Risk management is therefore one of the core tasks of project management and must be carried out continuously over the entire course of the project. Some things that look harmless at the beginning can develop into threats over time and cause the project to fail.

#### Identification of project risks

Project risks should be recorded as completely as possible. Various techniques can assist with this (Martinelli/Milosevic 2016, p. 379–381; Rohrschneider 2006, p. 21–46). Lists of potential project risks, for instance, also serve as an aid (Windolph 2018). They stimulate thought in directions not previously considered. Lessons learned from other projects can also be a good source. It is additionally important to exchange ideas with experts such as experienced project leaders and managers. Consider the causes and indicators to better understand the risks.

#### Risk analysis

In risk analysis, the risks that have been identified are analyzed and evaluated with regard to various aspects (Martinelli/Milosevic 2016, p. 381–385; Rohrschneider 2006, p. 47–80). First, the probability of occurrence (e.g., low, medium, and high) and the effect (e.g., low, medium, high), i.e., the amount of damage, are determined for each risk. This is used to calculate the damage value (probability of occurrence x amount of damage). A project risk could be, for instance, that important stakeholders change during the project because a restructuring of the company is pending. The department head who strongly supports the project might no longer be in this position after this reorganization, but is rather in another department within the company. The risk analysis now assesses how likely it is that stakeholders will change. It also assesses how high the damage may be. In this case, the damage could be high because this person has pushed the project in the relevant company bodies all the way up to company management.

Risks can be divided into risk classes on this basis. For prioritized risks, measures are developed to reduce the probability of their occurrence or to limit the damage if they do occur.

#### **Risk monitoring**

The indicators for the occurrence of a risk must be continuously monitored during the course of the project and, if necessary, the prepared countermeasures must be initiated (Martinelli/Milosevic 2016, p. 385). In addition, emerging risks must be identified, analyzed, and included in the monitoring. If measures have been taken to reduce the probability of risks occurring, their effectiveness must be examined.

### Quality Management

If a project does not meet the agreed quality requirements, this can have serious or negative consequences for the stakeholders (PMI 2021, Part 2, p. 80). An app that crashes frequently, for instance, is quickly uninstalled by users and negatively reviewed. In the case of safety-critical functions, such as autonomous driving, quality defects are unacceptable and can have fatal consequences. Therefore, quality management is a key task of project management and is one of the core competencies of a project manager. Quality management can refer to two aspects (GPM 2017, p. 126):

* The quality of the project management process, i.e., the way in which the project is planned and controlled.
* The quality of the project’s results and deliverables, i.e., whether all requirements, functions, and metrics are met.

Quality management includes all tasks for planning, controlling, testing, and improving quality. It is essential in all phases from project planning to project completion. Quality management has the following goals (Zell 2017, p. 72):

* Creating clear structures and comprehensible processes.
* Minimizing errors.
* Avoiding frictional losses.
* Reducing complaints and reworks.
* Increasing productivity.

#### Quality planning

Quality planning is about creating a common understanding of quality, what specifically is to be achieved, and what demands are placed on quality (Schulz 2015). This should be done at in early phase of the project. Quality goals, quality requirements, and quality standards for the project and the project results are agreed upon (Patzak/Rattay 2018, p. 230–240). For this purpose, the corresponding measures for quality assurance and quality review must be planned and responsibilities defined.

#### Quality assurance

Quality assurance provides confidence that the results developed in the project meet all quality requirements. There are different types of quality assurance measures, with the specific measure chosen depending on the level of quality needed at the time. Examples are (Schulz 2015):

* **Four-eyes principle:** (partial) results are checked by a second person.
* **Review:** formal review of deliverables based on pre-agreed criteria.
* **Walkthrough:** going through a document or developed software code step by step with a tester or testing a software or product in direct interaction

### Documentation, Configuration and Change Management

Project results and their respective configuration status must be documented over the entire course of the project (Timinger 2017, p. 138). It must be possible to track what was changed when and for what reasons. Documentation, configuration, and change management ensure this.

#### Documentation management

Well-functioning documentation management ensures that all project members can quickly find the documents they need in their current status (Madauss 2020, p. 458–460). This includes defining ...

* ... which documents are required for successful project implementation (Madauss 2020, p. 461–463). For example, which documents are required by the client, or which documents must be submitted as proof in the case of approval or authorization by authorities must be clarified.
* ... which information must be documented in which form and who is responsible for its creation and release, respectively (Madauss 2020, p. 463–466). The degree of documentation that is appropriate and necessary must also be decided in each project. An excess of documentation leads to high effort and expense; too little documentation can lead to problems with changes or later repair and maintenance work.
* ... how the status of documents is recorded, maintained, and monitored (Madauss 2020, p. 469f.). Examples of status include *planned*, *in preparation*, *under review*, *approved*.
* ... where documents are stored. A central storage location with corresponding access authorizations reduces unnecessary effort searching for documents. Depending on the size of the project and the number of project participants, a **document management system** (DMS) can be useful (Madauss 2020, p. 460–462). A shared wiki or blogs can also be suitable for project documentation (Alam/Gühl 2020, p. 44).

**Document management system**

A document management system (DMS) is software for managing and archiving documents.

* ... to whom and in what form the respective documents are distributed (Madauss 2020, p. 469f.). Distribution lists are created for this purpose, for example.

#### Configuration management

Documentation management is the basis for configuration management. Configuration management means the management of **configuration units** of the product or software developed during the project and the associated configuration-related data (Madauss 2020, 471ff. ). This configuration unit is like a package into which connected work results, e.g., a connected software and hardware status, are packed. Customers can be offered different configurations, e.g., a basic configuration and a professional variant. Configuration management includes the identification of configurations, their monitoring and maintenance, and status determination. A separate standard serves as a guide to configuration management, namely DIN ISO 10007:2020–10 (DIN e. V. 2020a).

**Configuration unit**

A configuration unit comprises a set of work results that collectively perform a given task.

#### Change management

Every project must handle change requests, even if traditional practices attempt to specify all requirements as precisely as possible in advance. The later a change occurs in the course of a project, the more expensive and time-consuming it tends to be. Change management in a project ensures that all change requests are recorded in a structured manner and reviewed by the right people (Timinger 2017, p. 146–148; Wysocki 2019, p. 288–291). How change management is specifically carried out in a project should be determined in the project planning phase (DIN e. V. 2009a, p. 29). This also determines who decides on a change. Depending on the scale of the change, it may be possible, e.g., for the project manager to decide themselves or for the project steering committee to decide on approval.

When reviewing change requests, a cost-benefit analysis is often performed. The effect on the project and the project outcome must be realistically assessed. Alternatives are examined, if necessary. The risk posed by the change must also be considered. After a change has been approved, documentation and deliverables must be adjusted so the change can be easily tracked later.

### Self-Check Questions

1. Mark the correct answers.

* A stakeholder matrix classifies stakeholders according to their interest in and availability to the project. (F)
* A stakeholder matrix classifies stakeholders according to their expertise and influence. (F)
* *A stakeholder matrix classifies stakeholders according to their interest and influence.*
* A stakeholder matrix classifies stakeholders according to their motivation and availability. (F)

1. What tasks are part of risk management in a project?

*The range of tasks within risk management includes (i) identifying potential risks, including their causes and indicators, (ii) systematically evaluating and prioritizing these risks, (iii) developing measures to reduce these risks, and (iv) monitoring all the tasks related to risk mitigation.*

Summary

Traditional project management encompasses a wide range of methods and techniques. These methods have proven themselves over decades and are still very useful today, partly in combination with agile methods. Traditional practices are characterized by the fact that the project process is determined in advance to the greatest possible extent. This means that the end date, deliverables, and project costs can already be contractually agreed between the client and the project at the start of the project. Project implementation is closely monitored in traditionally conducted projects. The progress of the project can be clearly demonstrated to the client or a steering committee based on the completion of the defined work packages. This clear, predefined structure is also the biggest disadvantage of traditional project management. It makes it difficult to handle changes and unclear requirements. Changes during the project incur high effort and expense and can delay the entire project.

# Unit 4—Agile Project Management

Study Goals

On completion of this unit, you will be able to ...

... explain the factors that led to the development of agile practices in project management.

... substantiate the values and principles underlying agile methods and design their implementation in everyday project work.

... explain agile practices according to Scrum.

... engage with the evolutionary approach to change taken by kanban.

... contrast Scrum and kanban and demonstrate how the best of both approaches can be combined.

... show how lean thinking is shaping project management today.

# Agile Project Management

### Introduction

Agile approaches have found their way into software and product development in many companies in recent years, as well as in process optimization and the introduction of new (software) solutions (Fuchs et al. 2019, p. 199). According to the study by Komus et al. (2020), the most important reasons for using agile approaches are to optimize time to market, to optimize quality, and to reduce risks in a project.

**Time to market**

The time to market describes the time span from the product idea to the launch of the product.

A short **time to market** leads to clear competitive advantages (Measey et al. 2015, p. 103; Viscardi 2013, p. 7f. ). As long as there is no competition, products can be sold at higher prices. In addition, the break-even point can be reached earlier or the product can offer added value to users. A shorter time to market also reduces the risk that customer needs have evolved so much that the finished product is already obsolete. Nevertheless, a product that is brought to market prematurely and immaturely has negative consequences: expected features are missing, errors occur, customers become dissatisfied and make their displeasure known, particularly on social networks.

Agile approaches contribute to precisely these points because they focus on customer value and concentrate on the tasks and features that offer the highest added value for the customer (Measey et al. 2015, p. 119f.; Barenkamp/Thomas/Zarvic 2019, p. 225). The work is done in iterations. By delivering a partial result in each iteration, feedback from future users can be obtained early on (Stellman/Greene 2015, p. 56). By developing products that are ready for use at an early stage and already deliver significant benefits for the customer, they can quickly be productively offered to customers in an initial version and then successively developed further.

## 4.1 Agile Manifesto and Agile Values

Agile project management is based on a set of values published in 2001 as the “Manifesto for Agile Software Development,” abbreviated to “Agile Manifesto,” which has been translated into over 50 languages. The Agile Manifesto defines a common basic understanding for all agile practices (Clark 2019, p. 4f. ). The term *agile* came to prominence with the publication of the Agile Manifesto and various pre-existing ideas, approaches, and techniques were brought together (Pröpper 2012, p. 27).

The Agile Manifesto was signed by 17 people who have shaped agile project management and agile software development, some of whom still have a major influence on it today. These include Jeff Sutherland and Ken Schwaber, the founders of Scrum (Schwaber/Sutherland 2020), Kent Beck, one of the founders of extreme programming (XP) (Beck/Andres 2004), and Dave Thomas and Andrew Hunt, developers of pragmatic programming (Thomas/Hunt 2019).

### Agile Values

The Agile Manifesto defines agile values by forming pairs of values and emphasizing in each case which of the two values it considers to be more important in the agile project environment. The pairs do not describe an “either/or” and the less important side also has its *raison d’être* (reason for existence) (Preußig 2018, p. 39–42; Cobb 2011, p. 38f. ).

Agile Values

|  |  |
| --- | --- |
| Agile Values (Beck et al. 2001a) | Explanation (Stellman/Greene/Demmig 2018, p. 27–32) |
| Individuals and interactions *over* processes and tools | A tool that helps one team may be strongly rejected by another team because they do not see it as adding value. When a new tool or new procedure is introduced to the project team, it must improve communication and collaboration within the team and with stakeholders. |
| Working software *over* comprehensive documentation | Documentation is often interpreted differently by different people. In order to discover whether software or a product works, it must be tried out by those who will actually use it later. |
| Customer collaboration *over* contract negotiation | Agile teams know that requirements are not perfect at the start of the project and will change as the project progresses. Therefore, they do not seek to agree in detail on what will be implemented and how before the project starts. Rather, they work closely with the customer throughout the project. |
| Responding to change overfollowing a plan | Planning also occurs in agile projects. However, agile teams assume from the off that their plans will change as the project progresses. They do not work from a plan that they know is problematic. |

The values on the right provide structure and security. They are particularly strong in company groups and large companies. If a company wants to become more agile, Preußig (2018, p. 39–42) recommends ensuring a good balance between the left and right sides. Each organization must find its own way and take its specific economic, organizational, and legal circumstances into account .

### The Agile Manifesto Principles

The Agile Manifesto sets out twelve principles of agile software development. They concretize the agile values and serve as instructions for implementation in everyday project work. It is essential to understand these principles because agile methods and practices are built on them (Preußig 2018, p. 43).

#### Principle 1: satisfied customers

The first principle of the Agile Manifesto is: “Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.” (Beck et al. 2001c, n.d.). This principle calls for projects to be consistently aligned with the customer and their needs (Stellman/Greene 2015, p. 53). Software, or more generally formulated, a partial product, is valuable to the customer if it can already be used in its current scope and creates a **customer benefit** in the process.

**Customer benefits**

Customer benefit refers to the benefit experienced by the customer, i.e., what makes the product special to them.

Early and continuous deliveries enable the customer to provide feedback on interim results at a very early stage instead of waiting for the final delivery. This reduces the risk of continuing development without meeting customer needs over a longer period of time (Preußig 2018, p. 45; Stellman/Greene 2015, p. 54f. ).

#### Principle 2: changes are welcome

In the original, the second principle is: “Welcome changing requirements, even late in development. Agile processes harness change for the customer’s competitive advantage.” (Beck et al. 2001c, n.d.). This principle does not mean that chaos reigns in agile projects, that requirements need not be well thought out, or can be changed at will. On the contrary: the principle states that it is critical for success to consider comprehensible change requests that are based on customer feedback, new strategic requirements, or changed boundaries, e.g., new legislation (Preußig 2018, p. 45–47). If a project is able to take such requirements into account at acceptable costs, even late in the development period, this can have enormous competitive advantages.

#### Principle 3: functional increments in short cycles

The third principle in the original is: “Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.” (Beck et al. 2001c, n.d.). Functioning software means that it is not a prototype or a demonstrator that, for example, only shows the user interface and does not offer any further functionality (Preußig 2018, p. 50). Rather, in agile projects, functional program versions are regularly developed and presented to the customer (Stellman/Greene 2015, p. 61). After each step, a review is conducted to see what has been achieved. This feedback flows into the next **increment**. Depending on the product to be developed, an increment can also be a digital service, a physical product, or even a concept. Thus, the third principle complements the first principle. The principle also calls for keeping development time spans, often referred to as iterations, short (Measey et al. 2015, p. 107). This reduces the time without delivery and without testing.

**Increment**

In software or product development, an increment (Latin *incrementum—*increase, growth) is a deliverable intermediate result.

#### Principle 4: customer view in the project

The fourth principle claims: “Businesspeople and developers must work together daily throughout the project.” (Beck et al. 2001c, n.d.). This is necessary because requirements are only concretized as the project progresses while in close collaboration with the customer or with subject matter experts (Preußig 2018, p. 50f.; Stellman/Greene 2015, p. 68). In Scrum, the product owner has a dedicated role for this (Preußig 2018, p. 51). In practice, however, daily collaboration is difficult when employees are working on several projects at the same time.

This principle is also understood as a requirement for **cross-functional teams** (Preußig 2018, p. 50–52) consisting of experts with different focuses, such as process owners, business analysts, marketing experts, UX specialists, software and product developers, and testers. The opposite approach is an organization into component teams, such as requirements, design, and quality assurance teams, each of which is responsible for specific sub-aspects.

**Cross-functional team**

A cross-functional team has all the skills to work together to turn an idea into a product.

#### Principle 5: independent project staff

The fifth agile principle states “Build projects around motivated individuals. Give them the environment and support they need and trust them to get the job done.” (Beck et al. 2001c, n.d.). This spells out the belief that people want to and can act on their own responsibility. First, this requires employees who pursue their work with enthusiasm and propel their projects forward (Preußig 2018, p. 52f.; Stellman/Greene 2015, p. 74; Measey et al. 2015, p. 92–98). Second, an environment in which employees can learn from their experiences and receive the support they need must be created (Pröpper 2012, p. 31).

The trust in the project team must be noticeable in their daily work. For example, a meeting in which project team members talk about the status of their work can be perceived as control or as welcome support, depending on how it is initiated or moderated (Preußig 2018, p. 53).

#### Principle 6: direct communication

The sixth principle calls for face-to-face communication within the project team, rather than exchanging documents and emails (Stellman/Greene 2015, p. 67): “The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.” (Beck et al. 2001c, n.d.).

To promote direct communication, Scrum, for instance, defines a series of meetings. For example, the project team briefly synchronizes every day about the current status and upcoming tasks facing them over the course of the day. The need for coordination and support is addressed directly. Misunderstandings can be clarified immediately. This kind of meeting works both when the team is physically, e.g., as a stand-up at the coffee machine, or virtually in one place.

#### Principle 7: results orientation

The seventh principle requires that project progress be measured on the basis of specific and presentable results. “Working software is the most important measure of progress.” (Beck et al. 2001c, n.d. ), i.e., it is only a matter of which parts of the software are completed and fully functional (Stellman/Greene 2015, p. 74f.; Measey et al. 2015, p. 108f. ). How many components are still in progress, what research has been done, or what documents have been started are irrelevant. Nor is the number of working hours or the number of program lines measured. This principle ensures a clear focus on results (Pröpper 2012, p. 31).

#### Principle 8: sustainable project progress

The eighth principle is: “Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.” (Beck et al. 2001c, n.d.). Continuity is both a prerequisite and a result of agile working. At a constant pace, team members neither work to the breaking point nor are they underchallenged or waiting for work results from colleagues. The focus is therefore not only on reaching a project milestone in the short term, but also on long-term collaboration with employees (Stellman/Greene 2015, p. 76).

In this context, the concept of *team velocity* is important as a measure of the workload that the project team manages in an iteration (Preußig 2018, p. 56; Measey et al. 2015, p. 64). The scope of the next iteration can be planned out on this basis. A prerequisite here is that the project team has developed a good sense of what it can accomplish.

#### Principle 9: pursuit of excellence

According to the ninth principle, high-quality technical solutions and designs should always be the focus: the ninth principle states that “Continuous attention to technical excellence and good design enhances agility.” (Beck et al. 2001c, n. p. ). If the technical quality of the solution is not maintained throughout the development process, making changes to the product becomes increasingly difficult (Measey et al. 2015, p. 109). Interdependencies between work products should be avoided so as not to build up unnecessary complexity. Early and continuous testing ensures that any errors that occur can be quickly rectified. This ensures a high level of satisfaction among customers and users. It also prevents or reduces rework in later iterations, which often leads to schedule delays and skyrocketing costs (ibid., p. 107f. ).

#### Principle 10: simple solutions

“Simplicity—the art of maximizing the amount of work not done—is essential.” (Beck et al. 2001c, n.d.). This principle aims to keep the project team focused on the work that actually adds value (Measey et al. 2015, p. 119). Things should not be made unnecessarily more complicated or elaborate than they actually are. The temptation to do this is often great in projects, e.g., when the customer is excited about a feature and immediately has many more ideas about it(Preußig 2018, p. 59f.). This aspect will be taken up in the context of lean management and its approach to avoiding waste in the further course of the unit.

#### Principle 11: self-organization

“The best architectures, requirements, and designs emerge from self-organizing teams.” (Beck et al. 2001c, n.d.). This principle of self-organization clearly shows the difference in the organization and roles of traditional and agile project teams (Preußig 2018, p. 61). In an agile environment, it is not the task of a project manager to break down all the tasks into delegable subtasks and distribute them. This is done within the project team. This principle is closely related to principle five, which calls for the employees’ individual responsibility.

**Kaizen**

Kaizen is Japanese and means improving or changing something for the better. In Europe, it is known as a *continuous improvement process* (CIP) (Erne 2019. p. 152).

