Chapter 5

Making IT Perfect: Managing People and Organizing Communication

Two main resources contribute greatly to making good software: people's intellect and people's ability. The techniques we have seen in the previous chapters help to control the software production environment, but people turn ideas into requirements and requirements into software. Thus, it is not surprising that managing people and teams effectively is a big component of software development projects. To be fair, managing people and teams is important in any kind of project. In no other engineering domain, however, can people contribute so much to determining the success or failure of a project.

In this chapter, therefore, we will have a look at the main activities related to managing teams and organizing work. We will look at the topic from two points of view. On the one hand, we will look at the activities that are necessary to manage people. On the other hand, we will hint at some of the theories and studies behind the management of people, to understand what motivates people and what a manager can do to create a favorable environment to carry out work. A look at organizational structures for projects and at managing communication completes the overview, by suggesting how work can be organized and how information flows.

5.1 Managing People

There are four main steps related to human resource management in a project. They are

1. **Define staff requirements**. This is the activity during which the project requirements, in terms of human resources, are identified. It includes both numbers and, more importantly, skills and competences.
2. **Select staff**. This is the activity during which the people who will work in the project are selected. The selection process can include personnel already working in the organization or it might require new resources to be hired.
3. **Manage staff**. During a project, the manager has three main goals. The first is to make a team out of the individuals participating in the project. The second is to provide resources and motivations to the team so that it can perform well. The third is to ensure that people acquire skills and capabilities, so that the time they invest in the project is spent not only in achieving project results but also in creating new career opportunities and self-growth.
4. **Release staff**. All projects come to an end. When a project nears completion, it becomes necessary to manage the transition of the team to their next assignments. A management concern in this phase is to ensure that proper recognition is given to the work performed in the project and, when possible, that the know-how built in the project is not dispersed.

Actual scenarios in which projects live and teams form are most diverse. In some organizations, teams consolidate and the same people will end up working in different projects. In other structures, each new project requires the formation of a new team.

Some of the activities described in this section are sometimes carried out with the support of the human resources department, if the organization is big enough to afford one. For instance, part of the staff selection process could be the responsibility of human resources. On some occasions, human resources might support a project manager in strengthening a team and improving teamwork. On others, human resources set the organizational standards and limit the margins a manager has, for instance, in granting bonuses.

Good project managers, however, have good people management skills.

5.1.1 Define Staff Requirements

As soon as the goals, assumptions, and boundaries of a project are clear (see Section 3.2), it is necessary to start defining the requirements of the project team. One approach identifies the hard and the soft skills that a project requires.

Hard skills are those that refer to specific technical abilities that can be taught and are measurable; for instance, the ability to write software in C, knowledge about statistical methods, and being able to read and write Portuguese.

Table 5.1 An Example of a Skill Matrix

Activity	*Skills*
Requirements	Good know-how of the automotive domain. Experience in questionnaire management.
Design	Experience in the use of the IBM Rational suite of modeling tools.
Implementation	Very good know-how of the C++ and WxWidget GUI environment. Experience with test-driven development.

By contrast, **soft skills** (or **emotional intelligence**) are capacities that are difficult to teach and difficult, if not impossible, to quantify. Soft skills usually depend on personality traits and include the capability of getting along with other people, empathy, thoroughness, and creativity, to name a few. In general, all projects will require both hard and soft skills.

To become systematic, one can use a **skill requirements matrix**, as suggested in Tomczyk (2005). The matrix is a table that lists, for each project activity, the main hard and soft skills that are required. Table 5.1 shows an example of a skill matrix: each row corresponds to a project activity; for each project activity, the matrix highlights the main requirements. Focusing on specific skills, rather than generic ones, of course, can make the definition of the skill matrix more effective.

Note that soft skills take time to develop. Hard skills, by contrast, can be taught. Certain projects might have a time frame for which appropriate training activities and specific skills might be acquired.

5.1.2 Selecting Internal Staff

The skill matrix defines our main personnel requirements to carry out the project. Once we have the requirements, we can start individuating the personnel who fulfill these requirements.