#### Principle 12: self-reflection

The twelfth agile principle postulates: “At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.” (Beck et al. 2001c, n.d.). This principle is reminiscent of **kaizen**, a fundamental attitude according to which improvement takes place continuously in small steps and is never completed (Preußig 2018, p. 61f.; Erne 2019, p. 152f. ). Added to this is the aspect that it gives the project team the opportunity to adapt itself and its working methods to a changed project environment.

In everyday project work, this principle is often implemented through lessons learned or **retrospectives** (Pröpper 2012, p. 32). These take place on a regular basis. The project team looks back at the last iteration, e.g., the last two weeks, and reflects on what went well and what went less well (Derby/Larsen 2006; Löffler 2014). In addition, the team develops measures that it wants to implement in the next iteration.

**Retrospective**

A retrospective is a meeting in which a team reflects on its own collaboration and develops measures for optimization.

### Self-Check Questions

1. What are the four values defined by the agile manifesto?

*The agile manifesto defines the following four values: (i) individuals and interaction are more important than processes and tools, (ii) working software is more important than comprehensive documentation, (iii) collaboration with customers is more important than contract negotiations, and (iv) reacting to change is more important than following a plan.*

1. Complete the following sentence:

The agile manifesto places great emphasis on the collaboration of the project team with the *customer*. Addressing the *customer’s needs* is more important than a watertight contract. Partial products are delivered early on and at regular intervals so *feedback* can be gathered and incorporated into the next *iteration.*

1. Mark the correct answers.

* The agile manifesto calls for developing a mock-up of the planned product in the first iteration so the customer can quickly get an idea of the finished product. (F)
* *The agile manifesto formulates the principle that functional software or products that are ready for use should be delivered.*
* The agile manifesto requires that each project member briefly document the status of their work in writing every day. This provides all project participants with an overview of the project’s progress and tasks that are still pending. (F)
* *The agile manifesto favors direct, face-to-face communication over written exchanges.*

## 4.2 Agile Approaches: Scrum and Kanban

Agile approaches are based on the agile values and principles. These represent common basic considerations, whereby individual values and principles are generally in the foreground. Scrum and kanban will now be considered in detail as agile approaches. According to the international study conducted by Komus et al. (2020), Scrum is the most widely used agile approach at team level with 84%, followed by kanban.

### Scrum

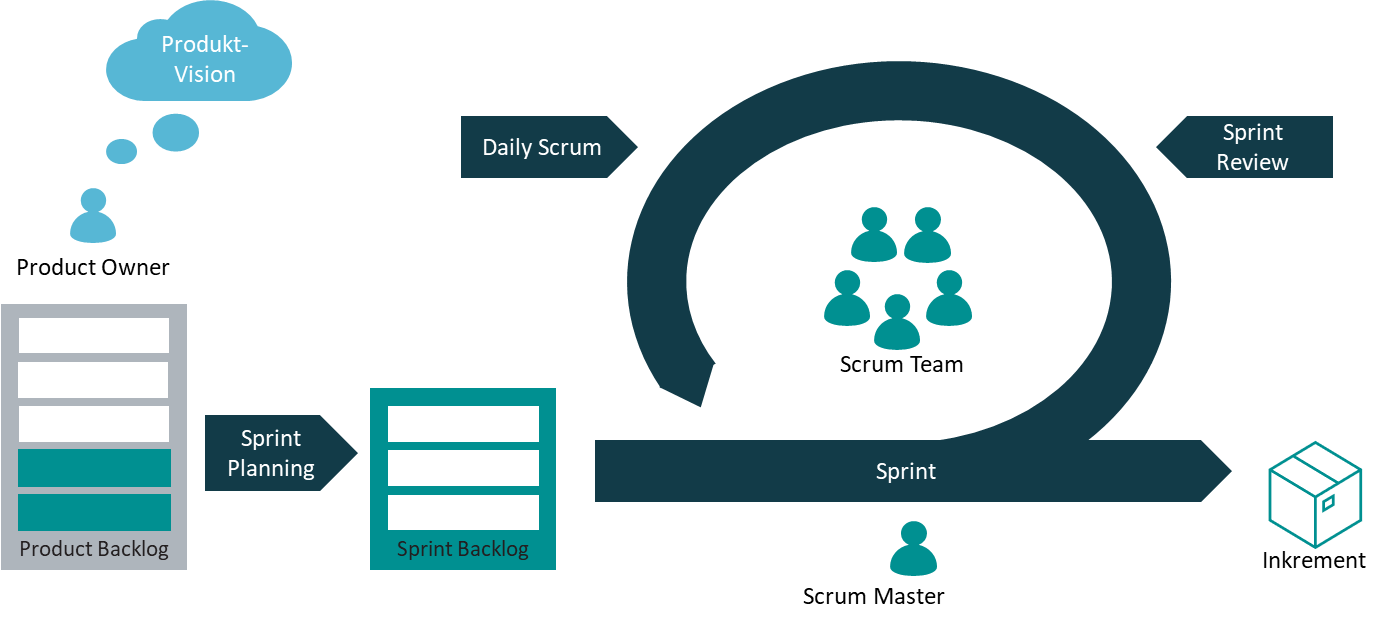
Scrum was conceived in the 1990s as an approach for agile product development (Viscardi 2013, p. 8–10). Jeff Sutherland and Ken Schwaber published Scrum for the first time at the OOPSLA conference in 1995. The concepts on which Scrum is based draw, among other aspects, on innovative approaches in product development that were developed, in particular, at Toyota (cf. Takeuchi/Nonaka 1986) and are presented below under the approaches of lean project management (Pichler 2013b, p. 3). Scrum has met with great interest in software development. In the meantime, Scrum has established itself on a general level as an agile approach for the development of complex products (Pichler 2013a, p. 1–5).

The founders of Scrum, Ken Schwaber and Jeff Sutherland, wrote the Scrum Guide in 2010 (Schwaber/Sutherland 2020). In less than 20 pages, they succinctly summarized what Scrum is all about and thus created a basic understanding of Scrum and the roles, activities, and artifacts involved. The original version of the Scrum Guide from 2010 has been subjected to ongoing further refinement (cf. Pfeffer 2020 on the innovations in the version from November 2020).

Scrum is designed as a lightweight framework (Sutherland/Coplien 2019). The Scrum Guide only defines boundaries, such as project roles and certain processes that are regularly repeated, and thus provide routine. It does not prescribe specific techniques. Gloger/Margetich (2018, p. 59) see the strength of Scrum precisely in this focus and deliberate simplification.

Among other aspects, Scrum embodies the values and principles of the Agile Manifesto (Pichler 2013b, p. 1). Products are designed and developed by self-organized, cross-functional teams. A Scrum team delivers functional increments in firmly defined development cycles, which are known as sprints. This means that every product increment can potentially be put into production (Preuss/Renk 2020, p. 30f. ). This also means that a product is built up and further developed step by step. Valuable new features are added with each sprint and are each reviewed from the customer’s point of view. The findings from this flow into the next sprint and thus into the next increment of the product. These steps are repeated until the product is completed (Pichler 2013b, p. 7):

Roles, Events and Artifacts in Scrum



#### The Scrum team

The basis for successful project work is an interdisciplinary project team. It usually consists of a maximum of 10 team members (Schwaber/Sutherland 2020). The three roles of developer, product owner, and SScrum master each have clearly assigned responsibilities. There is no hierarchy (Schwaber/Sutherland 2020).

**Product owner**

In Scrum, the product owner is responsible for creating the product according to the project goal or vision.

The **product owner** isresponsible for product development and represents the interests of the customer (Pichler 2013a, p. 7–30). They must ensure that the results justify the financial outlay for the project. They also combine some of the tasks held in traditional approaches by requirements managers, business analysts, project managers, and product managers. In particular, their tasks are (Measey et al. 2015, p. 133; Kooijman 2018):

* Close contact with stakeholders and customers and representation of their interests.
* Development and communication of the product vision in line with which the product is developed.
* Collaboration with the developers and the SScrum master.
* Documentation, maintenance, and communication of all requirements or tasks in the product backlog and prioritize them according to their value contribution to the product.

**Development team**

The development team carries out the work required in each sprint to create a product increment that can be delivered to the customer.

* Monitoring of project progress and organization of reviews with stakeholders during sprint reviews.

The **development team** implements the requirements and tasks in such a way that a product of value to the customer can be presented after each iteration (Pichler 2013b, p. 13–19). It is responsible for analysis, design, implementation, testing, and documentation. The development team works in a self-organized manner, i.e., it plans and distributes the upcoming tasks for a sprint and within a sprint independently within the team and monitors progress (Preußig 2018, p. 112–114). It bears responsibility for the quality of the delivery.

**Scrum master**

The Scrum master supports the product owner, the development team, and the organization in establishing Scrum.

The **SScrum master** ensures strict adherence to the processes as defined in the Scrum Guide, for example, and that all events take place (Pichler 2013b, p. 19–23; Viscardi 2013, p. 19). They support and coach the team in the application of agile methods, in self-management, and in interdisciplinary collaboration. They ensure that difficulties and problems holding up the team, known as impediments, are resolved and that the team can work undisturbed and productively (Measey et al. 2015, p. 132). The scrum master does not take the role of project manager or otherwise authorized to give instructions, but acts on an equal footing with the self-organized team (e.g., van der Wardt 2019).

#### The events

Scrum sets out various events and meetings. The Scrum Guide describes the sprint as the heartbeat of SScrum (Schwaber/Sutherland 2020). A sprint is an iteration, lasting a maximum of one month, in which the SScrum team develops a partial product (Preußig 2018, p. 79–81). After a sprint has been completed, the next sprint starts. This ensures short and continuous delivery cycles. Risks are minimized by obtaining feedback promptly and being able to take follow-up action. All other events take place within a sprint.

**Sprint planning** takes place at the beginning of a sprint. The entire SScrum team plans which requirements will be implemented in the current sprint (Viscardi 2013, p. 57–82). The basis is the product backlog, in which the product owner has marked the tasks with the highest priority according to the sprint goal. This gives the team a clear idea of how the benefits and value of the product are to be increased in this sprint. The developers must realistically assess which scopes they can implement within the parameters of the current sprint. The scopes to be implemented are transferred to a sprint backlog.

**Sprint planning**

The result of sprint planning is the sprint backlog, with all the tasks to be implemented within the parameters of the sprint, and a plan of how to proceed during the sprint.

The daily SScrum is a stand-up meeting of usually 15 minutes in which the developers coordinate (Measey et al. 2015, p. 75f. ). It has proven successful for the participants to answer the following questions (ScrumGuide.de n. d. ):

* What exactly have I achieved since the last daily Scrum?
* What will I achieve today?
* Am I expecting problems to hold me back and how could the team help me with this?

In the sprint review, the partial product that has been developed is presented to the customer and the most important stakeholders (Viscardi 2013, p. 113–126). Achievements are reviewed and the features to be implemented in the next sprint or can also be omitted are mutually determined.

The sprint retrospective is used to learn from experience in order to increase effectiveness and quality (Derby/Larsen 2006; Löffler 2014). The retrospective implements the principle of self-reflection from the Agile Manifesto. Each sprint is concluded with a sprint retrospective.

#### Scrum artifacts

The Scrum Guide defines three artifacts, namely the product backlog, the sprint backlog and the increment (Schwaber/Sutherland 2020). These artifacts represent a specific work or value that is created in the project as an (intermediate) result. Each of the artifacts creates transparency for certain pieces of information.

**Product backlog**

The product backlog in scrum is the key tool for collecting, structuring, and prioritizing requirements.

The **product backlog** is a list of requirements and tasks that must be carried out to develop the product (Pichler 2013b, p. 27–29; Viscardi 2013, p. 32–38). These can be new features, improvements, or bug fixes. The product backlog ensures a common understanding of how the planned product should look and how extensive it is. The entries in the product backlog are prioritized by the product owner (Pichler 2013b, p. 38f.). Alongside this, developers estimate the effort and expense required for implementation. The product backlog is not a static document completed just once, but rather, new entries are added. Requirements are often described in varying degrees of detail, namely as precisely as they are understood at the current time (Pichler 2013a, p. 56). In general, higher priority entries should be described in more detail than lower priority entries. This corresponds to the tenth agile principle, on simplicity: superfluous activities should be avoided.

The sprint backlog contains all the activities required to achieve the sprint goal, i.e., all the tasks to be completed in the current sprint (Pichler 2013b, p. 102–104). In sprint planning, the sprint backlog at hand is defined. During a sprint, no new tasks are added to the sprint backlog from outside.

**User stories**

A user story tells a story about how a customer uses the product. It is formulated in everyday language. The user story is written from the perspective of the user group.

The Scrum Guide does not specify a format for the backlog entries. In practice, **user stories** and **epics** have become established for this purpose (Measey et al. 2015, p. 53–56; Preußig 2018, p. 67–75; Pichler 2013b, p. 46–48). The same applies to an estimating the effort and expense. This is usually carried out on the basis of story points, abstract units for the complexity, effort and expense of a task (Measey et al. 2015, p. 60–62). In practice, the backlog is typically displayed on a (digital) pinboard or whiteboard with one card per user story. Digital tools, such as Jira from Atlassian or Trello, support agile teams in creating, editing, and archiving user stories and sprint planning (Preußig 2018, p. 76; Atlassian n.d.; Joiner 2018). This also makes it easy to generate different views, such as a kanban board. Some teams also still like to work with a physically tangible pinboard.

**Epics**

An epic is a massive user story. It is so large that its implementation would take more than one sprint. An epic is therefore broken down into several user stories.

An increment is a functional partial product, i.e., a step in the direction of the product to be developed, and is designed within the parameters of a sprint (Preußig 2018, p. 82f. ). The **definition of done** creates a common understanding of the quality criteria to be met (Preußig 2018, p. 97f.; Measey et al. 2015, p. 108). The increments each build on one another and must be functional.

**Definition of done**

With the definition of done (DoD), the project team establishes criteria for when a task is considered complete.

### Kanban

Kanban originated in Japan in the mid-20th century, when the automobile manufacturer Toyota developed methods under the name **Toyota Production System (TPS)** to optimize production processes and thus increase efficiency. The aim was to manufacture products in the required quality, at minimum cost, and with the shortest possible lead times (Erne 2019, p. 60). Approaches that became known as kanban played an important role in this. The Japanese word *kanban* literally means *card* or *placard* (Preußig 2018, p. 163; Anderson/Carmichael 2018, p. 11). Information relevant to production control is noted on these cards. These cards are hung on what is known as a kanban board so workflows can be displayed and bottlenecks can be analyzed.

**Toyota Production System (TPS)**

Since the 1950s and through the Toyota Production System (TPS), Toyota has pursued the goal of becoming competitive with other automakers.

David J. Anderson is considered to be the pioneer for the use of kanban as an agile approach in IT projects (Leopold/Kaltenecker 2018). The ideas from production control were transferred to knowledge work in the early 2000s, combined with other approaches, and adapted. In addition to software development, initial applications included service hotlines for handling customer inquiries and incident reports (Anderson/Carmichael 2018, p. 1). It defines a set of values, basic principles, and core practices by which kanban can be integrated into existing systems and procedures (Burrows 2015, p. 3–54).

#### Kanban values

Kanban defines the following nine values (Kusay-Merkle 2018, p. 215):

1. transparency,
2. balance,
3. cooperation,
4. customer focus,
5. workflow (flow),
6. leadership,
7. agreement,
8. understanding, and
9. respect.

#### Basic principles of kanban

Kanban defines the following four basic principles (Timinger 2017, p. 199–201):

* Start with what you do now.
* Agree to pursue incremental, evolutionary change.
* Respect the current processes, roles, responsibilities, and titles.
* Promote leadership and accountability at all levels of the organization.

These four basic principles illustrate the evolutionary change management approach of kanban. Building on the current status, small permanent improvements are made to the way things work and their effectiveness measured (Leopold/Kaltenecker 2015, p. 15–17). These small steps are intended to lead to greater acceptance by all those involved and reduce risks. This approach implements a **plan-do-check-act cycle**. Kanban is not an approach that leads to radical breaks and introduces many innovations at once. Rather, it is about continuous improvement. Kanban can thus be used in any company at any time.

**Plan-do-check-act cycle**

The plan-do-check-act cycle (PDCA cycle), also known as the Deming cycle, describes a continuous improvement process in four stages. Measures are planned, implemented and their effectiveness tested. These findings are then incorporated.

#### Six core practices

Kanban defines six core practices as concrete ways of acting in practice (Anderson/Carmichael 2018, p. 19–30; Measey et al. 2015, p. 148–150; Leopold/Kaltenecker 2015, p. 18–23; Timinger 2017, p. 202–209):

**Bottlenecks**

A bottleneck becomes clear on a kanban board: if tasks are jammed in a tasks column because the employees responsible for the subsequent step have not taken up a sufficient number of tasks, there is a bottleneck. This bottleneck theory is an important basis of kanban.

* **Visualize:** the workflow is displayed on what is known as a kanban board, typically a (digital) whiteboard. It shows how tasks “flow” through a process from left to right. Columns represent the steps in the process. The kanban board shows all the tasks that are in progress or waiting to be processed and thus creates the basis for managing the workflow and eliminating **bottlenecks** (Anderson/Carmichael 2018, p. 21f.; Leopold/Kaltenecker 2015, p. 25–37).
* **Limit** work in progress **(WIP):** kanban requires that the amount of work in progress (WIP) is limited to a reasonable level (Measey et al. 2015, p. 148f.). New tasks may only be started when work has been completed. The background to this is that processing a high number of tasks simultaneously increases **lead times**, e.g., the time it takes to process a ticket and close it again, or to implement a specific feature. In addition, set-up times occur each time a task is switched between, i.e., the employee needs time to get back into the task, provide the required work equipment, etc. The motto “stop starting, start finishing” sums up this approach (Roock 2018). This way of working transforms a push system into a pull system, i.e., a system in which employees independently pull tasks to themselves instead of being assigned them (Anderson/Carmichael 2018, p. 22f. ). Employees and teams work in a self-organized manner. This pull system is also a key aspect of lean management, which will be introduced later in this unit.

**Lead time**

Lead time is the amount of time it takes to process orders—from start to successful completion.

* **Manage the workflow:** various metrics are used to assess how productive the workflow currently is and to identify potential for improvement (Anderson/Carmichael 2018, p. 24f. ). The key metric is the cycle time, which should be minimal and as uniform as possible. The latter leads to better plannability. Other variables include waiting times, i.e., how long it takes for a finished task to be pulled from a neighboring processing station, throughput, or the error rate.
* **Make process policies explicit:** in practice, there are a great deal of informal rules to be found. This core approach means communicating process policies, e.g., what must be completed for tasks to move to the next column or the WIP limits, i.e., the rules limiting parallel work (Anderson/Carmichael 2018, p. 25f. ). Only when such policies are explicitly formulated can they be scrutinized and improved (Leopold/Kaltenecker 2015, p. 21f. ).
* **Implement feedback loops:** regular feedback in meetings and reviews is necessary to address problems and blockades and to remove obstacles (Leopold/Kaltenecker 2015, p. 22). For example, daily meetings in front of the kanban board, similar to the daily Scrum, are a good opportunity for this.
* **Improve collaboratively, evolve experimentally:** kanban pursues continuous and incremental improvements according to the philosophy of Kaizen, which, just like TPS, was developed by Taiichi Ohno (Anderson/Carmichael 2018, p. 30). The starting point is always the current situation. These improvements are to be made collaboratively through dialog, by employees who take responsibility for themselves and the organization. In the process, assumptions are made and things are tried out, discarded, or modified in such a way that an actual improvement is achieved.

### Comparing Scrum and Kanban

According to Kusay-Merkle (2018, p. 44–47), the key difference between Scrum and kanban is the way in which the amount of work commenced is limited: Scrum limits the time in which pending tasks are to be completed by introducing sprints with a fixed duration. Tasks are broken down so they can be completed within a sprint. In contrast, kanban limits the amount of tasks being processed simultaneously with the help of the WIP limit and thus ensures a constant workflow. Kniberg/Skarin (2010, p. 1–52) elaborate further differences and similarities. In general, it can be said that Scrum is particularly well-suited to creative tasks, since it gives the project team a clear structure. Kanban can also be used for routine tasks with workflows that are always the same, including those where the workload fluctuates greatly (Thiel 2020).

The introduction of Scrum or kanban presents organizations with different challenges (Measey et al. 2015, p. 151). Kanban is much less *invasive*: it is initiated with the existing roles, responsibilities, and processes. It is on this basis that small, evolutionary improvements take place. In contrast, both the ways of working and the company culture are subjected to fundamental changes with Scrum (Maximini 2018, p. 18–21). There is also a new set of fixed roles and rituals.

Scrum and kanban can be combined well in practice (Müller 2021; Scrum.org 2021; Brechner/Waletzky 2015, p. 57–70; Kniberg/Skarin 2010). For example, aspects of kanban are added to the roles, events, and artifacts of Scrum, particularly the limitation of work in progress through the WIP limit and visualization of the workflow. Many Scrum teams use kanban boards to visualize the tasks within a sprint. The term *ScrumBan* can also be applied to this (Reddy 2015).

### Self-Check Questions

1. What are the three roles in a Scrum team and what are the main tasks for each of them?

*There are three roles in a Scrum team: (i) product owner, (ii) developer and (iii) Scrum master. The product owner is responsible for product development and represents the interests of the customer. The developers implement the product, e.g., they develop the planned software according to the customer’s wishes. The Scrum master is responsible for Scrum compliance, such as ensuring that the various meetings actually take place as planned. One of their most important tasks is to eliminate problems that hinder the team in their work.*

1. What does the statement that kanban takes an evolutionary approach to change management mean?

*This means that, according to kanban, existing processes are improved in constant small steps, i.e., evolutionary. Kanban supports understanding a process and its weak points first and then optimizing it. The adjustments can also be experimental. What does not work is discarded, what works is kept. By constantly making many small improvements, instead of a massive, radical change, the risk of each individual improvement measure is reduced.*

1. Mark the correct answers.

* An agile team must choose either Scrum or kanban. The methods must not be mixed. (F)
* *Scrum and kanban can be combined well.*
* *Both Scrum and kanban rely on self-organized teams.*
* Combining Scrum and kanban well requires the experience of a kanban master. (F)

## 4.3 Lean Project Management

As a mindset, leanhas its origins in production. Lean production stands for a holistic approach that makes production processes waste-free (Bertagnolli 2018, p. 4). The customer is placed at the center (Helmold 2020, p. 1). They should be offered products of good quality, with short delivery times, and at low cost. Everything that is unnecessary for this can be omitted. Like kanban, lean production was developed by the Japanese car manufacturer Toyota in the context of the Toyota Production System (TPS) in the mid-20th century (Erne 2019, p. 55–62). Since then and under the general term *lean management*, the lean way of thinking has spread to various industries and application areas, including those that are not related to production, where it has been further specialized, e.g., as *lean innovation* or lean *start-up* (Erne 2019, p. 62–65). Lean ideas have also been applied to project management (Hüsselmann/Leyendecker 2020). Lean offers principles and methods for streamlining processes and using resources efficiently, while focusing on high quality at the same time.

### Transferring the Lean Idea to Project Management

The lean mindset is relevant for all practices in project management, be it traditional, agile or hybrid, since lean influences the way a practice is designed (Erne 2019, p. 3). In all these practices, adherence to a small number of principles can lead to high-quality results for the customer, at lower costs and with shorter lead times.

In particular, agile methods, such as Scrum, directly implement principles from lean (Timinger 2017, p. 218). They focus on the tasks that create added value for the customer. Non-value-adding activities such as excessive documentation are reduced to a sensible level.

### Lean Principles

There are various approaches to transferring the ideas of *lean production* to project management, some of which are strictly based on the original, and some of which are more freely interpreted (for an overview, see Erne 2019, p. 65–71). Thus, there is not one set of principles, as is the case with the Agile Manifesto. Timinger (2017, p. 219–235) and Erne (2019, p. 72f.) are guided by the principles of lean thinking (Womack/Jones 2003), each listed in parentheses as follows:

#### Focus on the customer (specify value)

First, a good understanding of the customers’ interests and requirements must be developed (Erne 2019, p. 72). Unnecessary activities can be identified from the customer’s perspective, e.g., with the help of the following questions. What makes the product attractive to the customer? What added value does it create for them? What features are they willing to pay for? Which activities in the project contribute to delivering this added value and the expected product quality? Which do not? This focus on customer value is also found in the agile values and principles.

**Value stream mapping**

Value stream mapping (VSM) visualizes material and information flows. The aim is to identify activities that do not add value.

#### Identify the value stream (map the value stream)

Now, with the help of **value stream mapping** (Becker 2018, p. 154–162; Bertagnolli 2018, p. 103–118), all the necessary activities from project initialization through implementation to delivery of the project result are considered (Tiemeyer 2014, p. 230f. ). Activities that do not add value should be reduced or eliminated. This aspect has already been described in this unit in the context of agile values and principles, e.g., when it involves communicating efficiently or documenting appropriately. Agile approaches are oriented toward this lean principle.

#### Implement the flow principle (create flow)

This principle is about designing the flow of activities in the project so results are implemented as smoothly as possible. This active design of the workflow evokes that of kanban. In addition to avoiding multitasking and bottlenecks, a purposeful scope with safety buffers is also important in project management (Tiemeyer 2014, p. 231f. ).

#### Use the pull principle (establish pull)

In the project context, this principle means that team members *pull* tasks in a self-organized manner, as already introduced in agile practices (Tiemeyer 2014, p. 232). It can also mean that a feature is only relevant if it is *pulled* by the customer, i.e., if it is considered essential by the customer (Erne 2019, p. 73; Hüsselmann/Leyendecker 2020, p. 33).

#### Strive for perfection (work to perfection)

The other four principles are implemented cyclically so the project team and its working methods continue to develop (Erne 2019, p. 73). It is important to learn from mistakes and, conversely, to share best practices with colleagues, even across project boundaries (Tiemeyer 2014, p. 233f. ).

In contrast to Scrum, there is no set of rules in lean project management that specifies how these principles are to be implemented in projects (Stellman/Greene 2015, p. 269).

### Self-Check Questions

1. Mark the correct answers.

* *The thinking behind “lean production” has been transferred to various industries and functional areas, including project management.*
* Lean project management and kanban are mutually exclusive. (F)
* *Lean thinking is relevant to all types of project management, whether traditional, agile, or hybrid.*
* *Agile methods have adopted lean approaches and principles.*

1. Complete the following sentence:

Lean management is a management philosophy primarily derived from the *Toyota Production System (TPS)*. The main goal of lean management is to minimize *waste by eliminating the unnecessary*. In processes, the *workflow* is optimized so lead times are reduced. In projects, the focus is on delivering the features and quality that the *customer* demands.

Summary

Agile project management has several advantages. To begin with, agile practices increase the speed with which the first usable results can be presented to the customer. Feedback can thus be obtained and incorporated relatively early on. Furthermore, agile practices are designed to handle unforeseen events and changes as the project progresses, such as the emergence of new requirements.

The Agile Manifesto defines fundamental values and principles for agile project work. When the Agile Manifesto was published in 2001, these values were not new, but the publication created a common understanding of what agile means. The values and principles described in the Agile Manifesto form the basis of various agile methods and practices. In the process, they were concretized in such a way that they can be applied in everyday project work.

Scrum and kanban are currently the most widely used agile practices. They are followed by lean and other agile approaches such as feature-driven development and extreme programming. Many agile practices have their origins in software development, but are now successfully used in a wide variety of projects. Scrum defines roles, activities, and artifacts and provides projects with a clear framework. Kanban is characterized by its evolutionary approach to change management. Changes are made to the status quo in small, incremental steps. Lean project management is presented as the third mindset and practice. As with kanban, the focus here is on efficiency.

# Unit 5—Hybrid Project Management

Study Goals

On completion of this unit, you will be able to ...

... show how agile and traditional practices can be combined in different ways in hybrid project management.

... select situationally appropriate methods from various project management approaches based on suitable criteria.

... describe roles and organizational structures for hybrid projects.

... assess which software tools are suitable for hybrid project management.

# 5. Hybrid Project Management

### Introduction

Hybrid project management refers to the combination of agile and traditional project management practices, methods, and roles (Timinger 2017, p. 241; Kuster et al. 2019, p. 18). Depending on the definition, mixed forms of agile/agile, such as Scrum plus kanban, and traditional/traditional, are also included. In some cases, these are also referred to as *blended*, such as in the Agile Practice Guide (PMI 2017a).

Comprehensive process models such as the waterfall model or the V-model XT are often combined with lightweight, agile approaches such as Scrum, kanban or extreme programming (Komus 2017, p. 5f.; Canditt/Rauh/Wittmann 2011). Individual elements can be easily integrated into daily work. For example, a daily stand-up can replace project status meetings that can last several hours (Preußig 2018, p. 104f. ). Alternatively, the project team can conduct a retrospective on a regular basis instead of a one-time *lessons learned* at the end of the project (Measey et al. 2015, p. 77). Hybrid process models are therefore also a good way to become familiar with agile practices (PMI 2017a, p. 30). Stroh (2020, p. 23) suggests working a little agile every day in order to become increasingly more agile as a result.

Hybrid practices are quite widespread in the field, as the study by Komus et al. (2020) shows. From 2012 to 2019, the share of users using hybrid practices rose from 27% to 43%. Another 28% use agile and traditional process models depending on the project.

## 5.1 Selection Criteria for Suitable Process Models

For each project, it is necessary to select the project management practice that is best suited to completing the project on time, within budget, and according to the project goals. This involves selecting the approach that minimizes project risks and maximizes benefits for the customer. Which process model this is depends on the project type, as well as the context in which the project is carried out (Measey et al. 2015, p. 13; Burgan/Burgan 2014; Wysocki 2019, p. 37). Here, there is often no single correct process model: *one size fits all* does not apply to project management. The best variant may well be a combination, i.e., a hybrid approach (Habermann 2013, p. 99–101; Gemino/Reich/Serrador 2021, p. 168f. ).

Various models offer assistance with selecting a suitable process model in the specific project context. The models presented below share the fact that they each define criteria that speak in favor of agile, traditional, or hybrid practices. This provides a basis for discussing within the project which practices and methods should be best used and, if necessary, combined.

### Stacey Matrix

**Stacey matri**x

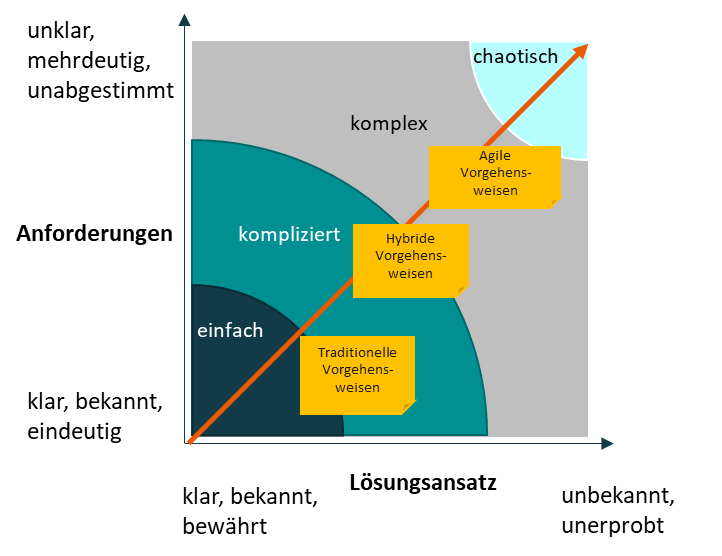
The Stacey Matrix helps to decide for or against a process model in project management.

The **Stacey matrix** according to Ralph D. Stacey (1996) is a simple framework that can be used to quickly classify projects into four categories: simple, complicated, complex, and chaotic. The assessment is based on two parameters (Komus/Schmidt 2018, p. 2; Fuchs et al. 2019, p. 202):

* Clarity about the project goal and the requirements to be implemented (“What?”) and
* Clarity and experience-based knowledge regarding the approach and tools to be used (“How?”).

Whether an agile or traditional procedure is more suitable is determined according to this classification (Komus/Schmidt 2018, p. 4f.). Since the transition from complicated to complex is not always clear, the hybrid process models are to be found here (Komus/Schmidt 2018, p. 6). This matrix also includes further details that position specific methods and practices such as design thinking, kanban, Scrum, and lean start-up in this representation (Komus/Schmidt 2018, p. 5).

Stacey Matrix

****

Tasks and projects in the four categories differ as follows (see Komus/Schmidt 2018, p. 3–5; Fuchs et al. 2019, p. 203):

**Cause-effect relationship**

A clear cause-effect relationship (or causality) exists when a cause A leads to an effect B.

* **Simple:** simple tasks are characterized by the fact that requirements and solution paths are clear. **Cause-effect relationships** are obvious. Standards, as well as best practices, can be used beneficially.
* **Complicated:** in complicated projects, it is still possible to predict with sufficient certainty what will happen with specific inputs. Compared to simple projects, for example, several influencing factors or non-linear processes must be taken into account. With expert knowledge, certain practices can be assessed as promising. Medium to long-term planning is possible and advisable. Traditional practices ensure a high degree of planning reliability with regard to end dates, costs, and delivery results.
* **Complex:** in complex projects, cause-effect relationships are no longer clear. There are a large number of influencing factors that exhibit multi-layered interdependencies. The *try-recognize-react* approach is appropriate here. Agile approaches now play to their strengths, particularly their flexibility over the entire course of the project.
* **Chaotic:** *chaotic* describes confusing situations in which causalities are no longer recognizable. Formerly proven processes and methods no longer work, and new ones have not yet emerged. Agile practices are helpful here as well.

With its eye-catching representation, the Stacey matrix facilitates a discussion of the suitable practice for a project (Komus/Schmidt 2018, p. 7–12). However, it is precisely this simplification that disregards other relevant factors. This is likely the reason that Ralph D. Stacey no longer lists the matrix in the more recent editions of his book (Viscardi 2013, p. 13). In general, the Stacey matrix strongly resembles the **Cynefin framework**, which is also frequently presented in literature and training on agile practices (Fuchs et al. 2019, p. 202f. ).

**Cynefin framework**

The Cynefin framework is a method from the area of knowledge management. It helps to classify situations and identify suitable practices.

### The Five Critical Factors according to Boehm and Turner

Boehm/Turner use the five factors of project size, criticality, dynamics, employee qualification level, and (company) culture to evaluate whether an agile or traditional practice is more suitable for a particular project (Boehm/Turner 2004, p. 54–57; Boehm/Turner 2003). In detail, these five factors consider the following aspects:

* **Project size:** plan-driven process models are oriented toward large-scale products and large project teams. Agile practices, on the other hand, are better suited to small-scale products or **small project teams** (Boehm/Turner 2003, p. 59). However, it should be noted that frameworks such as Scrum of Scrum (SoS) (Agile Alliance 2015; Sutherland 2001), Scaled Agile Framework (SAFe) (Knaster/Leffingwell 2020), and Large-Scale Scrum (LeSS) (Larman/Vodde 2017) have the effect of **scaling** agile practices (Klose 2015).

**Small project teams**

The Scrum Guide recommends a project team of no more than ten people (Schwaber/Sutherland 2020).

* **Criticality:** traditional practices have proven successful in the development of products that place the highest demands on product safety, such as in the aerospace, automotive, and medical technology industries. When developing these safety-critical products, a number of standards and legal requirements must be met and evidence must be well documented. Even in 2004, Boehm/Turner wrote that agile practices had not been tested for this purpose. Now, there are extensions of Scrum such as SafeScrum (Hanssen/Stålhane/Myklebust 2018). The Agile Practice Guide (PMI 2017a, p. 122) recommends that, when agile practices are used, they should be extended to include conformance testing and documentation requirements. This means that features are not fully implemented until the required documentation has also been created and accepted.

**Scaling**

The term scaling means that agile practices not only work in small teams, but are also adapted and extended so they can be used across multiple teams and even across the company.

* **Dynamics:** detailed plans and concepts, as used in traditional practices, work when the requirements and the project context are stable (Boehm/Turner 2003, p. 59). If they change frequently, this leads to costly reworks. Agile practices are called for in this case. Change management is essentially integrated into them: since the customer is closely involved, they must regularly prioritize whether a change or new functionality is implemented. Agile practices are also suitable for stable requirements.
* **Employee qualification level:** agile practices place higher demands on the qualifications and independence of the employees involved. For example, agile teams are often staffed across functions (Preußig 2018, p. 50–52). In plan-driven practices with clear, stable requirements, certain tasks can be divided in such a way that inexperienced employees can take them on (Boehm/Turner 2003, p. 59).
* **(Company) culture:** agile methods primarily function in a company culture in which employees have a great need for freedom. Traditional methods, on the other hand, provide more security through their clear roles and guidelines (Boehm/Turner 2003, p. 59).

If factors lean in different directions, e.g., two factors speak for agile and three factors for traditional approaches, this model does not provide a clear recommendation regarding the approach to take (Königbauer 2020, p. 3). Despite this point of criticism, the systematic consideration of the five factors creates transparency in the project and its context.

In addition to the model of the 5 critical factors by Boehm and Turner, there are other models, too. In the Agile Practice Guide (PMI 2017a), for example, Appendix X3 contains a detailed model that integrates various approaches.

### Self-Check Questions

1. Mark the correct answers.

* *In the case of complex projects, the use of agile practices is a good idea.*
* For complicated projects, the use of agile practices is a good idea. (F)
* Agile practices are not appropriate for large projects. (F)
* *Traditional practices are well established in the development of safety-critical products.*

1. On the basis of what factors does the model according to Boehm and Turner (2004) evaluate whether agile or traditional project management is better suited to a project?

*Boehm and Turner (2004) evaluate this using what they refer to as the “five critical factors.” These are: (1) the size of the project (or project team), (2) the criticality of the project, (3) the dynamics with which requirements change, (4) the skill level of the employees, and (5) the (company) culture.*

## 5.2 Configuration of Company-Specific Hybrid Process Models

There are standardized procedures in many companies that projects have to follow during their implementation. Depending on the company, projects can select from and adapt certain options (Burgan/Burgan 2014). The configuration options that exist and how these individual, hybrid process models can be created are presented in the following.

### Company-Specific Process Models

Large companies, in particular, define their own standardized process models in order to carry out projects efficiently within the company (Alam/Gühl 2020, p. 7; Burgan/Burgan 2014). There may be variants for different types of projects (Timinger 2017, p. 245f. ). Company-specific process models are generally based on known and proven process models. For example, Commerzbank’s Project Management Framework is based on the approaches of the International Project Management Association and the process model of DIN 69901–2 (Nockmann/Weber 2014, p. 31). This involves tailoring terminology, roles and processes to the company. For example, processes are adapted so they fit into the company’s overall process landscape. These company-specific standards for project management are typically documented in what is known as a **project management manual** (Weilacher 2005, p. 1f. ).

**Project management manual**

A project management manual summarizes all the regulations that apply within an organization for the planning and implementation of projects.

There are many benefits if all the projects at a company are handled according to a uniform procedure (Nockmann/Weber 2014, p. 32; Schramm/Ternité/Kuhrmann 2013, p. 38–40). Milestones can be defined at which, e.g., all projects are approved and project status reports are delivered as part of project portfolio management (Schopka 2015, p. 1–3). In addition, project managers and employees can quickly find their way around a new project, since project management structures and processes are known and terms are used consistently. In addition, process models and methods can be refined in a targeted manner on the basis of the experience gained in the projects. All project participants can thus draw on a proven set of methods, tools, and templates.