The first step is to look for personnel already available in the organization. There are three elements that need to be taken into account.

The first consideration is that policies and practices might limit the actual possibility of selecting resources. For instance, some organizations do not favor moving resources from one department to another, even on a temporary basis. Thus, the internal resources that can be actually selected for a project do not necessarily correspond to those potentially available.

The second is that experienced resources are limited. In many situations, if a skilled resource is required, part-time involvement might be inevitable.

The third consideration is the timing and priority of our project. Both could limit or enlarge, for different reasons, the pool of resources we can select from.

In all the situations mentioned above, good negotiation skills with peers and bosses can help quite a bit in drafting the right people for your project.

5.1.3 Selecting External Staff

When the internal selection process does not yield the people with the required characteristics or availability, it might be necessary to **hire personnel** for the project.

The hiring process requires the following:

1. Defining a job description
2. Advertising the position
3. Waiting for an appropriate amount of time
4. Analyzing the received résumé
5. Interviewing the candidates
6. Selecting the personnel to hire.

A **job description** is a short document that describes the context for which a position is sought, information about the company hiring and the project, the skills and experience required, and the salary range. Sometimes, companies do not want to make their recruitment needs public. In these cases, the job description lists only the skills required and the salary range. The advertising and the pre-selection processes are delegated to a recruitment company, which finds the most appropriate candidates. An advantage is the speed with which personnel with the right skills are found, since these companies manage a big network of potential candidates.

Job descriptions are advertised through specific and generic channels. Professional associations, mailing lists, and websites are some starting points. One's professional network and friends are another source of support.

The goal is to collect a list of potential candidates. These will answer the call providing a résumé, in some cases reference letters, and an accompanying letter, motivating the reason for the application. The résumé will highlight the hard and soft skills, together with the work experience and education; the accompanying letter might explain where the interest for the position comes from.

Human resources and the project manager will then analyze the résumés received, identifying the most promising candidates, who will then be interviewed.

The most diverse interview styles have been proposed and used. Some focus on the technical skills. The interviewers, in this case, will test the proficiency and competency of the candidate by posing a technical problem, like, for example, writing a bubble-sort algorithm in C++, if programming in C++ is one of the skills required for the position. Others prefer to test general problem-solving abilities, posing questions that probe the analysis and synthesis skills. Administering questionnaires or adopting specific interviewing strategies can be used to assess personality traits and verify the performance of people under stress.

In any case, an initial exchange with the candidate about the résumé, working experience, and motivations helps provide basic information about the candidate and sets the ground for more specific questions. Work experience, in fact, might provide details about technical skills and personality traits; education provides insights on the fundamentals, but it becomes less important for people with long experience on the field. Feedback from previous bosses (where this is feasible) or from people

providing references can also help in getting a frank and sincerer assessment of the candidate.

The selection process can be very structured. Larger organizations, for instance, use a multistage process in which a potential candidate is interviewed by different people, each assessing different traits of the candidate.

Independent of the specific technique, the analysis of the résumé and the interviews should end up with the manager having a clearer picture about the hard and soft skills of the candidate.

5.1.4 Managing Staff

A range of soft skills, such as the capacity to motivate, mediate, and solve conflicts, clearly helps one be a good manager. Thus, we might be happy enough stating that good managers have good soft skills and those who do not should be doing something else.

Moving one step further and understanding what drives and motivates people can have a huge impact on the science of management. In fact, it can make one a better manager and, more importantly, it moves people management from art to science, making it teachable in the process.

Researchers have tried to explain people drivers and, consequently, the management styles that make teams more productive and effective. These are shown in Figure 5.1, which depicts a timeline of the main studies in the area.