In order to ensure the acceptance of a standardized procedure, it should be able to be flexibly tailored to the project context at hand. It must also be ensured that the methods and tools are practical and up-to-date (Weilacher 2005, p. 3).

### Possible Combinations for Hybrid Process Models

Timinger (2017, p. 246) distinguishes between three ways in which process models can be combined and integrated to form hybrid process models: sequential, parallel, and integrated. The Agile Practice Guide (PMI 2017a, 25ff) makes a similar distinction.

#### Sequential application

In sequential application, different phases of a project are carried out according to different process models. For example, the development of a new digital service is carried out according to Scrum, and the subsequent rollout in different areas of the company according to the waterfall or V-model (PMI 2017a, p. 26). While the first phase is characterized by unclear requirements and new technologies, the tasks during the rollout and implementation of training are clear and repeatable. The hybrid process model can reduce project risks. The project team can have different members for both phases.

**Water-Scrum-fall**

The water-Scrum-fall refers to a hybrid process model consisting of the waterfall model and scrum.

The reverse variant is water-Scrum-fall, which revolves around Scrum (Timinger 2017, p. 266). This means that the planning, specification, and design phases take place according to waterfall, implementation according to Scrum, and integration and delivery according to waterfall again.

In general, the sequential application of different practices is rather easy to implement because clear handover points can be agreed upon (Timinger 2017, p. 264). At these handover points, it must be clear in each case which information is handed over, in which form, and how work is to be continued with it. If, for example, the requirements phase is carried out according to Scrum, epics and user stories are the result. A project working according to waterfall, however, would expect a requirements specification with functional and non-functional requirements.

#### Parallel application

When different process models are used in parallel, subprojects are carried out according to the different process models in play (Timinger 2017, p. 269). The main part of the project can be carried out traditionally or agilely. The former is particularly found in routine projects that also include a certain new scope. The main part of the project, which is clear and relatively familiar, is carried out according to traditional procedures. The new scope, which involves uncertainties, is handled with an experimental approach. Conversely, it is also possible to have a largely agile overall project with individual traditional subprojects. This makes sense, for example, if a certain scope cannot or must not be developed in an agile manner.

In order for the simultaneous application of agile and traditional practices to function in everyday project work, clearly defined synchronization points are required between the subprojects working according to different process models (Timinger 2017, p. 270). At these points, the agile and traditional methods must mesh in terms of time and content. This application scenario is frequently encountered in practice.

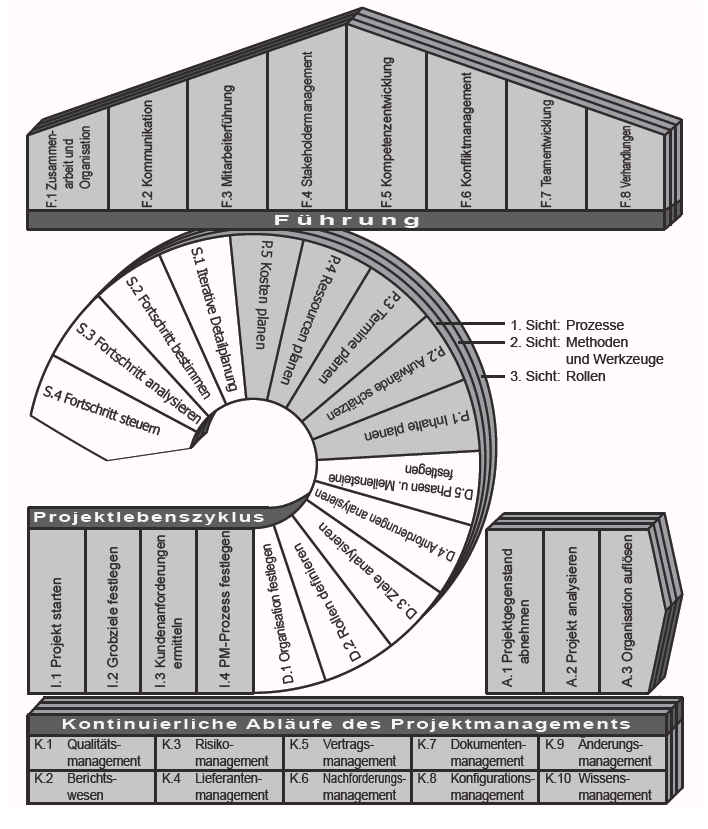
#### Integrated application

In integrated application, there is a *main* process model into which methods and techniques from other process models are integrated. The application is appropriate to the situation at hand (Timinger 2017, p. 278). In contrast to parallel application, individual subprojects do not work agilely or traditionally, but only make targeted use of the methods and toolbox of the other project management philosophy in question. For example, a project working according to the V-model uses techniques from kanban for task planning. Another company might use agile methods at points to gradually familiarize employees with agile practices. There are a variety of possible combinations for integrated application. These will be considered later in the unit.

### Framework for Hybrid Project Management according to Timinger and Seel

There are many ways to create individual hybrid process models. First and foremost, the selected procedure should optimally support the project team in achieving the project goals. Timinger/Seel (2016) propose a framework for the configuration of an individual hybrid process model. This would later be referred to as the framework for hybrid project management HyProM (Timinger 2017, p. 252). The figure below presents the framework:

Framework for Hybrid Project Management



This is divided into three areas (cf. Timinger/Seel 2016, p. 57–59):

* **Leadership**:the area of leadership, in turn, defines eight sub-areas, namely collaboration and organization, communication, employee leadership, stakeholder management, competence development, conflict management, team development, and finally, changes.
* **Project life cycle**: the project life cycle is divided into five phases: initialization, definition, planning, control, and completion. These can be carried out several times.
* **Continuous project management operations:** this area contains ten continuously performed operations such as quality and risk management, change management, and knowledge management.

Each area is assigned the following three views, each of which contains elements from the different practices:

* **Processes:** includes, e.g., the processes from Scrum or the V-model.
* **Methods and tools:** examples here are a wording template for user stories or a template for work packages.
* **Roles:** roles and organizational structures are necessary to carry out processes and apply methods. A distinction is made between which roles have responsibility, which roles participate, and which only receive information.

To derive a new process model, the relevant areas and sub-areas, along with the appropriate processes, methods, and roles, are selected from the framework. Purely agile, purely traditional, and agile-traditional mixed process models can be created in this way.

### Self-Check Questions

1. What are the possible overarching combinations of agile and traditional practices (e.g., according to Timinger 2017)? Mark the correct answers.

* *Sequential application.*
* Virtualized application. (F)
* *Integrated application.*
* *Parallel application*.

1. Many companies set out one or more practices in project management as a standardized procedure. How does this benefit a company and its projects?

*A uniform procedure in project management promotes the efficient handling of projects, since all the project participants can draw on processes and methods that have been tried and tested at the company. The wheel need not be reinvented in every project. Uniform terms in project management, e.g., uniform designations of processes and milestones, ensure that employees can quickly familiarize themselves with a new project. Since the processes are known or can be looked up, if necessary, all the project participants can concentrate on the project content.*

## 5.3 Integrated Application of Agile and Traditional Project Management Principles

Agile and traditional project management principles can be applied during a project in an integrated manner. This means that practices, methods, and tools from agile and traditional approaches are selected based on what is appropriate for the situation, as well as pragmatic (Eberspächer 2020, p. 6–8). Agile or traditional practices are not clearly assigned to individual project phases or subprojects. Rather, they are applied throughout the entire project life cycle and affect all aspects of a project (Timinger 2017, p. 281).

### Situational Integration in Everyday Project Life

The study by Königbauer (2020, p. 7) shows that, in practice, agile and traditional practices are combined in a wide variety of ways. Most participants (over 80%) rate their hybrid model positively for the project. The integration of methods from Scrum and kanban into traditionally designed projects is particularly popular. Examples of this are:

* Short, daily meetings of the project team akin to the daily stand-ups from Scrum. These meetings ensure an efficient exchange of information within the team (Preußig 2018, p. 101–104; Measey et al. 2015, p. 75f. ).
* Kanban boards as visual aids. They create transparency for the project team in terms of upcoming tasks and processing progress (Preußig 2018, p. 94f.; Measey et al. 2015, p. 83f. ).
* The limitation of work in progress (WIP), i.e., the number of tasks that are being processed simultaneously, drawn from kanban (Preußig 2018, p. 98–101). The goal is to enable employees to work on tasks in a focused manner and to shorten the overall processing times for tasks.
* Estimation based on story points. When a team estimates effort and expense in a planning game on the basis of story points, the estimate is often more realistic than an individual estimate (Measey et al. 2015, p. 60–62). The team thereby gains a common understanding of the complexity of a task. Uncertainties can be addressed directly.
* Pair programming, as a significant component of extreme programming (XP). It is particularly used for knowledge transfer between software developers and for code review under the 4-eyes principle (Measey et al. 2015, p. 90).
* Retrospectives from Scrum. A regular retrospective enables the continuous development of the team (Measey et al. 2015, p. 77–83; Preußig 2018, p. 107–109). Insights from a retrospective can flow directly into the next cycle.

Conversely, agile projects also use methods from traditional process models (PMI 2017a, p. 28). One example is quality gates, which are used to monitor the progress of the project and to review compliance with time, costs, and quality. They are often associated with the release for the next project phase. Quality gates can be useful at critical points in agile projects. In addition, agile project teams make use of a number of techniques from the standard repertoire of a traditional project manager. These include stakeholder analysis, methods for prioritizing tasks, and risk management.

### Formal Integration of Agile Methods into Traditional Process Models

Some traditional process models have now been specifically extended to include agile aspects. Two well-known representatives are PRINCE2 Agile and the V-model XT.

#### PRINCE2 Agile

PRINCE2 is a comprehensive project management framework. In 2015, PRINCE2 Agile was published as a supplement to apply agile methods from Scrum, kanban, extreme programming or **lean start-up** to PRINCE2 projects (AXELOS 2019). PRINCE2 Agile aims to combine the strengths of PRINCE2—controlling and managing projects—with the strengths of agile practices, namely developing and delivering concrete project results. This is intended to achieve both good controllability and high flexibility.

**Lean start-up**

Lean start-up refers to a method developed by Eric Ries for establishing companies and implementing new business ideas quickly and cost-effectively.

PRINCE2 Agile supplements the seven basic principles of PRINCE2 with five agile behaviors that create the mindset for the successful use of agile practices. It is recommended that they be continuously monitored and made visible by means of a traffic light status. The agile behaviors are (Cooke 2016, p. 36–38):

* **Transparency:** all project participants should have up-to-date information about the project and its status in order to identify problems early on.
* **Exploration:** project teams should have the opportunity to experiment and try different approaches.
* **Collaboration:** the project team works closely together and pursues a vision. Team members take responsibility for achieving the goal.
* **Self-organization:** project teams work in a self-organized manner. Tasks are independently distributed within the project team, not by the project manager.
* **Diverse communication:** project managers and team communicate directly, using a variety of media.

The topics defined in PRINCE2—business case, organization, quality, plans, risk, changes, and progress—are specifically expanded to include agile concepts (Kaiser/Simschek 2020, p. 87). For example, agile techniques are integrated into the processes. Thus, in the first phase, the product vision and the product roadmap are created in preparation for the project. In subsequent phases, artifacts such as product and sprint backlogs are used and sprint reviews and retrospectives are conducted.

In terms of organization, the roles from PRINCE2 are also supplemented by roles that identify, prioritize, and confirm requirements in the sense of agile practices (Cooke 2016, p. 40f. ). This does not simply involve a product owner as in Scrum. There are also other people or groups: a management representative, senior users, customer subject matter experts, business ambassadors, and business analysts, as well as requirements managers.

#### The V-model XT with agile elements

V-model XT is the standard process model for IT projects in the German federal administration and is often required in public **tenders** (Informationstechnikzentrum Bund 2019). It describes the tasks and processes of both the client and the contractor. The highly comprehensive V-model XT is usually tailored to the respective project, as reflected in the name: XT stands for eXtreme Tailoring. The V-model XT is so flexible that agile methods can be integrated into it (Lewitz 2009; Canditt/Rauh/Wittmann 2011; Informationstechnikzentrum Bund 2019, p. 6). Since the V-model XT is method-neutral, various agile methods can be used within the V-model (Friedrich/Kuhrmann 2014, p. 117–119). This represents the strength of the V-model, namely the strongly structured and results-oriented project planning and execution, together with the flexibility and lightweight nature of agile methods (Canditt/Rauh/Wittmann 2011).

**Tender**

In a tender, a company, organization, or government institution invites suppliers to submit a bid for a specific delivery or service. Public tenders are particularly required when contracts are awarded by the state or municipalities.

Version 2.3 of the V-model XT Bund explicitly provides for an agile approach. Thus, the various project implementation strategies are expanded to include a process for managing the contractor in the agile software development project (Informationstechnikzentrum Bund 2019, p. 238–241). As a result, a product owner on the customer side works with the contractor’s Scrum team in an agile manner. This also changes the designations of the decision points in the V-model as well as the required products (Informationstechnikzentrum Bund 2019, p. 20). For example, in an agile approach, a requirements concept (product C.14.1) replaces the requirements specification (Informationstechnikzentrum Bund 2019, p. 169). It is the basis for the creation of the entries in the product backlog (product C.14.2) by the product owner. These documents are relevant at the corresponding decision points. For example, the requirements concept is required for the decision point *requirements defined* (E.1.3) or *product vision designed* (E.1.4) (Informationstechnikzentrum Bund 2019, p. 227f.).

### Success Factors for Integrated Application

The integrated application of agile and traditional project management principles requires a great deal of experience with the underlying practices (PMI 2017a, p. 119–121) and a good understanding of why something should be done a specific way (Measey et al. 2015, p. 12). A process model should be successfully applied several times in its original form before it is adapted. Otherwise, there is a risk of leaving out something that seems inconvenient, but is actually essential to project success. For example, a Scrum team might leave out the retrospective because, in its opinion, it only takes time and the team is not used to talking openly about what went well or poorly. However, through the retrospective, the team learns to address difficulties in its collaboration and develop mutual solutions. In addition, there are many practices that complement each other—if only one of them is adopted, the entire process model will not work.

When adapting process models, those affected should be involved in order to secure their support (PMI 2017a, p. 120). Experienced coaches can provide assistance here. It is also helpful to have a scope, e.g., two iterations, in which the new practice is tried out and then evaluated. The opportunity to provide feedback increases acceptance among all participants. In general, best practices should be institutionalized in the company so they can be easily adopted by projects with similar characteristics.

### Self-Check Questions

1. One form of hybrid project management is integrated application. What is meant by this?

*In integrated application, agile and traditional project management methods are used as needed along the project life cycle. The individual methods cannot be assigned to specific phases or subprojects.*

1. Provide examples of how agile and traditional approaches can be integrated in practice.

*Agile methods such as kanban boards, burn-down charts, or methods for estimating effort and expense such as planning poker can be easily integrated into traditional practices. Typical meetings from agile practices can be adopted into traditionally managed projects, such as daily stand-ups, reviews with the customer and retrospectives. As a rule, these are shorter but more frequent meetings. Agile projects also benefit from the proven methods of traditional project management, such as for budget planning or risk management.*

## 5.4 Project Organization in the Hybrid Approach

Hybrid projects need an adapted project organization, since roles and responsibilities are different in agile and traditional projects. There is currently no standard for the form of this project organization (Walg/Breuninger 2021).

### Comparison of Traditional and Agile Project Organizations

The following remarks on projects with a significant share of software development present the different roles and their tasks in traditional and agile projects. The traditional project is planned and organized by a project manager (Timinger 2017, p. 35), who is responsible for the success of the project. The project team consists of, for instance, requirements analysts, architects, software developers, testers, etc., according to the tasks to be completed.

In agile projects, e.g., according to Scrum, these roles do not exist, not even that of the project manager. Rather, a distinction is made between the roles of product owner, Scrum master, and development team (Schwaber/Sutherland 2020). Neither the product owner nor the Scrum master are authorized to issue instructions to the development team (van der Wardt 2019). The development team works in a self-organized manner and is responsible for ensuring that (partial) results are completed in the required quality (Preußig 2018, p. 112–114). The Scrum master coaches the development team and ensures compliance with the processes as defined in the Scrum Guide (Measey et al. 2015, p. 132). The product owner is responsible for product development and represents the interests of the customer (Pichler 2013a, p. 7–30).

As can be seen from these roles’ tasks and responsibilities, role mapping is not possible.

### The Project Organization with Sequential or Parallel Application

Traditional and agile elements can be combined in different ways in hybrid managed projects. This has an effect on the project organization required.

In sequential application, project phases are carried out either agilely or traditionally. A separate project team with the appropriate organizational form can be compiled for each. There is no need to mix agile and traditional roles within each phase. However, a good understanding of the other methods and delivery results is needed at phase transitions (Timinger 2017, p. 268). For example, a traditional team needs to understand the epics and user stories from an upstream agile phase and translate them into their way of working. If employees work in several phases with different characteristics, it is important that they feel comfortable in both organizational forms. If the role an employee previously held no longer exists in the new form, such as the role of project manager, there is a risk that they will perceive this as a loss of competence.

The requirements for the parallel application of different practices are similar, since subprojects running at the same time are organized either agilely or traditionally. The communication interfaces between the subprojects and to the higher-level project structure are also important here. One procedure that has proven itself in practice is for a traditional overall project manager to assume the role of product owner for the agile subprojects (Timinger 2017, p. 271). This means that the team of the agile subproject retains responsibility, as envisaged in the agile process model. At the same time, the overall project manager is involved in the subproject to an appropriate extent through their role as product owner.

### The Project Organization with Integrated Application

There is usually a leading practice in an integrated application of traditional and agile project management practices. In PRINCE2 Agile, for example, this is the project organization of process-oriented PRINCE2, which is specifically supplemented by agile roles (Kaiser/Simschek 2020, p. 87). It is important that the tasks, competencies, and responsibilities of the individual roles are clearly defined and that overlaps are avoided. The tasks of the project manager are generally more diverse in such hybrid-managed projects. They need in-depth knowledge of traditional as well as agile practices. New training and certification models from PRINCE2, IPMA and PMI cover this knowledge (Ammer 2019, p. 2f. ). In addition to technical leadership, their role as a coach and mentor takes on great importance.

Regardless of the role, every project member needs an understanding of the new methods and techniques and their areas of application, as well as their limitations. A shared understanding of why a method is being introduced is important (PMI 2017a, p. 120). In particular, employees with many years of experience in traditional projects must be guided along this path. Depending on prior knowledge, training courses can be useful for building up knowledge.

### Self-Check Questions

1. How does the role of project manager differ from that of Scrum master?

*A project manager is responsible for achieving all the project goals. For this purpose, they plan, coordinate, and track all the work packages over the entire duration of the project. A Scrum master is more of a trainer or coach than a manager and helps the team to implement the values and processes of Scrum.*

1. Mark the correct answers.

* *A project team needs basic knowledge of agile methods in order to be able to use them in a target-oriented manner in their everyday project work.*
* The role of the Scrum master must be filled, since this person ensures compliance with agile methods. (F)
* *A project manager must be an expert in traditional and agile process models to be able to combine the best of both worlds in a meaningful way.*
* *A hybrid practice can be used to introduce project members to agile ways of working.*

## 5.5 Software Tools in Hybrid Projects

Various types of software tools support project management tasks (GPM 2019, p. 277f. ). Often, the first thing that comes to mind is traditional **project management software**, which is used, for example, to create work breakdown structures, milestone plans, and Gantt charts (Timinger/Seel 2018, p. 160). Microsoft Excel is also widely used in everyday project work. However, projects quickly reach their limits with it when plans and representations become more complex and several people are working on them simultaneously (Tremel 2017). In addition, many agile project teams make intensive use of information and collaboration platforms (Timinger 2017, p. 282). The possible software support options are presented below and considered in the context of hybrid projects.

**Project management software**

Project management software is software specifically designed to support project management tasks.

### Project Management Software

The tools available on the market offer extensive functions for professional project management. Some also support the management of project and program portfolios (GPM 2019, p. 279; Stang/Schoen/Henderson 2019). Such software tools have been available for over 30 years, with examples including Microsoft Project or the free **open-source software** ProjectLibre (Timinger 2017, p. 282). The basic functional scope of project management software includes the following aspects, in particular (Venzmer 2021; Schoen/Stang/Henderson 2019):

**Open source software**

Open source refers to software whose code is public and can be changed and used. The use is mostly free of charge.

* **Project and task planning:** work packages, milestones, and specific tasks must be defined and pursued. Project management software creates transparency about pending and completed tasks or work packages. This promotes results-oriented work in a project.
* **Resource planning:** project management software supports the planning of the required resources, i.e., employees, work equipment, machines, etc. These resources are assigned to work packages and tasks. Utilization and availability must be continuously kept in mind to achieve deadlines within the project budget.
* **Monitoring and reporting:** project management software shows the current status of the project’s most significant key figures, e.g., the degree to which the defined scopes have been completed or whether the agreed delivery dates have been met. This transparency is important for taking timely action. Recurring tasks in project controlling, such as the creation of certain reports, are (partially) automated.
* **Document and knowledge management:** documents must be shared within the project team and, if necessary, with the customer. Knowledge that is built up during the project must be easily collected and shared with colleagues. In addition, there are functionalities for searching and archiving, as well as a versioning of documents. Access control regulates who can see and edit which documents.

Project management software often contains templates for recurring activities and reports (Totah n. d. ). This saves time in everyday project work, increases the recognition effect, and ensures a specific quality standard.

### Information and Collaboration Platforms

Software tools can enable intensive collaboration in project teams, even if they are active at different locations (worldwide) (Klötzer/Hardwig/Boos 2017, p. 293). Such information and collaboration platforms enable those involved to exchange information quickly and purposefully in real time and to react to new circumstances (GPM 2019, p. 286). In contrast to traditional project management software, which is typically only used by project management, a project management office (PMO), and supervisors, entire project teams use these solutions (GPM 2019, p. 279). Information and collaboration platforms, also known as *enterprise collaboration software* or *social collaboration tools*, offer the following functionalities, in particular (GPM 2019, p. 286f.; Klötzer/Hardwig/Boos 2017, p. 294; Flößer 2014):

**Enterprise collaboration software**

An umbrella term for digital platforms and tools that help employees to better communicate and collaborate.

* Shared saving and editing of documents.
* Task management and to-do lists, as well as visual representations of the processing status, e.g., on a kanban board or as a burn-down chart (Capterra n.d.; Albers 2016);
* Micro-blogging, e.g., in the form of comments and discussion threads on work packages;
* Communication across physical distances, including with chats, telephone and video conferencing, desktop sharing, and online whiteboards.

These functionalities are sometimes integrated into project management software, but are more commonly found as specific products (GPM 2019, p. 287).

### Selection of Software Support for Hybrid Projects

Hybrid project management calls for traditional project management functionalities, as well as experienced support for communication and collaboration in the project team. As the following example shows, they must mesh with each other (based on GPM 2019, p. 280): a hybrid project plans subprojects according to a plan-driven process model. A **work breakdown structure** is created. Individual work packages are then handed over to agile teams, who plan their work package in detail using a kanban board.

**Work breakdown structure**

A work breakdown structure (WBS) represents all activities that occur in a project in hierarchical form.

For this purpose, either individual solutions can be meaningfully integrated or an overall solution can be selected (Venzmer 2020). Start-ups and smaller companies, in particular, tend toward the former and combine the company’s available tools and open source tools at low cost. This has the advantage that new, innovative tools can be used for collaboration, with younger employees, especially, expecting such tools. The disadvantage is the need for familiarization with different tools. In addition, suitable interfaces are needed so data is not redundantly recorded or gaps and contradictions occur, e.g., in project plans. All-in-one solutions advertise that they cover all the required functions and eliminate the need for cumbersome interfaces. Examples of such all-in-one solutions are Wrike, Planview Projectplace, teamwork, and Projektron BCS.

The most suitable solution for a specific company depends on various factors, e.g., which functionalities are actually used in everyday project work, whether there are specific requirements for certain functionalities, or whether standard functions are sufficient. Organizational issues can also play a role , e.g., whether licenses from different manufacturers are necessary, making settlement/billing more costly. The selection of project management software should therefore be made systematically on the basis of the project management processes and methods used at the company (Meyer 2016, p. 1–3).

**Big data**

Big data systems use state-of-the-art computer architectures and specialized software to quickly process and analyze large volumes of data.

### Outlook: Automation of Project Management Tasks

Many tasks in project management involve monitoring certain developments, evaluating progress, and managing developments (see GPM 2019, p. 276). An earned value analysis or a milestone trend analysis can be created automatically, for example (Eberspächer 2018, p. 16). Digital technologies such as **big data**, **artificial intelligence**, and machine learning will add a large amount of value to these activities in the future. The networking of an increasing volume of data expands the capabilities for recognizing interdependencies, analyzing modes of action, and ultimately automating planning and decision-making processes (GPM 2019, p. 275–277; Timinger/Seel 2018, p. 160; Niederman 2021).

**Artificial intelligence**

Artificial intelligence (AI) refers to the ability of computer systems or machines to act or learn autonomously.

In addition to artificial intelligence, Gartner sees **robotic process automation** (RPA) as another approach to automate project management tasks and particularly to efficiently integrate information from different standalone solutions (Stang/Schoen/Henderson 2019).

**Robotic process automation**

Robotic process automation (RPA) makes it possible to automate routine processes with the help of software robots.

In their vision for digitized project management, Timinger/Seel (2018, p. 160f.) also outline that an individual hybrid process model could be configured in an automated manner according to the framework for hybrid project management HyProM, which has been presented in this unit. For this purpose, data from completed projects should be included in addition to the framework data for the current project.

### Self-Check Questions

1. Which tasks does project management software typically support? Mark the correct answers.

* *Project planning.*
* *Resource planning.*
* *Project controlling.*
* Test management. (F)

Summary

The decision as to which process model is selected for a specific project should be made purposefully. Depending on whether the focus is on compliance with certain documentation requirements (as with safety-critical industries such as medical technology), customer orientation, or internal aspects such as employee motivation, a traditional or an agile process model may be a better fit. To combine the best of both worlds, an individual, hybrid procedure is often configured in practice. Hybrid project management is not limited to IT projects, but rather is successfully used in various industries and specialist areas (Königbauer 2020). Hybrid projects require a suitable project organization and the right IT support.

# Unit 6—Lateral Leadership in Hybrid Project Management

Study Goals

On completion of this unit, you will be able to ...

... explain what leadership means and what types of leadership there are.

... handle situations that require leadership without disciplinary authority.

... assess which leadership concepts and leadership styles are suitable for leadership in hybrid projects.

... purposefully form project teams, giving consideration to the challenges within digital transformation projects.

... identify the need for team development activities.

... understand the dynamics—both positive and negative—that arise in a project team.

# 6. Lateral Leadership in Hybrid Project Management

### Introduction

In one company, a project team is formed for a digital transformation project, namely for the development and introduction of a new sales platform (adapted from Hess 2019, p. 95–97). Hybrid project management was chosen for the project: subprojects are undertaken partially according to traditional practices and partially according to agile practices, in this case according to Scrum.

The overall project is managed by an experienced employee from the company’s digitalization unit. Two other colleagues from this department are working full-time on the project, and another is working 50%. In addition, three employees from the sales area are on the project team, i.e., from the organizational unit that will work directly with the new sales platform. They bring technical expertise to the project. One of the three colleagues from sales has the role of product owner for the introduction of the sales platform. The project team will be joined by two additional employees from IT. They are responsible for implementing the technical solution. The project team is supported by an external service provider whose project team members work partially on site and partially at the service provider’s location.

This brief overview already highlights some challenges for project team leadership and collaboration. This unit introduces concepts and methods that support project leadership and project teams in their collaboration.

## 6.1 Management without Disciplinary Authority

**Hierarchical structure**

A hierarchical structure refers to the superordination or subordination of organizational units (Piekenbrock 2018). In the sense of a coordination function, the superior body issues instructions to the subordinate positions.

Traditionally, many companies were organized in a strongly hierarchical manner. This kind of **hierarchical structure** includes superiors who guide employees and who, by virtue of their position, hold power and authority. However, the digital transformation has changed the demands on companies and their organizational structures (Reinhardt 2020, p. 106f.; Appen 2019, p. 12f.; Regnet 2020, p. 63): Successful companies are fast, adaptable, and innovative. They are characterized by flat hierarchies and strong networking across departmental and company boundaries. In addition, there is a high proportion of project work. In these organizations, leadership without disciplinary authority takes place in many situations—in addition to traditional leadership (Schmutte 2020, p. 48f. ). Before considering what is meant by this type of leadership and what occasions there are for it, a basic understanding of what leadership means is provided.

### Leadership: What Does It Mean?

Rosenstiel/Nerdinger (2020, p. 22) define leadership as the goal-related influencing of employees by their superiors with the help of communication tools, such as direct discussions on goal agreement or feedback discussions. The success of leadership is measured by the realization of leadership goals, such as the achievement of sales or profit objectives, compliance with quality specifications, or a good working atmosphere (Schaffner 2020, p. 565).

#### Specialist and disciplinary responsibility

A fundamental distinction is made between the specialist and disciplinary right to issue instructions (Oechsler/Paul 2015, p. 284):

* **Specialist responsibility:** the person who has specialist responsibility is responsible for the scope and the manner in which the tasks are carried out by employees. They are therefore also responsible for the achievement of goals by employees and the entire team. Employees expect the person with specialist responsibility to have sound specialist expertise.
* **Disciplinary responsibility:** the leader is responsible for the legal structure of the employment relationship, i.e., they are responsible for hiring employees, evaluating them, and conducting employee appraisals. They are also responsible for salary matters, approving vacation requests, parental leave, etc. Warnings and terminations are also issued by the disciplinary leader.

**Organizational structure**

The organizational structure is the hierarchical structure of a company. The organizational structure is shown by means of an organizational chart, which represents the individual divisions and departments.

In a traditional **organizational structure** with divisions, departments, and teams or workgroups, specialist responsibility and disciplinary responsibility were usually bundled together in one person, i.e., in the respective division, department, and team management (Oechsler/Paul 2015, p. 284; Lippe 2015, p. 113). In a **matrix organization,** and also in international organizations, the right to issue specialist and disciplinary instructions is separate.

**Matrix organization**

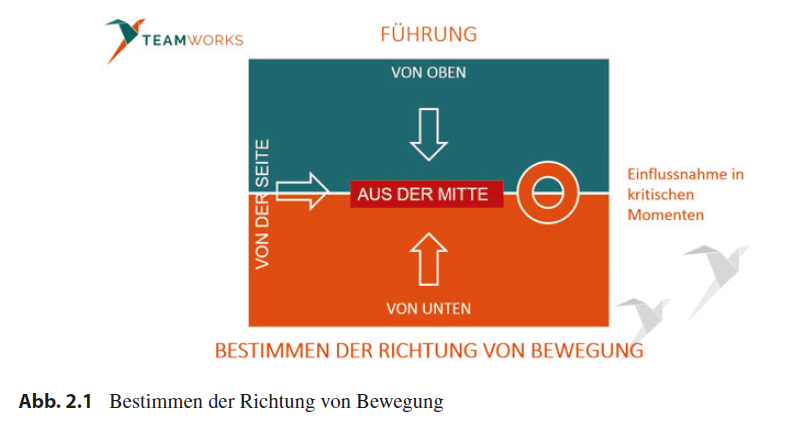
The matrix organization describes a multi-dimensional organizational structure, with departments forming one dimension and objects, such as projects or products, representing further dimensions. Matrix organizations often form the basis for a temporary project organization.

The distinction between specialist and disciplinary responsibility is particularly relevant for project managers. In project management, the project manager assumes responsibility for the implementation of the project and the achievement of the project goals (Lippe 2015, p. 115–117). This means that the specialist responsibility lies with them. Whether disciplinary responsibility also lies with the project manager must be clarified in each case.

#### Four directions of leadership

Hofert (2018, p. 27) defines leadership more generally by saying that “leadership is the determination of the direction of movement, as well as the successful exertion of influence in critical moments without direction.” Based on this understanding, it is easy to show that leadership can not only come from above, i.e., from a superior, but also from below, from the side or from the center in the sense of self-leadership (Hofert 2018, p. 26–28). This concept was described by Niklas Luhmann as early as the 1950s, and described leadership as universal (cf. Stangel-Meseke 2019, p. 164; Kühl 2017, p. 12f. ).

Four Directions of Leadership



Leadership from below means that employees, for example, develop something informally in the interests of the company and thereby exert pressure on their supervisor. Self-leadership describes the ability of employees to influence themselves and their behavior. Leadership from the side is also referred to as lateral leadership and is considered in detail below.

#### Lateral leadership

Lateral leadership, i.e., leadership *from the side* or *to the side*, describes a leadership situation in which the leader has no direct authority or formal power, but leads through appreciation, motivation, and communication (Sterrer 2014, p. 124; Kühl 2017, p. 2f. ). In this context, people meet on an equal footing as partners. According to Kühl (2017, p. 19), lateral leadership is based on three pillars, namely **power**,understanding, and trust. Those who lead laterally use these three mechanisms and their interaction to influence their counterparts.

**Power**

Power refers to the ability of persons (or groups) to influence the behavior of other persons or groups in their own interests.

### Occasions for Leadership without Disciplinary Authority

Collaboration in cross-divisional, cross-project, and cross-company teams requires a leadership style that is not based on disciplinary power (Haufe Akademie n. d. ). Employees from other divisions or companies cannot be given work assignments directly; rather, tasks must be coordinated and compromises negotiated. In addition, agile projects require leadership styles that manage without disciplinary authority. In agile project teams, the focus is on the self-responsibility of a team; leadership tasks and responsibilities can be carried out by different people (Kusay-Merkle 2018, p. 31). Another opportunity can be found in companies and organizations where hierarchies have been dismantled. Here, lateral leadership is used as an alternative control mechanism (Kühl 2017, p. 13).

For many project managers, it is normal that they exclusively bear specialist responsibility, in contrast to line managers. Even without disciplinary authority, they must motivate the project team, convince the project stakeholders, and involve customers appropriately throughout the course of the project (Wastian 2020, p. 488; Hofert 2018, p. 27). One challenge in many organizations is that, although the project manager bears overall responsibility for the project, the required resources, particularly which employees are working on the project, are approved by the department heads (Sterrer 2014, p. 61).

### Self-Check Questions

1. What is meant by “specialist leadership”?

*Specialist leadership means that the leader coordinates tasks, advises on the content of the tasks, and monitors results. In other words, the specialist leader issues the necessary instructions for carrying out a task. To this end, they possess sound specialist knowledge in the specific subject area.*

1. Which of the following are part of disciplinary responsibility? Mark the correct answers.

* *Performance evaluation.*
* *Employment law issues, such as salary negotiations, continuing education.*
* *Hiring and termination in close coordination with the HR department.*
* Provide sound technical advice on ongoing tasks. (F)

1. Provide an example in which a project manager leads as a specialist, but not disciplinarily.

*The project manager recognizes the need for further training for a team member because they are having difficulties with the task to be completed (e.g., lack of methodological knowledge). The project manager must coordinate the further training with the disciplinary supervisor, who must approve it.*

## 6.2 Leadership Concepts and Styles for Hybrid Project Management

An overview is first provided to facilitate an understanding of various leadership concepts and their special features. This establishes the basis for assessing which leadership concepts and styles can be usefully applied in hybrid-led projects. When transferring conventional leadership approaches to the project context, the specific characteristics and peculiarities of project work must be taken into account (cf. Wastian/Braumandl/Weisweiler 2012, p. 76).

### Overview of Leadership Concepts and Styles

**Leadership concept**

A leadership concept (also: leadership theory, leadership model, leadership approach) systematizes the relationship between the one who leads and the one who is led (Schaffner 2020, p. 565).

Various **leadership concepts** have been developed and studied in recent decades. They reflect a common image of humanity and show what was imagined to be the ideal leadership characteristics or leadership behavior in the era in question (Berger 2018, p. 30). Historically, the following leadership concepts are the most significant, since certain aspects have been preserved to this day, sometimes in a more modern form (cf. Berger 2018, p. 30; Oechsler/Paul 2015, p. 286).

#### Trait-based approaches

These approaches are based on the understanding that a person’s leadership success depends on specific **personality traits** (see Oechsler/Paul 2015, p. 286; Schaffner 2020, p. 566–569; Berger 2018, p. 31f. ). The oldest of these approaches is the great man theory from the beginning of the 20th century, which goes back to Thomas Carlyle. This states that leadership success is based on innate psychological and physical traits. These models have been criticized for oversimplifying and ignoring all other influencing factors. In the 1990s, these approaches became popular once again, namely in the context of what is known as the **big five** model, which describes five dimensions of personality (Oechsler/Paul 2015, p. 287–289). These five dimensions are: extraversion, emotional stability, openness to new experiences, agreeableness, and conscientiousness. The study investigated which aspects and constellations are relevant for leadership success. And yet, the characteristics of these five **personality traits** only slightly correlated with leadership success (Hofert 2018, p. 86). Nevertheless, they are a good basis for becoming aware of one’s own strengths and those of team members and for developing them in a targeted manner. Hofert (ibid. , p. 203–206) provides concrete guidance on this with exercises.

**Big five**

The big five model comes from personality diagnostics. It describes five primary dimensions, each of which can be weak or strong.

**Personality trait**

This term describes basic and stable personality characteristics.

#### Behavioral approaches

**Leadership style**

Leadership style is the way in which a person carries out their leadership duties, and how they behave toward their employees in particular.

Behavioral approaches focus on the behavior displayed by a leader. In this context, what leaders specifically do and which of these behaviors lead to success are examined (cf. Oechsler/Paul 2015, p. 291). A **leadership style** is defined as a permanently or frequently recurring behavior. One well-known example is the leadership style continuum according to Tannenbaum and Schmidt from 1958, which lists leadership styles ranging from authoritarian to cooperative (Schaffner 2020, p. 571–573).

#### Situational approaches

The basic assumption of situational (or situation-oriented) approaches is that leadership behavior must adapt to changing circumstances in order to be successful. Ideally, therefore, there is a suitable leadership style for each situation (Schaffner 2020, p. 576). One example is the situational leadership theory of Paul Hersey and Ken Blanchard, which differentiates leadership behavior based on the professional and personal **maturity** ofthe employee (Schaffner 2020, p. 578–581).

**Maturity**

The maturity of an employee depends on the situation. For example, if an employee is assigned to a new project,

they may initially have few technical qualifications, but are highly motivated.

#### Transactional and transformational leadership

These approaches originated in the 1990s and are summarized under the term *new leadership paradigm* (cf. Oechsler/Paul 2015, p. 309). Transactional leadership emerged from the principle of *management by objectives* (cf. Hofert 2018, p. 47). If an employee achieves the agreed goals, they are rewarded for their commitment and for achieving the goal at hand. Goal agreements have thus become an important leadership tool in many companies. In contrast, **transformational leadership** does not function according to the principle of performance and reward as does transactional leadership. The focus here is on how a leader can inspire their employees and encourage their intrinsic motivation (Hofert 2018, p. 48f. ). This leadership style is of great importance in times of uncertainty, as it picks up employees on an emotional level when changes are necessary and inspires them to achieve common goals (Schaffner 2020, p. 583–585). It therefore fits our current environment, which is characterized by being volatile, uncertain, complex and ambiguous, abbreviated to **VUCA**.