Taylor formulated one of the first theories about management and workers' motivations; it is known as **scientific management** (Taylor, 1911). Taylor does not have a particularly positive view of workers. Some of his findings are that workers perform at the slowest rate that goes unpunished and that workers cannot be relied on for talent and intelligence. The solutions Taylor proposes to make work more efficient are high control from the management and, maybe a bit surprisingly, better

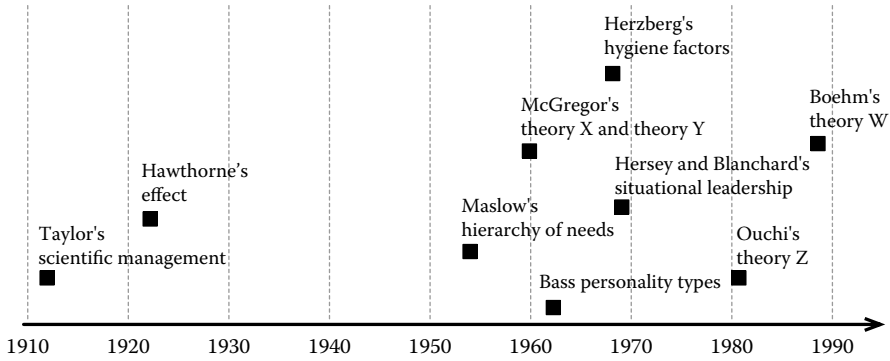

Figure 5.1 A timeline of management theories.

pay and rest periods. However, the first is connected to outputs and the latter allows workers to regain strength and make the work subsequent to the rest period more efficient.

In the 1950s,* **Maslow** proposed a **hierarchy of needs** (Maslow, 1943, 1954). According to his work, people are wanting animals and, as soon as they achieve a need, they start craving for something else. Maslow thus organizes the needs in a hierarchy, which represents the order in which these cravings materialize. At the lowest level of the hierarchy, we find physiological needs, such as, for instance, the **need for safety**. As we satisfy our basic needs, we start desiring higher level needs. The top level of the hierarchy is constituted by **self-actualization**, in which workers are free to fully express themselves. Thus, according to the theory, good managers will create an environment that allows workers to be driven by higher levels of the hierarchy.

McGregor conducted the next relevant studies that are summarized by the **theory X and theory Y** work. According to **McGregor**, there are two different theories that explain how workers behave. The first, called **theory X**, describes workers as little motivated, similar to Taylor. The second, called **theory Y**, recognizes work as a natural activity, assumes people are very creative, and considers self-realization and self-esteem as motivating drivers, similar to Maslow's hierarchy of needs. The key point is that two different management styles will have to be applied in the two contexts. If the manager thinks she is dealing with a "theory X" person, she will adopt an autocratic management style. In contrast, if the manager believes she is working with a "theory Y" person, she will prefer a style that entails a climate of delegation and trust. See McGregor (1960, 1966), McGregor and Cutcher-Gershenfeld (2005) for more information.

The **situational leadership** theory, proposed by **Blanchard** and **Hersey**, elaborates on McGregor's work. According to the two researchers, in fact, the best management style is a combination of **direction** and **support**. Four different styles can be defined: **low support and high direction**; **high support and high direction**; **high support and low direction**; and **low support and low direction**.

The management style a manager should adopt is one of the four and depends on the person being managed. People with *low skills* and *low motivation* are best managed with a highly directive and low support management style. This, in fact, will be the only way to achieve results. As the motivation of an employee grows, management will benefit from increasing support and decreasing the directive behavior. As skills improve, so can delegation. In fact, people with *high skills* and *high motivation* are better managed with low direction and low support.

* There is a bit of discussion about the dates. Maslow published his first work in the 1940s, but the book that made his work famous got published in the 1950s.

Choosing the wrong management style yields to friction and failure. For instance, applying a highly directive management style to a skilled person underpins competency and undermines motivation. More to the point, modulating one's management style can help personnel move from a low skills/low motivation status to a high skills/high motivation status. The theory, originally published in Hersey and Blanchard (1969) is nicely described in Hersey et al. (2012).

Another good, effective, and simple characterization is that proposed by **Bass** according to whom people are **task-oriented**, **interaction-oriented**, or **self-oriented** (Bass and Dunteman,1963; Bass et al., 1963; Bass, 2008). Different personalities prefer and work better on different types of tasks. Thus, assigning the most appropriate task increases individual and team performances. Task-oriented people will be more interested in tackling intellectual challenges, while interaction-oriented people will thrive in collaborative environments; finally, self-oriented people will have to find a return in what they do.

A more recent theory, proposed by **Merrill** and **Reid**, distinguishes personality traits in two main dimensions: how much a person is task- rather than people-oriented and whether a person is an introvert or an extrovert. The quadrants of this two-dimensional space define four different personality traits: **analytical** (introvert and task-oriented), **driver** (extrovert and task-oriented), **expressive** (extrovert and people-oriented), and **amiable** (introvert and people-oriented). Different personality traits have different needs and, consequently, different stimuli to which they react better. Thus, for instance, the amiable type needs personal security and sincere appreciation and performs better in situations in cooperative group work. See Merrill and Reid (1981) for more information.

Other relevant works focus on the drivers.

Hawthorne Works, in the 1920s, commissioned one of the first studies to improve workers' efficiency. In particular, the study tried to evaluate the effect of different lighting conditions on workers' performances. To the surprise of the researchers, it turned out that increasing or decreasing lighting conditions had the same effect: workers increased their performances. One explanation is that being observed and the motivation deriving it were the actual causes of the increased performances. The studies had a significant impact in the field of organizational behavior (Zhong and House, 2012). See, however, (Kolata, 1998, 2009), for some recent critiques about the rigorousness of the study and its results.

Frederick Herzberg, in the 1960s, presented his **theory of hygiene factors**, which was based on the consideration that *the opposite of job dissatisfaction is not job satisfaction*. In more detail, Herzberg analyzes various factors contributing to job satisfaction and job dissatisfaction, realizing that some of them systematically contribute mainly to job dissatisfaction, while others contribute mainly to job satisfaction. Factors in the first group are called **hygiene factors**, while factors in the second group are called **motivational factors**. Hygiene factors are necessary but not sufficient to create the conditions of a good working environment. If the hygiene factors are not satisfied, a worker will be unsatisfied. However, if the hygiene

Table 5.2 Herzberg's Hygiene and Motivational Factors

Motivational Factors	*Hygiene Factors*
Achievement	Company policy and administration
Recognition	Supervision
Work itself	Relationship with supervisor
Responsibility	Work conditions
Advancement	Salary
Growth	Relationship with peers
	Personal life
	Relationship with subordinates
	Status
	Security

factors are satisfied, the worker will not be satisfied unless one or more of the motivational factors are present. Table 5.2 shows the motivational and hygiene factors and (Herzberg, 2003; Herzberg et al., 1957, 1959) provide more information about Herzberg's work.

Finally, Boehm and Ouchi focus their work on motivations and win-win conditions (Ouchi, 1981). In slightly more detail, Ouchi's **Theory Z**, close to the lean manufacturing theories, focuses on keeping workers motivated and creating an environment in which people report mistakes.

Boehm proposes **theory W**, according to which it is necessary to create **win-win** conditions for all stakeholders. Thus, a good manager will focus on understanding the winning conditions of his/her team, setting the right expectations, and assigning *achievable* tasks, based on a person's capabilities (Boehm and Ross, 1989).

5.1.5 Management Styles

If you are not at the top of your organization's pyramid, you will have a boss. So, taking a different point of view, we can also have a look at the styles a manager has, in order to better comprehend behaviors and drivers. We will focus on two main theories. The first characterizes management styles on a one-dimensional continuum, while the second uses a two-dimensional space.

The one-dimensional theory distinguishes five different management styles:

1. **Autocratic**, when the manager takes all the decisions. A subcase is the **paternalistic** management style, when the manager pays a bit more attention about the opinions and feedback of subordinates, but the ultimate decision remains with the manager. Autocratic managers can be further classified as **permissive** or **directive**, according to the degrees of freedom they allow the subordinates to carry out the work.
2. **Persuasive**, when managers tend to convince subordinates to do the work and implement the decisions they have taken. While still autocratic in the

decision-taking process, persuasive managers tend to be more aware of the needs of personnel and to motivate their decisions.