**Transformational leadership**

In transformational leadership, the leader is a role model with integrity and conveys meaning and motivation.

**VUCA**

The acronym stands for a world characterized by volatility, uncertainty, complexity and ambiguity.

### Leadership Characteristics in Project Management

Different forms of leadership can be distinguished between in project management (Kuster et al. 2019, p. 360):

* **Leadership in the sense of management, analogous to company management:** project progress must be monitored and ensured.
* **Leadership in the sense of employee management:** influence is exerted on project staff in a purposeful and goal-oriented manner.
* **Leadership in the sense of coaching:** team members and the team as a whole are supported and encouraged.
* **Leadership in the sense of dynamic and decentrally distributed leadership work:** leadership work is carried out by different people in the project team, depending on the situation.

Regardless of whether traditional, agile, or hybrid project management is chosen, the project team needs leadership (Kuster et al. 2019, p. 349). In traditional project management, the project manager assumes leadership in the senses of management, employee leadership, and coaching (Kuster et al. 2019, p. 361). In agile and hybrid projects, leadership and communication can fall to roles other than the project manager (Wastian 2020, p. 496). Here, the focus is on **self-monitoring.** In this, the project team assumes leadership tasks (Kuster et al. 2019, p. 350). Scrum additionally assigns certain tasks to specific roles: the product owner is responsible for the result, while the Scrum master coaches the project team (Kuster et al. 2019, p. 361). In this context, one speaks of **servant leadership**,since the Scrum master does not guide the project team members in a specific direction, but rather supports them to efficiently execute their tasks (Hofert 2018, p. 51).

**Self-monitoring**

The ability to observe and specifically influence one’s own behavior is referred to as self-monitoring or self-management.

**Servant leadership**

Servant leadership aims to support project staff so they can work on their tasks in a focused manner (Hofert 2018, p. 51). It is not about dominance or guiding in a specific direction.

### Suitable Leadership Approaches in Project Management

The entire repertoire of leadership concepts and styles, as described above, can generally be used on leadership projects (Wastian 2020, p. 494). Transactional and transformational leadership approaches are particularly suitable for leadership tasks in project management and can even complement each other (Wastian/Braumandl/Weisweiler 2012, p. 87): the transactional leader focuses on the project goals, the transformational leader motivates the project team. The project team can be focused on the common goals and enthused about the task, while at the same time, the progress of the project is monitored (Sterrer 2014, p. 124).

Wastian/Braumandl/Weisweiler (2012, p. 87) recommend adapting the leadership style to suit the project phase. In creative project phases, a transformational leadership style is particularly suitable, since project members can be encouraged to be creative and there is an openness to addressing potential problems. In contrast, with phases in which solution ideas must be implemented and completed, a transactional leadership style is preferable to ensure that goals are met.

### Self-Check Questions

1. Complete the following sentence:

Transactional leadership is based on the *clear definition* of goals with the employee and the delegation of corresponding tasks. The employee is *motivated* by being *formally rewarded* when the goals are achieved, e.g., through a *salary increase* or *bonus payment*.

1. Mark the correct answers.

* In transformational leadership, the focus is on solving problems, that is, transforming them into solutions. (F)
* *Trait-based leadership approaches describe the traits that good leaders should have.*
* Behavioral leadership approaches reward appropriate behavior on the part of the employee. (F)
* Situational leadership means that the leader chooses the leadership style that best suits them, depending on the situation. (F)

## 6.3 Team Formation and Development

Project teams are formed for a limited period of time for a specific project (Sterrer 2014, p. 117). There are various factors that have a positive influence on the success of teams, which should be taken into account when composing and developing teams (Kuster et al. 2019, p. 388; Wheelan 2013, p. 3). These are considered below.

**Team**

A team is a group of at least two people who are expected to work together to complete a task or achieve a goal.

### What is a Team?

A **team** is often described by the statement: “A team is more than the sum of its parts” (Hofert 2018, p. 32; Sterrer 2014, p. 116). Teams are characterized, among other things, by the mutual processing of typically complex tasks, close communication, and mutual support (Schiersmann/Thiel 2018, p. 222). An important aspect of teamwork is the orientation towards a common goal and the knowledge of winning or losing together (Sterrer 2014, p. 116). The experiences and competencies of the entire team must be utilized to solve these typically complex tasks and problems. In addition, teams give each other appreciative **feedback**. Well-functioning agile teams, for instance, achieve this through retrospectives, among other activities (Gren/Goldman/Jacobsson 2019).

**Feedback**

Feedback is information about how one perceives another's behavior and what that behavior elicits in them.

**Successful teams**

Successful teams are characterized by strong cohesion, a high level of commitment among team members, and a clear goal orientation (Patzak/Rattay 2018, p. 66).

Various studies have examined what makes particularly **successful teams**, known as high-performance teams or top teams (Ellebracht et al. 2018, p. 204f.; Wheelan 2013, p. 3; Katzenbach/Smith 2003). Top teams share meaningful values and themes, enjoy working on their tasks together, have a shared history, and feel a sense of commitment to each other.

In addition to these positive aspects, teamwork also has challenging aspects for team members, such as informal power processes, clique formation, or the exclusion of team members (Eidenschink 2020b). These dynamics and potential for conflict will be considered later in the unit.

### Project Teams

According to Kuster et al. (2019, p. 38), project work is always teamwork, since individuals cannot manage the complexity of projects. Rather, it requires collaboration. The project team is defined as the people who are actively involved in the project at hand (Angermeier 2018). There are several key positions (cf. Kuster et al. 2019, p. 385f. ). First, there is the project manager or a coordinator who ensures collaboration within the project team. Second, there are the team members who are specialists in their field. There is also the client or the members of the **steering committee**, who areauthorized to issue specialist instructions to the project manager.

**Steering committee**

The steering committee is the superior body on a project. It decides, e.g., on whether to continue or terminate the project.

### The Formation of Project Teams

Various aspects need to be considered when forming project teams (Kuster et al. 2019, p. 386f.; Patzak/Rattay 2018, p. 66–70).

#### Necessary skills

Transformation projects in digital transformation usually have very diverse requirements in terms of the skills needed to work on the project subject matter and are therefore usually staffed on an interdisciplinary basis (Hess 2019, p. 96). Due to the particular importance of the interdisciplinarity of the project team, this aspect will be considered on its own later in this unit.

Employees in hybrid projects must also be familiar with both agile and traditional project management practices. Even if someone is working on a subproject that is exclusively carried out in a traditional or agile way, they still need a basic understanding of the other way of working (Timinger 2017, p. 268).

#### Balanced team structure

Schiersmann/Thiel (2018, p. 164) recommend involving employees from different hierarchical levels. Although this is often difficult in terms of time for people higher up in the hierarchy, it promotes acceptance of the project results. They also advise having a mix of people who have been with the organization for some time and new colleagues. The former contribute their organization-specific experience, while the latter have an unbiased view and bring in an external impetus. Rasche and Müller (2019, p. 4) mention that a project team values diversity and different perspectives as one of seven behaviors of successful agile teams.

#### Time availability

If team members cannot or do not want to devote sufficient time to project work, this can jeopardize the success of the project (Kuster et al. 2019, p. 387). Therefore, good **demand planning** is necessary, i.e., the extent that an employee should be available for a project must be clear. In addition, the proportion of time must be ensured, i.e., the employee must be released from their other tasks for this period.

**Demand planning**

Demand planning involves determining the share of an employee's time that should be available for a project.

In hybrid projects, it is crucial that employees are continuously and reliably available throughout the project duration. According to the Agile Manifesto, sustainable project progress is the goal (Beck et al. 2001c). A constant work rate is not possible if project workers are repeatedly pulled out of the project work at short notice.

#### Team size

A manageable team size promotes cohesion in the group and thus has a positive effect on performance. For example, Schiersmann and Thiel (2018, p. 164) recommend a project team of five to seven people and in Scrum, a maximum of ten people (Schwaber/Sutherland 2020). The larger the group, the more difficult it can be to reach a consensus in specialist discussions. Organizational coordination is also typically easier in smaller teams and the risk of issues with team dynamics, such as the formation of subgroups, is less likely. The team size may also change depending on the project phase (Kuster et al. 2019, p. 386). For example, a feasibility study is carried out with a small team, and is subsequently implemented with a large team.

### The Development of Project Teams

Teams are not successful top teams from the first day. This takes time and support in team development (Hische/Hische 2019, p. 113). **Team development** refers to measures that promote the development of a team and maintain or even increase its performance (Alter 2019, p. 22; Schiersmann/Thiel 2018, p. 252). In most cases, this involves the team reflecting on its collaboration and cohesion (Kauffeld/Grote/Lehmann-Willenbrock 2018, p. 177). In addition to jump-starting newly formed teams, there are other occasions for team development (Schiersmann/Thiel 2018, p. 231):

**Team development**

Team development aims to form a team in such a way that it works together efficiently and achieves the best possible results.

* Increase the productivity of the team.
* Solve problems in daily collaboration within the team or with supervisors, clients, or similar.
* Build the social skills of the team members.
* Develop methodological skills and work techniques.
* Promote identification with the team’s goals.

### The Team Roles according to the Belbin Model

There are various concepts for developing teams (Schiersmann/Thiel 2018, p. 232). The **Belbin model** helps to answer the question of how an optimum team should be formed.

**Belbin model**

The Belbin model is named after Meredith Belbin, who studied human behavior in teams and compiled it into this model.

#### Nine team roles

According to Belbin, there are nine team roles (Belbin 2010). They are formed within the team based on the behavioral patterns of the team members. Each role has certain strengths and weaknesses. People can take on different roles in different situations and environments (Hofert 2018, p. 124). Most people have two or three team roles in which they feel most comfortable (BELBIN Associates n.d.). Efficient teams consist of different roles. Depending on the project phase, tasks at hand, and goals, certain team roles may be more important than others (Hofert 2018, p. 124; BELBIN Associates n.d. ).

Team Roles according to Belbin

|  |  |  |
| --- | --- | --- |
| Action roles | Communication roles | Knowledge roles |
| * Shaper * Implementer * Completer Finisher | * Coordinator/chair * Team player * Networker | * Innovator * Specialist * Observer |

#### Use of the Belbin model for team composition and development

The Belbin model can be helpful from the early stage of forming teams onwards (Portman 2021, p. 1). In this way, targeted attention can be paid to ensuring that the various roles are balanced. Eberspächer (2012, p. 12) recommends conducting an interview in advance with potential team members whom you have not met before so they and their preferred roles can be better assessed.

The Belbin model has also proven its worth for team development (Hofert 2018, p. 124). Team members reflect on which roles they prefer to assume in which situations and how this affects collaboration in the project team. As an alternative to the Belbin model, the Team Management System (TMS) according to Charles Margerison and Dick McCann (Tscheuschner/Wagner 2008; Sterrer 2014, p. 120–122) can be applied. Coaching and facilitation skills are needed to conduct this kind of reflection with a team. In most cases, support is sought from an outsider, such as an external **team coach**, or an internal colleague from HR (Alter 2019, p. 23; Kauffeld/Grote/Lehmann-Willenbrock 2018, p. 178).

**Team coach**

A team coach is a coach who specializes in working with teams. They provide impetus for the further development of a team and moderate processes for finding solutions.

### Self-Check Questions

1. Complete the following sentence:

A suitably assembled/composed project team is important for *successful project implementation*. Employees with the *skills* needed to handle the project task should be selected. In addition, care should be taken to ensure that the project team members have sufficient *time* for the project work and are accordingly released from their *daily business*.

1. How many team roles does the Belbin model describe? Mark the correct answers.

* Seven. (I)
* Eight. (I)
* *Nine.*
* Ten. (I)

1. Mark the correct answers.

* Everyone has a fixed team role that can be determined by testing. (F)
* *People can take on different team roles in different situations.*
* For teams to work efficiently, each team role should be represented exactly once on the team. (F)
* Certain team roles are stronger than others. (F)

## 6.4 Interdisciplinarity of Hybrid Projects in Digitalization

The project teams of digital transformation projects usually consist of employees from different departments and disciplines (Hess 2019, p. 96). What constitutes these interdisciplinary project teams and what challenges this entails is examined in the following.

### Interdisciplinary Project Teams

Projects have the task of developing solutions for complex and novel issues. The project team frequently must be creative and able to concretize visions and develop new approaches to solutions. This requires a project team whose members cover the different facets of the task, i.e., in which experts from different disciplines and with different professional backgrounds work together (Kuster et al. 2019, p. 347; Schiersmann/Thiel 2018, p. 164). This kind of team, in which at least two disciplines are represented, is referred to as **interdisciplinary.**

**Interdisciplinary**

An interdisciplinary team is structured in such a way that people with different perspectives, ways of thinking, specialist expertise, and methodological knowledge come together in the team.

Subject matter experts in the interdisciplinary project teams are expected to contribute their in-depth expertise to the project and their often extensive experience in how these topics are implemented in real operations (Kuster et al. 2019, p. 385). They are also expected to be aware of the latest developments in their field, as well as to be able to call on other proven experts as needed.

#### The project team within a company context

Interdisciplinary project teams are thus formed across disciplines, divisions, and departments. A project organization is, therefore, the exact opposite of the organizational structure, which structures experts according to their specialist areas (Kuster et al. 2019, p. 384f.). Each project member, consequently, also represents their department and the interests of their area in the project. If, in early project phases, primarily department-specific requirements are carried into the project, the solutions developed in later phases must be presented in one’s own area and their acceptance must be ensured.

This type of project organization has another advantage from the company’s perspective because project staff acquire new knowledge and gain new experience by working with colleagues from other areas. They, in turn, bring this back to their specialist areas (Schiersmann/Thiel 2018, p. 164).

#### Prerequisites for successful interdisciplinary collaboration

Interdisciplinary collaboration can only be successful if the subject matter experts work with each other openly and respectfully (Kuster et al. 2019, p. 385). Other opinions and perspectives must be perceived as enrichment and not as a threat to one’s own worldview. This requires high social and communication skills on the parts of the team members. They must be able to listen to others, and also to explain their own positions to someone who is not a specialist. This is the basis for bringing together different ideas and problem-solving strategies.

### Teams for Digital Transformation Projects

In a digital transformation project, IT experts and employees from specialist departments, such as marketing or business development, typically work together (Hess 2019, p. 96). This is why cross-functional digitalization teams are discussed. In general, all project members should have a high affinity for digitalization-related topics (Hess 2019, p. 96). After all, they serve as role models for handling digital transformation. Conversely, there is a risk that dissatisfied project staff will spread their concerns and fears throughout the company.

In addition to the interdisciplinary background of the project members, Nink (2020, p. 37) emphasizes the importance of soft factors for digital transformation. He recommends staffing teams as diversely as possible, i.e., with employees of different ages, genders, origins, sexual orientations, and social backgrounds. A diverse team can better understand internal or external customers in their complex and diverse personal environment and offer more tailored solutions.

When assembling the project team, it should also be noted that different skills are needed depending on the **project characteristics** (Kuster et al. 2019, p. 387). For example, a potential project, i.e., a project with open questions, tends to need innovative and creative people. An acceptance project, which has a high degree of social complexity, should include colleagues with excellent communication skills. They have the task of approaching the various stakeholders and involving them adequately in the project, thus ensuring acceptance of the project.

**Project characteristics**

Projects can be classified according to different characteristics, such as their task and social complexity.

The form of collaboration in a project team is based on the requirements of agile or traditional project management or a mix (Kuster et al. 2019, p. 347f.). The goal is for the project team to have optimal working conditions. Even more than products conducted along traditional lines, agile practices require close collaboration within the team. They also require close and trusting collaboration with the customers and stakeholders of the project (Measey et al. 2015, p. 100). This means that agile and hybrid project teams must demonstrate a higher level of maturity as a team (Gren/Torkar/Feldt 2017, p. 104). Team development is therefore of great importance and is the task of the project manager or the agile roles such as the product owner and the Scrum master (Kuster et al. 2019, p. 40). It is also the task of each individual employee, since in the agile context, each team member bears responsibility for the development of the team (Jäger/Petry 2018, p. 71). They need not be psychologists, but a good understanding of team dynamics and how to handle conflicts, which will be considered below, is essential (Measey et al. 2015, p. 92).

### Self-Check Questions

1. Describe the composition of an interdisciplinary project team for a digital transformation project as an example.

*An interdisciplinary project team for a digital transformation project typically includes experts from the specialist departments, such as purchasing, production, marketing or sales, as well as from the IT department. If there is a digitalization unit in the company, then employees from this department are often also involved.*

1. Mark the correct answers.

* *Project members in digital transformation projects often act as ambassadors for digitalization-related topics in their areas.*
* An interdisciplinary project team means more work for a project manager. (F)
* Interdisciplinary project teams should always be supported in team development due to their complexity. (F)
* *In interdisciplinary project teams, mutual trust and respect are needed so everyone can contribute their perspectives.*

## 6.5 Team Dynamics and Conflict Management

To accomplish their tasks and achieve goals, teams must organize themselves, exchange information, and work together. The process of how a team organizes itself is called team dynamics (Eidenschink 2020a). A team must ensure both the preservation of the group and the achievement of goals in this process. Conflicts can also arise here. Therefore, conflict management will also be considered in addition to team dynamics in the following.

### Dynamics in Project Teams

Project teams are put together temporarily for the duration of a project (Schiersmann/Thiel 2018, p. 227). Accordingly, a special feature of such teams is that they “are not grown and consistent teams [in which] group norms, cohesion, and a uniform understanding of collaboration, roles, and task distribution have already developed” Wastian (2020, p. 488). Thus, a project team is not a team from the start, but initially a collection of individual people with their own ideas and goals (Hische/Hische 2019, p. 113). There are also additional challenges (Sterrer 2014, p. 116f.; Kauffeld/Grote/Lehmann-Willenbrock 2018, p. 168f. ):

* **Time pressure:** projects have a defined target date. Due to this time pressure, there is usually little time for team development.
* **Heterogeneity:** members of the project team typically come from different areas of the company, from different locations and have different (specialist) focuses. In addition, there may be linguistic and cultural differences.
* **Team size:** it is often difficult to implement real teamwork in large project teams. If teams exceed a certain size, it is therefore recommended to form sub-teams.
* **Task:** projects are characterized by the uniqueness and novelty of their tasks. Solving these tasks can challenge project teams.

**Conflict**

Conflicts can arise when opinions, interests or values that are perceived as mutually incompatible converge.

### Conflict Potential in Teams

There is a wide range of potential for **conflict** in teams. Different types of conflicts can be distinguished between. The following overview shows one way of distinguishing between them:

Conflict types

|  |  |  |
| --- | --- | --- |
|  | Factual/task-related conflicts | Social conflicts |
| What is it about? | Discussion about the best way to solve a particular problem. | Conflicts characterized by mistrust, anger, fear, frustration, or other negative experiences. |
| Examples | * Which software should be used for a specific task? * Which logo represents the product better? | * Personal dislike between team members * Ideas proposed by team members are disparaged |
| Effect | Moderate task-related conflict can help ensure that the best solution is found.  Social conflicts can arise if task-related conflicts are repressed or suppressed. | Social conflicts must be resolved constructively, since they can affect team performance. |

Conflicts must be dealt with adequately, since unresolved conflicts can diminish the productivity of a team and the satisfaction of its team members (Kauffeld/Grote/Lehmann-Willenbrock 2018, p. 172–174). Fundamentally, conflict management is about handling differences in a constructive and confident manner (Ellebracht et al. 2018, p. 246f.). It is therefore important to create opportunities for conflict partners to perceive each other’s perspective and develop an understanding of commonalities and differences.