3. **Consultative**, when managers involve the personnel in the decision process while retaining control over the decision process. Emphasis is given to ensuring that the needs of personnel are taken into account.
4. **Democratic**, when managers allow personnel to take part in the decision process. This management style requires extra effort on the part of the manager, for example, to have the appropriate information flow, but might end up in environments that are nicer to work in.
5. **Laissez-faire** and **chaotic** environment managers are those whose employees are given complete freedom on the decisions they take. The style embraces flexibility and creativity, with the managers playing the role of a mentor and guide.

The two-dimensional theory, proposed by **Blake** and **Mouton**, uses **concern for production** and **concern for people** to characterize five different management styles (Blake and Mouton, 1964).

Four styles are suboptimal. They are

1. The **impoverished style**, when both concern for people and production are low. The main goal of the manager is to avoid troubles, keep a low profile, and try to preserve jobs and seniority.
2. The **country club style**, when there is a high concern for people, but a low concern for production. The style is characterized by a friendly atmosphere, but production might not derive as a consequence of the nice environment.
3. The **produce or perish style**, when concern for production is high, while concern for people is low. This is a scientific management environment, where money is the justification for the employee to work and the manager uses rules and punishments to achieve the company goals.
4. The **middle-of-the-road style**, when concerns for people and production are somewhere in between. Managers who use this style hope to achieve acceptable performance.

With all due respect to the theory, the best management style is something we could expect. It is, in fact, the **team style**, where both concern for people and production are high. More interesting is the fact that this style is implemented using McGregor's theory Y and by making the employee feel as a constructive part of the company.

We conclude this section by highlighting some common mistakes that a manager can do to demotivate people (Amabile and Kramer, 2011). According to the study, there are, in particular, two conditions that need to be avoided. The first is one in which *work is stripped of its meaning*. The second is one in which managers become *micromanagers*.

Signs that work is being stripped off its meaning include situations in which managers dismiss the importance of employees' work or destroy employees' sense

of ownership of their work. Other demotivating factors concern attitude on plan and priorities. In particular, giving the message that the work one is performing will never end, keeping on changing priorities, and neglecting to inform employees that priorities have changed are three mistakes to avoid.

Micromanagement is the second way of demotivating people. Micromanagement is a form of autocratic management, in which the manager closely directs and monitors the work of employees. Lack of delegation and a zeal for monitoring without providing any help are two signs that one is micromanaging. The other two characteristics are withholding information and taking credit for results and shifting blame onto subordinates.

5.2 Project Organization Structures

The level of influence a project manager and other project stakeholders can exert depends on the organizational structure of a project. Choosing an adequate structure for the project can thus simplify or hamper a project.

Various organizational structures have been experimented with. As usual, project size and formality, together with external constraints, determine what organizational structure can be adopted for a specific project.

A good organizational structure has to define, at a minimum, the following information:

- Where responsibility and accountability are
- How information flows
- How conflicts are solved.

Some rules of thumb help make organizational structures more effective. We mention, for instance, ensuring that the responsibility is set where influence can be exerted and there is an interest in exerting it; keeping the decision process simple, so that decisions are taken fast; and making sure information flows.

In the following section, we review some of the most common structures, highlighting, for each one, the main positive and negative characteristics.

5.2.1 Hierarchical

Figure 5.2 shows different types of hierarchical structures.

In its simplest form, the project manager has control over technical and managerial matters and organizing the work of the project team, which might be structured in different groups. This is shown in Figure 5.2a.

The hierarchical structure works well in small projects. As the project size increases, however, the project manager becomes a bottleneck. In larger projects, therefore, the identification of a middle layer (e.g., work-package leaders) helps

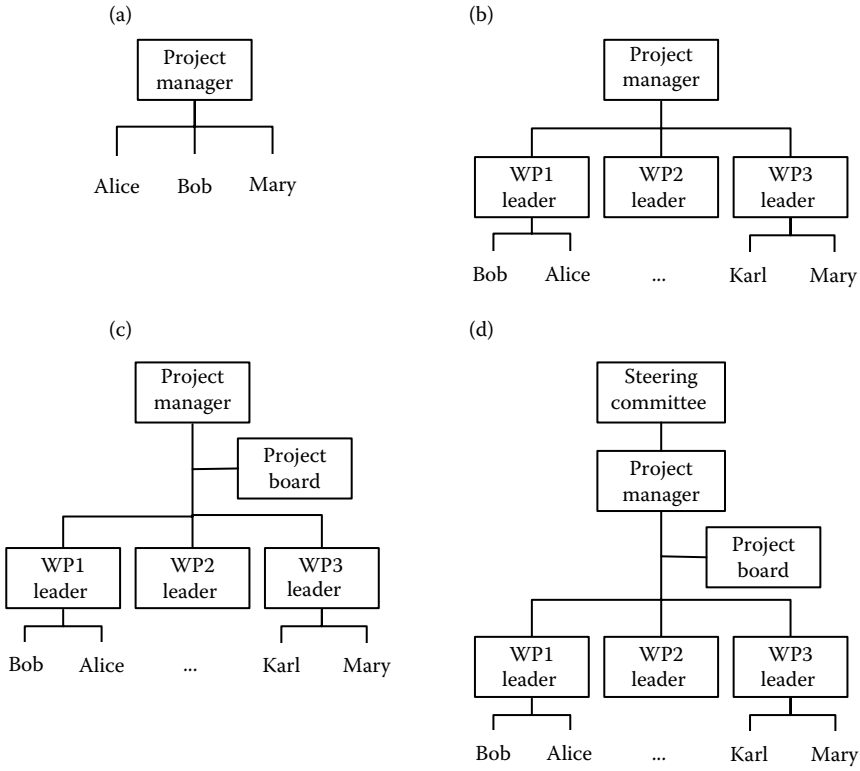

Figure 5.2 Hierarchical organizational structure. (a) The project manager manages the team; (b) the project manager interacts with work package leaders, who manage the team; (c) a project board supports the project manager; (d) a steering committee provides strategic guidance.

ensure that activities proceed more autonomously, while, at the same time, an effective coordination is kept. This is shown in Figure 5.2b.

When a project involves different functions or units of an organization, another common structure is one in which the middle layer is made by the people responsible for the organization's division or units. In such cases, the organization of the project structure is by function, rather than by task.

Another point of attention with the hierarchical structure is that it requires the project manager to have both managerial and technical competencies to properly deal with a project. In another common variation, therefore, technical and managerial leadership is distinct. The technical leader supervises the technical work, while the manager maintains control of the overall process. The level of autonomy can vary greatly, from situations in which the technical leader works as a counselor to situations in which the technical leader has large autonomy over the project.

In large projects, technical or managerial advice can also be provided by a **project management board**. The board can be composed by the work-package leader, providing a better integration among the work conducted in the different work-package levels. This is shown in Figure 5.2c.

In projects involving various organizations or a large number of stakeholders, often a **steering committee** is also appointed. The **steering committee** provides strategic guidance about the project by defining the strategies to apply and supporting the project manager in their implementation.

Advantages exist both for the project manager and the stakeholders. The first, in fact, can share some of the project liability or obtain support that would otherwise be difficult. The others have a chance to have their ideas and goals represented in the project. This is shown in Figure 5.2d.

5.2.2 Matricial Organizations

The hierarchical structure assumes that the manager can freely organize the work of the team. In many situations, however, projects borrow team members from the existing functional structures of a company and project managers need to negotiate assignments with the functional managers. Even if both managers work for the same company, the goals and interests of the project manager often differ from those of the functional managers. The first, in fact, focuses on taking the project home, while the others are more concerned with continuing operations in the departments they lead. They look at the project activities carried on by *their* personnel as a distraction.