**Personality test**

A personality test is a psychological testing procedure to discover the characteristics of a person and their related strengths and talents.

**Personality tests** such as the big five, the MBTI, and DISG can also create an understanding that not everyone is the same. However, they do not capture the complexity of dynamics in teams (Hofert 2018, p. 116). Models are used in order to recognize and work on these dynamics, including the Belbin model presented above, as well as the model of the five dysfunctions according to Lencioni (2002), the rank dynamics model by Raoul Schindler (Schindler 1999), and the model of team phases according to Tuckman. The latter is presented below. However, personality tests can certainly be helpful in purposefully assembling a project team in such a way that the advantageous characteristics of the team members complement each other as best possible (Hofert 2018, p. 203).

### The Model of Team Phases according to Tuckman

According to Bruce W. Tuckman, every team goes through specific development phases in which the team finds itself. This also applies to project teams, regardless of whether they work according to agile, classic, or hybrid process models and methods (Kuster et al. 2019, p. 403). The model originally developed by Tuckman in 1965 distinguishes between four phases (Tuckman 1965). Tuckman/Jensen (1977) later added a fifth phase to dissolve the team, which plays an important role in the project context due to its time-limited nature. In particular, the findings of empirical studies have been incorporated into the revision.

Not all phases are distinct in every team development process. For successful teamwork, each phase should be undergone separately. “Fast-tracking and bypassing inevitably lead to a loss of development capability: deficits cannot be identified and ironed out” (Stahl 2012, p. 74).

#### Phase 1—Forming (foundation phase)

A team is newly formed (Stahl 2012, p. 82). The team members get to know each other and everyone tries to find their position within the group. At the end of this phase, there is certainty in three respects, namely about basic interpersonal rules, official goals, and membership of the group (Stahl 2012, p. 90).

#### Phase 2—Storming (dispute phase)

In the second phase, the team begins to work. Conflicts and rivalries arise between individuals, and possibly also between subgroups (e.g., Miebach 2017, p. 275–277). This phase is also referred to as the dispute phase (Stahl 2012, p. 110). A team must resolve conflicts constructively if it wants to develop further.

#### Phase 3—Norming (contract phase)

Once conflicts have been resolved in the storming phase, the task now is to make the group functional. This phase is therefore also referred to as the contract phase (Stahl 2012, p. 140). The team agrees on common goals, tasks, rules, roles, and forms of decision-making.

#### Phase 4—Performing (work phase)

In the fourth phase, the functions of the group members are clearly defined and the synergy effects of teamwork take effect (Stahl 2012, p. 164). The team’s unity becomes visible to the outside world. The team is now able to work together efficiently and in a self-organized manner.

#### Phase 5—Adjourning (dissolution phase)

The fifth phase describes the completion of the teamwork. Tasks are completed and the first team members leave the group (Miebach 2017, p. 306). Team success is measured by the results, the satisfaction of the team members, and a strengthened ability to work together (Miebach 2017, p. 310).

**Team coaching**

Team coaching is about making a team successful as a whole. Among other things, goals, feelings, and behavior are reflected upon and possibilities for change are developed.

#### Use of the model of team phases

Tuckman’s model of team phases enables team dynamics to be understood (Stahl 2012, p. 68; Hofert 2018, p. 119ff. ). Since it explicitly recognizes that conflicts are also a central component of team development, it can be used in **team coaching,** e.g., to point out difficulties typical of phases to the team.

### Self-Check Questions

1. What is meant by conflict? Give two examples of conflicts in a project team.

*Conflicts arise when opposing views, motives, or feelings collide. As a rule, emotions are also involved. Conflicts in teams arise, e.g., with a dispute over an issue. For example, a project team argues about how a certain functionality should be implemented. Another example of a conflict in a project team is when several project members have the impression that one project member is only doing what is necessary or is just doing the bare minimum.*

1. What are the four team phases according to Tuckman?

*The four team phases according to Tuchman are forming, storming, norming, and performing.*

1. In which of Tuckman’s team phases does a team work most efficiently? Provide reasons for your statement.

*According to Tuckman’s team phases, teams work most efficiently in the performing phase. In this phase, conflicts are resolved, the roles and tasks of team members are clear, and there are agreed-upon practices. This phase is therefore also referred to as the working phase.*

Summary

Leadership in hybrid project management is very complex. In addition to the actual management of a project and ensuring that its goals are achieved, managing the project members plays a key role. Depending on the situation, project phase, and task, different leadership approaches and styles are suitable for this. In addition, a well-composed project team has a major influence on the success of the project. Among other aspects, the special expertise of the team members, their interdisciplinary background, and their communication and social skills play an important role. Since project teams are formed for a specific project and usually know each other only to a limited extend, team development must be supported and a constructive approach to conflict must be cultivated. For this purpose, models such as the team roles according to Belbin and the team phases according to Tuckman are introduced in this unit.

# Unit 7—Applying Hybrid Project Management in Digital Transformation

Study Goals

On completion of this unit, you will be able to ...

... present examples of digital transformation projects from different business areas and industries.

... identify challenges for project management in interdisciplinary product development.

... explain the tasks of project and portfolio management specific to innovation projects.

... assess the project management requirements of process digitalization projects.

# 7. Applying Hybrid Project Management in Digital Transformation

### Introduction

The etventure study, which has been conducted for several years in succession, asks company leaders what they understand digital transformation to mean (etventure 2019, p. 15). 67%, i.e., the majority of respondents, understood digital transformation to refer to the digitalization of an existing business model and analog processes. In contrast, 21% of respondents understood digital transformation to mean the development of new digital business models. For 10% of respondents, the focus was on standardizing and optimizing IT structures, and for 2%, on digital training for employees.

These answers show the spectrum of issues surrounding digital transformation in companies and, as a consequence, the diversity of measures and transformation projects for implementing digital transformation. Accordingly, this unit examines projects and their forms of project management with different focuses and in different company divisions and industries. These projects involve significant investments. This is shown, e.g., by the IT expenditures of the German insurance industry, which amounted to 5.5 billion euros in 2019 (Meyer/Helmich 2019, p. 2).

## 7.1 Hybrid Project Management in Interdisciplinary Product Development

Digital transformation projects often aim to develop new, innovative products and services for customers (Hess 2019, p. 99). New, digital business models are frequently behind this. In order to better understand the requirements for projects that develop new, digital products, a fundamental understanding of digital products and services is first established.

### Digital Products and Services

In general, three types of digital products and services can be distinguished between (Hess 2019, p. 99):

* **New stand-alone digital services:** examples of digital services include social networks (e.g., LinkedIn), video platforms (e.g., Netflix), auction services (e.g., eBay), or services for travel planning and booking (Hess 2019, p. 99–101).

**Condition monitoring** Condition monitoring means that the technical condition of a machine is monitored continuously or at defined intervals. For this purpose, various data such as temperatures or filling levels are measured.

* **Value-added services:** value-added services are digital services added to established products (Hess 2019, p. 102). One example is an airline app that offers passengers information and services. Other examples are the operation of machines via apps or remote access and the monitoring of machines for **condition monitoring** and **predictive maintenance**.

**Predictive maintenance**

Predictive maintenance, for example, uses condition data from machines to anticipate when these machines need to be serviced.

* **Hybrid products and services:** an analog product is combined with a digital service. One example is the TipToi pen from Ravensburger (Hess 2019, p. 99). Children can use it to access further information in a printed book, play songs, or solve puzzles by clicking on a picture of an animal, for example. Other examples include a printed newspaper with a supplementary online offering (Hess 2019, p. 101f.). Vehicles are also increasingly becoming hybrid products, with particular regard to autonomous driving.

### A Hybrid Process Model for the Development of Mechatronic Products at an Automotive Supplier

The following project example of an automotive supplier demonstrates how agile methods can be used in product development according to the V-model, resulting in a hybrid process model.

#### Value-added services and smart products for the vehicle

**Connected services** Connected services are digital services for automobiles. Examples include services for toll processing, parking space searches, and remote diagnostics and maintenance.

Many new vehicles already offer digital value-added services for vehicle information, navigation, and driver support (Winkelhake 2021, p. 114f.). The scope and variety of such **connected services** will continue to increase. Further potential can be developed by intelligently networking and evaluating the large volumes of data generated by mechatronic components in the vehicle.

**Mechatronic products** arebased on the interaction of electronic, mechanical, and information technology elements (Czichos 2019, p. 3). Examples from automotive engineering are the ABS (anti-lock braking system) or the ESP (electronic stability program). In the course of digitalization, a major development step has recently become possible, namely a step toward what are known as smart products. These products do not only have the conventional product characteristics, but also adapt flexibly and situationally (Kammler et al. 2019, p. 532). An example of this is an automatic transmission. Today, it detects the current driving situation and initiates a gear change. In the future, the required gear will be proactively detected and adapted to individual driving behavior (Kammler et al. 2019, p. 533).

**Mechatronic products**

Mechatronic products and systems can be found, e.g., in mechanical engineering and medical technology, as well as in automotive engineering.

#### Traditional process models for the development of mechatronic products

In the development process for mechatronic products, particular attention must be paid to the interdisciplinary linking of mechanical, electronic, and functional assemblies and their interactions (Czichos 2019, p. 58). The **V-model of VDI Guideline 2206** (cf. VDI 2004) is a frequently applied process model in mechatronic product development (Czichos 2019, p. 58–60; Feldmüller/Sticherling 2016, p. 14). In general, the V-model is a traditional process model in project management. The VDI guideline itself provides for iteration in this traditional framework, namely when going from the laboratory sample to the ready-to-use product (Feldmüller/Sticherling 2016, p. 16). The V-model provides a framework for interdisciplinary collaboration among project participants (Feldmüller/Sticherling 2016, p. 15). The development of smart products also requires interdepartmental and interdisciplinary work.

**V-model**

The V-model is a sequential process model. The phases are arranged in a V-shape.

**VDI Guideline 2206** Guideline 2206 of the Association of German Engineers (VDI) describes a development methodology for mechatronic systems.

#### Use of agile methods in the development of mechatronic products

The development of mechatronic systems is characterized by the fact that they are complex systems, requirements are fraught with uncertainty, and multiple disciplines are involved. In this context, according to Feldmüller/Sticherling (2016, p. 16), **agile values** such as openness to change, results orientation, appropriateness, and self-organization can play an important role. Agile methods should therefore be applied appropriately in such development processes (Schuh et al. 2017; Klein/Reinhart 2014).

**Agile values**

Agile values are those values that are the basis for successful agile work.

#### A hybrid process model

Feldmüller/Sticherling (2016, p. 19–21) worked with the development department of an automotive manufacturer to investigate how agile methods can complement the traditional V-model. The result was five concrete solution approaches:

* **V-model as a multiple iteration:** rather than just one run of the V-model, the multiple run offers the advantage that customer requirements do not need to be fully detailed in advance. Rather, they can be expanded over the course of the project based on the findings of the previous iteration and also corrected, if necessary.
* **(Real) parallel iteration:** meaningful synchronization points are needed for the parallel flow of mechanical, electronic, and software development. Reviews can also be carried out at these points in time.
* **Spatial proximity for collaboration:** for collaboration on a physical object or the creation of a test setup, the different disciplines should be able to work together on site.

**Lessons learned**

These serve the retrospection of a collaboration and the development of improvement measures

* **Organized knowledge transfer:** examples of organized knowledge transfer include short presentations within the development departments or **lessons learned** lists with solutions that have already been developed.
* **New role definition in a development team:** project management should have a broad understanding of all disciplines involved. They also hold the role of **team coach** and promote the team’s ability to organize itself. In addition, there is a project-accompanying advisor who supports the project team with their expertise and wealth of experience.

**Team coach**

A team coach works with teams on their further development and supports them in handling conflicts within the team. Like a coach, they provide assistance for self-help.

The first point, the V-model as a multiple iteration, appeared to be the easiest to implement in the study presented. The implementation of other points also requires cultural changes and the development of an agile mindset (Feldmüller/Sticherling 2016, p. 22).

### Self-Check Questions

1. What is meant by value-added services?

*Value-added services use digital technologies to supplement the current range in a targeted manner. They can add value, e.g., in the provision of the product, the initiation of the purchase, or in customer service.*

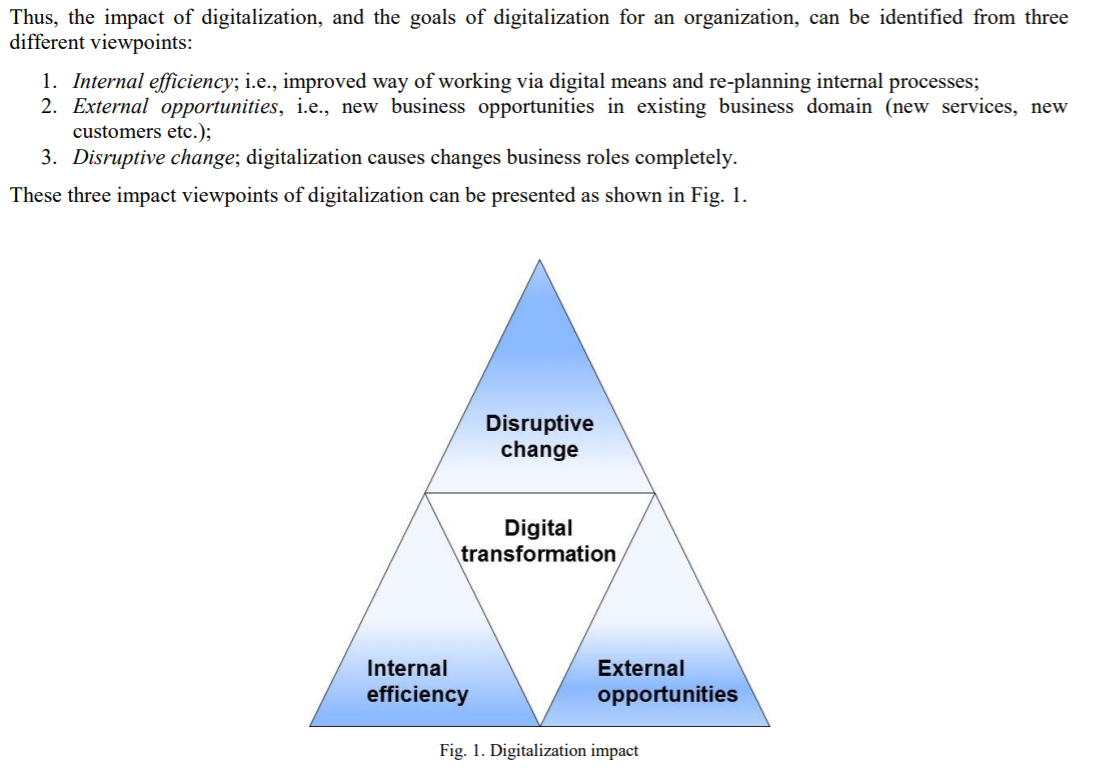
1. Agile methods can be integrated into the V-model as a traditional process model. Provide two examples of this.
2. *Agile elements such as lessons learned or retrospectives can be used in the various phases of the V-model. (2) Roles from the agile project environment can be added and thus, for example, the coaching of the project team toward more self-responsibility and self-organization can be supported.*

## 7.2 Hybrid Project Management in Strategic Innovation Management

Digitalization projects are carried out for various reasons. Three perspectives can be distinguished between (Parviainen et al. 2017, p. 66):

* Internal efficiency improvement, i.e., improving internal workflows and processes by eliminating manual steps, for example.
* External opportunities, i.e., seizing new opportunities in existing business areas, e.g., by acquiring new customer groups, offering existing customers new services or new ways of contacting them.
* Disruptive change, i.e., all-new business models are made possible by digitalization.

Digitalization Impact



In the following, the focus is on the second and third aspects. These are also referred to as incremental and radical innovations, respectively (Kerzner 2019, p. 20). To make these innovations a reality, it is important to think in terms of entire business models and not just in terms of changing individual dimensions (Matzler/von den Eichen/Anschober 2018, p. 77f.). Key questions in the development of new business models based on digital technologies and developments are listed in the following (Matzler/von den Eichen/Anschober 2018, p. 78):

* Which intended audiences can be offered which new and unique value propositions?
* What new products and services does digitalization enable?
* How can value chains and processes be changed?
* What are the new marketing opportunities?

### Strategic Innovation Management

Strategic innovation management creates the boundaries for the implementation and introduction of innovations. It defines the company’s innovation strategy and also shapes the boundaries for the implementation of innovation projects and pays attention to the development of a company culture that promotes innovations (Schuh/Bender 2012, p. 17).

#### The innovation strategy

Strategic innovation management is about identifying the technologies and markets that a company should develop and exploit (Schuh/Bender 2012, p. 18). The **innovation strategy** thus specifies the goal of the innovation activity. It covers the following aspects:

**Innovation strategy**

The innovation strategy must align with the overall company strategy. It serves as a structure for decisions on innovation projects in the company.

* Determination of the significance of innovation in relation to company strategy, value creation, and the achievement of competitive advantages.
* Consideration of potential market changes and technological leaps, particularly with regard to the company’s own products and their positioning.
* Identification of the company’s strengths and weaknesses and identification of changes to be achieved through innovation.
* Establishment of the long-term goals of innovation activity.
* Overall planning of development and innovation projects including resource allocation.
* Evaluation, prioritization, and launch of innovation projects to achieve goals.

#### The innovation organization

Another task of strategic innovation management is to create the structural boundaries for the implementation of innovation programs and projects, i.e., to design the corresponding innovation organization (Schuh/Bender 2012, p. 32). There are various ways in which a company’s innovation area can be organized and integrated into the company. One important form of organization in this context is the project-oriented organization (Schuh/Bender 2012, p. 38–39). This can take four forms:

* **Project management in the line:** here, project management and project staff come from the same line of divisions or departments.
* **Influence project organization:** an employee, often from a specialist team, assumes project management in the sense of coordination, i.e., without holding specialist and disciplinary authority. Decisions are made by the superior body. Project staff remain assigned to their areas.
* **Matrix project organization:** in this form of organization, which is common in companies, project-related and department-related competencies overlap. Project management has the specialist responsibility, whereas the disciplinary responsibility remains in the line.
* **Pure project organization:** here, all project participants are assigned to the project as an independent organizational unit. This form is frequently used for very large innovation projects.

#### The mindset for innovation projects

**Error culture**

A positive error culture refers to a basic attitude of leaders and teams in which errors are seen as an opportunity to learn.

Various traits at the cultural level can promote innovation (Schuh/Bender 2012, p. 50). In particular, courage and curiosity are prerequisites for developing innovative approaches to solutions. This includes a good **error culture**, as well as the opportunity to discover new solutions and experiment with alternatives.

Another success factor for innovation projects is consistent **customer orientation** (Matzler/von den Eichen/Anschober 2018, p. 77; Schuh/Bender 2012, p. 50). The project result must be aligned with the needs of the customer. Changes during the course of the project must be welcomed and not perceived as a disruption. Accordingly, important traits of a project team members are a willingness to change and openness. Ideas should be tested with customers early and repeatedly (etventure 2019, p. 20). Once an idea has been evaluated positively in a market test, it should be scaled up to a larger extent.

**Customer orientation**

Customer orientation means that the wishes and requirements of customers are regularly and systematically collected, analyzed, and consistently implemented in the products and services offered.

Many of these aspects are already familiar agile values and agile principles from the context of the Agile Manifesto. The first principle, for instance, places customer benefit in the foreground (Beck et al. 2001c). Ultimately, the customer decides what an actual benefit is for them (Böhm 2019, p. 19). Rasche and Müller (2019, p. 4f.) emphasize the importance of willingness to change: in successful agile project teams, team members adapt quickly to changes and also support each other in the process.

### The Implementation of Innovation Strategies through Innovation Projects

Innovation management and project management have long been regarded as two separate disciplines (Kerzner 2019, p. 5). First, there is innovation management with its creative approaches and cross-organizational teams. Second, there is traditional project management with its clearly defined, distinct phases. However, this understanding has now changed: companies have understood that their innovation strategy is implemented through projects (see also Keinz et al. 2021, p. 97). According to Kerzner (2019, p. 5), project management has evolved into a *delivery system* for innovations, but only if project management processes are less rigid.

#### Selection and prioritization of innovation projects

Companies are often not faced with the problem of finding new ideas, but rather of selecting the right ones to implement from a multitude of ideas and project proposals (etventure 2019, p. 20). The aim is therefore to evaluate and prioritize project proposals and their potential (Schuh/Bender 2012, p. 18; Gassmann/Wecht/Winterhalter 2018, p. 25). This is done in the context of **portfolio management** (Wördenweber 2020, p. 125). In this process, not only are new projects are evaluated: ongoing projects are also accelerated, canceled, or postponed. Many companies use stage gate practice, in which results are reviewed after each stage as part of a milestone analysis based on agreed criteria (Lichtenthaler 2020, p. 50). Projects can be stopped as a result of this review.

**Portfolio management**

The task of portfolio management in the field of innovation management is to prioritize new innovation projects and allocate resources to them.

When managing a portfolio of innovation projects, it is important to consider how all the projects interact with each other (Lichtenthaler 2020, p. 50). This is particularly relevant in the case of digital innovations, since these often combine several aspects. For example, digital services are added to existing products, creating new customer experiences.

According to Lichtenthaler (2020, p. 50), portfolio management pursues four goals:

1. Aligning all innovation projects to maximize value, i.e., selecting the projects that are most financially attractive.
2. Closely overlapping an innovation portfolio with company strategy.
3. Implementing the right number of innovation projects, i.e., appropriate to the resources available.
4. Balancing the portfolio with regard to radical and incremental innovations.

In the case of digital innovations, there are four additional goal dimensions (Lichtenthaler 2020, p. 51f.):

1. Generating new sales, i.e., new business areas are opened up by the innovation project.
2. Creating a convincing storyline, i.e., can a vision for the future of a company and its product and service offering be outlined based on the portfolio?
3. Contributing to the transformation of the company, e.g., by increasing the agility of processes.
4. Generating a link to the core business, i.e., the aim is to closely integrate new digital innovations with the company’s existing products, services, and resources.

### Self-Check Questions

1. What is meant by managing an innovation portfolio?

*It is used to evaluate and prioritize all of a company’s innovation projects and to control them over the course of the projects. The aim is to ensure that the right innovation projects are selected and that they are balanced with regard to predefined criteria.*

## 7.3 Hybrid Project Management in Digital Transformation Projects

In addition to projects that further develop existing business models or develop new, disruptive business models, there are also digital transformation projects in companies that focus on improving internal efficiency (Parviainen et al. 2017, p. 66). Digitalization can, e.g., improve the efficiency, quality, and consistency of processes. In addition, better and more up-to-date evaluations of business processes can be provided based on the integration of data from various sources.

For digital transformation projects to be able to change products, processes, and business models at all, companies and organizations must create the conditions for digital transformation (Hess 2019, p. 7f.). In particular, this involves creating the technical prerequisites in the IT landscape and structuring the organization with a view toward digital transformation, e.g., by establishing an organizational unit to drive digitalization-related topics forward. These supporting measures are also often carried out in the form of projects, which are known as support projects.

### Projects for the Digitalization of Business Processes

**Business process**

A business process is a sequence of tasks or workflows that generate added value for the company or its customers. Examples are product development or customer order processing.

The digitalization of processes is a key aspect of digital transformation for many companies (etventure 2019, p. 15). These digitalization projects usually focus on **business processes,** i.e., processes that are critical to the company’s competitiveness (Hess 2019, p. 125). Business processes are used to process the requirements placed on a company or organization in a comprehensible and structured manner (Fleischmann et al. 2018, p. 1).

Every business process is triggered by an event (Fleischmann et al. 2018, p. 2). This can take place inside or outside the organization. An example of the former is a business trip request, with a customer order as the latter. The task is to react to this event and to act in a coordinated and targeted manner, with business process models describing how to act and which tasks to carry out. If a process changes or is redesigned, these models must be adapted. Boundaries such as external or internal regulations and laws must be observed.

#### The degree of digitalization of processes

Business processes can be supported by IT solutions. The degree of digitalization can vary, i.e., only individual activities or all activities within a process can be carried out with the help of IT solutions (Appelfeller/Feldmann 2018, p. 20f. ). An analog process is one in which no activities are carried out with the aid of IT, e.g., work is still entirely paper-based.

Digital transformation projects are now concerned with increasing the degree of digitalization, i.e., digitalizing previously analog business processes or improving IT support. Process automation often plays a role here, i.e., the question of which activities can be carried out by the IT system itself without human intervention (Appelfeller/Feldmann 2018, p. 22; Fleischmann et al. 2018, p. 10). Technologies such as robotic process automation (RPA) offer new opportunities for automating business processes (Scheer 2020, p. 117f. ). In this, software robots, i.e., software programs, take over simple activities that were previously carried out by specialist human employees.

#### Project management for process digitalization

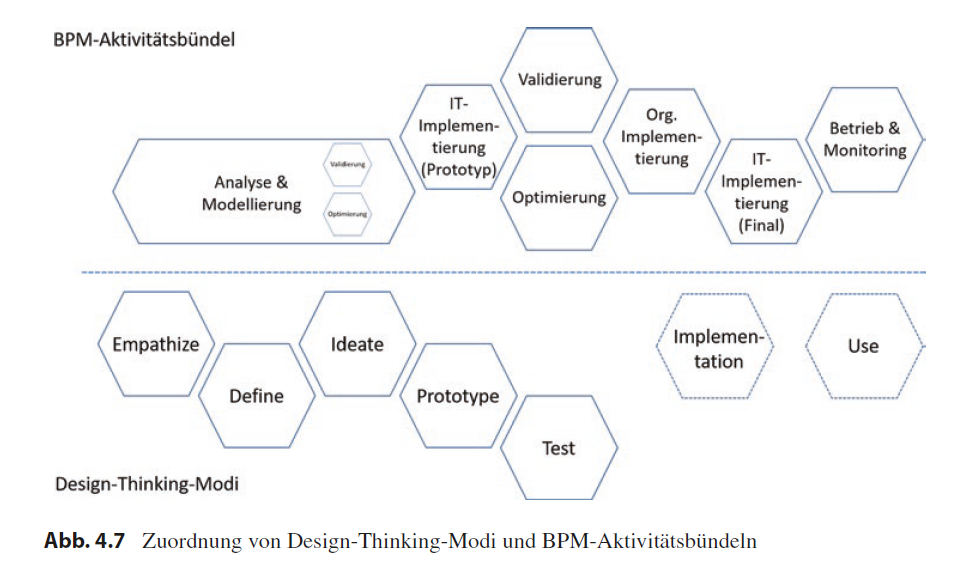
Many extensive process digitalization projects still opt for traditional project management (Fleischmann et al. 2018, p. 150f.; Hess 2019, p. 132; Müller/Schröder/Thienen 2021, p. 686). The analysis of the business processes, the design of future processes, their implementation organizationally and in terms of IT, and ultimately the introduction of the IT solution, take place step by step in clearly defined phases with milestones. This means that it may take a very long time before an IT solution is ready for use. Over the course of the project, there is also the risk that requirements and user wishes will continue to evolve, e.g., because business models have been re- developed or changed and, as a result, the underlying processes have also changed. Agile methods can be used to take this dynamism into account (Fleischmann et al. 2020, p. 172–174).

Fleischmann et al., for example, consider various activity bundles from business process management and map them onto the phases of the **design thinking** process (Fleischmann et al. 2018, p. 150–153).

**Design thinking**

Design thinking refers to a systematic, customer-oriented and iterative approach to solving complex problems.

Allocation of Design Thinking Processes Phases to Process Management Activity Bundles



In contrast, Müller/Schröder/Thienen (2021) design the entire process digitalization project according to an agile, iterative approach. In addition, it is possible to use agile methods specifically for individual tasks or phases in the process digitalization project, i.e., different hybrid process models can be configured. The considerations that play a role here are considered below for an analysis and modeling phase and for IT implementation.

**Analysis and modeling**

When analyzing and modeling business processes, the current status is recorded, potential for improvement is analyzed, and the desired target process is modeled.

When weighing up agile and traditional practices in a phase of **analysis and modeling**, this gives rise to the question as to what extent the requirements are already known and stable at the start of the project. This is often the case when existing processes are being further developed. Here, the aim is to improve the performance of the process, e.g., to shorten its lead time (Fleischmann et al. 2018, p. 151). This can typically be measured using key performance indicators. Creative approaches are needed to work out fundamental process innovations. Here, Fleischmann et al. (2020, p. 152) refer to design thinking methods, in particular.

Traditional or agile practices can also be used for IT implementation. If software is being developed, Scrum is a user-centric approach that has proven itself in software development (Fleischmann et al. 2018, p. 153). In this process, it is possible to first develop what is known as a **minimum viable product** and thus quickly provide users with a productively usable software that includes minimal functions. User feedback can therefore be incorporated into further development directly. Whether this procedure is suitable for a business-critical process must be assessed on a case-by-case basis: while it entails risks, since the new application may not yet be running stably, it may be possible to gain an edge over competitors by quickly deploying the new features.

**Minimum viable product**

A minimum viable product (MVP), literally a “minimal functional product” is developed quickly and is close to users’ basic needs.

#### Stakeholder management in process digitalization projects

A particular challenge in process digitalization projects is often that employees fear that their previous tasks will be automated and that they will, therefore, lose their jobs or that their areas of responsibility will at least change fundamentally (Falkenreck 2019, p. 14). The fact that this concern is justified is shown by the analysis of Manyika/Sneader (2018), for instance, which concluded in a study of 800 occupations that approximately half of all work activities can be automated. This leads to a fundamental change in the job descriptions of many occupational profiles (Grab/Olaru 2021, p. 145). The PwC study also paints a similar picture (Hawksworth/Berriman/Goe 2018, p. 1f.): 37% of employees fear that their tasks will be automated.

Process digitalization projects must handle the uncertainty and concerns of the employees affected: they are important stakeholders in the project and must be involved to an appropriate extent. It is important to listen to them, take their concerns seriously, and respect different opinions. It is also important to inform a company’s employees about the project, its goals, and parameters—in an up-to-date, credible, appropriate, and balanced manner (Falkenreck 2019, p. 25).

Falkenreck recommends using various communication media available within the company for targeted project communication (Falkenreck 2019, p. 20–24): employee magazines, emails, and newsletters, for instance , can be used to inform employees. Employee surveys can be used, e.g., to identify specific needs and areas of resistance or to evaluate the success of measures that have been implemented to date. Interaction between the project, management, and employees is created through the use of social networks, employee apps, blogs, and wikis. With the help of a **communication plan,** measures can be planned for the various project phases and taken into account in the budget calculation (Falkenreck 2019, p. 27f.).

**Communication plan**

The communication plan describes the intended audience, the time frame, and the person responsible for the planned communication measures (Falkenreck 2019, p. 28).

### Self-Check Questions

1. What are the goals of process digitalization projects?

*Process digitalization projects aim, e.g., to reduce processing times by automating individual work steps or the entire process. By supporting process steps with suitable IT solutions, the quality and availability of data can also be improved, for example. In addition, communication between process participants can be simplified.*

1. What are typical topics and tasks within support projects that create the conditions for digital transformation?

*Often, the prerequisites for digital transformation in companies must first be created through support projects. These ensure that the IT landscape is prepared accordingly and made more flexible, for instance. They build structures that promote innovation and aim to change the company culture. In addition, support projects can also have the goal of building the competencies required for the digital transformation.*

## 7.4 Further Case studies and Practical Examples

As the previous examples have shown, digital transformation projects cover a wide range of topics and therefore also place diverse demands on project management. In the following, an understanding of this is deepened by viewing projects that focus on digitalizing the interface with the customer. In addition, a project from an insurance company for which a hybrid process model was configured is presented.

### Projects to Improve the Interface with the Customer

A digital interface with the customer is important for both end-customer business (B2C = business to consumer) and B2B business (business to business). This topic has most recently moved to the forefront for all companies due to the Covid-19 pandemic. In Capgemini’s IT Trend Study 2021, companies were asked what projects they were planning to improve their interface with their customers (Roth/Heimann, p. 16). The fact that this topic is important for companies is also evident from the fact that only just under 7% of respondents stated that they were not planning a project on their customer interface. The projects focused on the following aspects, in descending frequency:

* Digitalization of the ordering process.
* Construction of automated service offerings.
* Digitalization of the payment process.
* Implementation of intelligent consulting systems for customers and/or service employees.
* Implementation/expansion of customer journey analytics.
* Establishment or expansion of digital showrooms.

The following is a practical example from the insurance sector that deals with precisely these interfaces with the customer.

### Practical Example: Output Management Project in the Insurance Industry

Insurance companies today face the challenge of modernizing contact with customers. Outgoing communication, i.e., from the insurance company to the customer, used to be primarily in paper form (Unterbuchberger/Hubinger/Rodewis 2018, p. 133). An insurance policy or an update on the status of benefit processing are often sent as a letter. However, customers expect digital contact points that can be used via any device, at any location and that provide all relevant information and services, from the conclusion of a contract to the amendment and termination of a contract (Unterbuchberger/Hubinger/Rodewis 2018, p. 134; de la Rosa et al. 2016, p. 7f. ). The project described here focuses on **output management**. To this end, it analyzes the existing system landscape, defines the functional target architecture, formulates requirements, and ensures the development and commissioning of the pilot application.

**Output management**

Output management ensures that all types of documents, such as invoices, contracts, orders, and customer letters, are correctly created, distributed, and archived in a revision-proof manner, both internally and externally (de la Rosa et al. 2016, p. 7).

#### Boundaries

In the run-up to the project under consideration here, a preliminary study was carried out. This study showed a very heterogeneous picture of the existing systems. In addition to modern systems, there are some very old systems for which extensions, as would be required in the context of output management, are no longer economical (Unterbuchberger/Hubinger/Rodewis 2018, p. 135).

In addition, a technical target image was formulated for output management, which sets the boundaries for all projects in this context with the following five points (Unterbuchberger/Hubinger/Rodewis 2018, p. 136f.):

* **Future viability:** flexible and open formats should be supported. In addition, there must be flexibility with regard to the delivery channel.
* **Editing process:** documents and delivery specifications should be made by employees of the specialist departments and should not require any specialist IT knowledge.
* **Process support:** workflows and tools for specialist employees are to be provided for the optimum support of business processes.
* **Format and presentation:** the desired presentation should meet recipients’ requirements on all end devices. The formatting allows text and the inclusion of other objects, such as graphics.
* **Delivery channels:** delivery should be carried out through the correct channel, depending on the customer’s preferences and legal requirements.

#### Project initiation and definition for a pilot application

All requirements were collected and described in preparation for the invitation to tender for the new software solution (Unterbuchberger/Hubinger/Rodewis 2018, p. 139f.). The selection of potential development partners was based on a market analysis, with providers who already offered solutions in the output management environment being chosen. In the further selection process, the offers were evaluated, interviews and product presentations were conducted, and test installations were evaluated.

In addition, a specialist department was sought internally for the project to test the new solution within the scope of its tasks and processes. This department acts as the client and future user in the pilot project (Unterbuchberger/Hubinger/Rodewis 2018, p. 141f.). A key aspect in the selection of the implementation candidate was that it supports the project without reservations.

#### Selection and configuration of a hybrid process model

When selecting a suitable practice for the pilot project, an agile approach was considered due to the boundaries of the pilot project (Unterbuchberger/Hubinger/Rodewis 2018, p. 142f.). During the decision-making process, the respective advantages and disadvantages of an approach according to Scrum and according to the waterfall model were identified. They are shown in the following comparison:

Comparison of Scrum and the Waterfall Model in the Output Management Project

|  |  |  |
| --- | --- | --- |
| Methodology | Advantages | Disadvantages |
| Scrum model | * Flexibility * Transparency * Alignment with customer needs | * Planning reliability |
| Waterfall model | Clear definition of:   * Scope * Time * Costs | * Result only visible at a late stage * Rigid specifications * Late detection of errors * High conceptual effort and expense |

After comparing the two process models, a decision was made in favor of a hybrid procedure, with the aim of making the project as efficient as possible. The IT solution for output management is developed according to Scrum. The actual integration of the new application into the insurance company’s existing system landscape, on the other hand, is carried out according to the waterfall model (Unterbuchberger/Hubinger/Rodewis 2018, p. 144).

Agile and traditional practices are thus combined to form a hybrid process model. According to the understanding of Timinger (2017, p. 246), who distinguishes between three possible combinations, namely sequential, parallel, and integrated, this is a sequential application. The two phases described, development and integration, are carried out according to different process models.

In the project example under consideration, this combination of agile and traditional practices led to challenges with regard to control and the close integration. (Unterbuchberger/Hubinger/Rodewis 2018, p. 144). The background to this is that there are agreed **release** dates that are subject to company-wide planning and coordination. Project results cannot, therefore, be delivered, installed, and put into production at arbitrary times. There are also such predefined time corridors for the integration and provision of the test environments. To nevertheless be able to provide a testable result after each sprint, as envisaged by Scrum, it was decided to establish a separate test environment . Agile development was therefore decoupled as far as possible from company-wide scheduling.

**Release**

A release is a version of a product or software that is released and published at a specific point in time. The functional scope of the individual versions and the release dates are defined as part of release management.

### Self-Check Questions

1. Mark the correct answers for completing the following sentence:

If project phases are partially carried out according to agile and partially according to traditional project management practices, this form of application is referred to as ...

* ... *sequential*.
* ... integrated. (F)
* ... parallel. (F)
* ... phase-oriented. (F)

1. Provide three examples of projects that improve the customer interface.
2. *A project to digitalize the ordering process, replacing a paper-based process with a digital solution. (2) The introduction of a chatbot that is integrated into the website and answers simple questions for potential customers. (3) The creation of a virtual showroom, e.g., where products can be presented in 3D.*

Summary

This unit considers how hybrid project management is applied during different types of digital transformation projects. For interdisciplinary product development, how new, innovative products and services are developed for customers is demonstrated. To do this, a distinction is first drawn between three types of products and services, namely new, stand-alone digital services, value-added services, and hybrid products and services. Building on this, a project example from the development of mechatronic products at an automotive supplier is used to show how a hybrid process model can be configured on the basis of the V-model.

A further focus is placed on hybrid project management in the context of strategic innovation management. After introducing important aspects of strategic innovation management, particularly the innovation strategy, innovation organization, and the appropriate mindset, how innovation projects can be planned and executed is outlined. Approaches for selecting and prioritizing such projects are also presented, since they are utilized in the context of project portfolio management, in particular.

Furthermore, projects that have the goal of digitalizing processes are considered. Given that such projects are currently still often carried out using purely traditional practices, new approaches that lead to hybrid project management are presented. Particular attention is paid to stakeholder involvement. In addition, projects to improve the interface with the customer are considered as a further thematic focus, since this type of digital transformation project is currently of great relevance from a company’s perspective. After providing an overview of the frequent goals of such projects, a specific project from the insurance industry is presented. In particular, how a hybrid process model was configured for this project is explained.

In general, the projects described in this unit demonstrate how methods and practices from traditional and agile project management are selected and combined. Which aspects, boundaries, and challenges in these practical examples led to decisions for or against certain methods is also discussed. When given the task of configuring and substantiating a suitable hybrid process model for a project, it may be helpful to refer to the experience and best practices presented here.