In this case, allocating the responsibility of the team exclusively to the project manager or to the functional managers leads to solutions that are equally unrealistic. The **matricial structure** can mitigate this problem. In the matricial structure, personnel are assigned both to the project manager and to the functional manager. According to who has priority when conflicts on assignments arise, we can distinguish a **weak matrix**, a **strong matrix**, or a **balanced matrix**. In the first case, the functional area manager has priority in solving conflicts; in the second case, the project manager has such a privilege; in the third case, the situation is something in between.

Figure 5.3, for instance, shows a matricial organizational structure.* We distinguish, in particular, between four functional units, namely, "design," "engineering," "production," and "administration" (shown in the columns of the matrix), and three projects (shown in the rows of the matrix). At the intersection of a functional unit and a project, we find the personnel of the functional unit who are working for a project. Thus, for instance, "Project 1" has two people working from the "Design" unit and three people of the "Production" unit. Similar is the case for the other projects.

* The pictures of the people in this and other diagrams are taken from Morville and Callender (2010) and distributed under a Creative Common License.

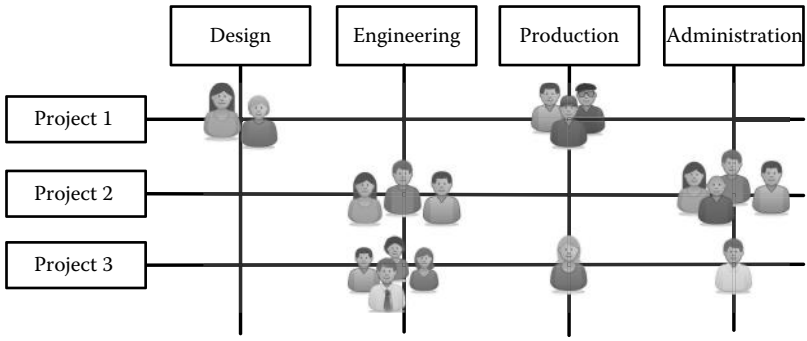

Figure 5.3 Matricial organizational structure.

One of the strengths of the matricial structure is that it favors pooling of competencies. For instance, it accommodates very well a **project management office**, which pools the management competencies of an organization.

The main drawback is the so-called *two bosses syndrome*, in which personnel report to two bosses.

Note that the matricial structure can also be used to organize the work within a project, if this is large and complex enough to justify such structuring.

5.2.3 RACI Matrix

The **RACI** matrix is a useful tool to represent the role and responsibilities in a project. RACI is an acronym, which stands for **responsible** (who carries out the work), **accountable** (who liable for the work performed), **consulted** (who is consulted), and **informed** (who is kept informed).

In a RACI matrix, rows include the list of work packages or tasks of a project and the columns contain the team or the organizational structures involved in the project. At the intersection of each row T and column P, the letters "R," "A," "C," and "I" indicate the role P has in task T. The only constraint is having exactly one "A" per row. All other allocations depend on the project.

This is shown, for instance, in Table 5.3, where we show the RACI matrix of a large project involving eight different partners (labeled $P1, \ldots, PN$) and seven different work packages. Cells define the role of each partner in the different work packages. Thus, for instance, $P3$ is accountable (and responsible) for the work in WP5. All other partners are consulted.

5.2.4 Agile Teams

Agile software development moves away from the structures we have just presented, favoring smaller structures and a more democratic approach to decision taking.

Table 5.3 An Example of an RACI Matrix

Work Package	*P1*	*P2*	*P3*	*P4*	*P5*	*P6*	*P7*	*P8*
WP0. Project Management	AR	C	C	C	C	C	C	C
WP1. Case Study Requirements	C	C	C	AR	R	C	C	R
WP2. Network Architecture Definition		AR			C		C	C
WP3. Software Development	AR			R	C	R		C
WP4. Assessment and Evaluation	C	C	R		AR	R	R	R
WP5. Sustainability and Exploitation	R	R	AR	R	R	R	R	R
WP6. Dissemination	R	R	R	R	R	AR	R	R

Concerning the first point, for instance, Scrum teams are usually between five and nine people. Concerning the second point, all members of the team are empowered and participate in the decision-taking process. Thus, rather than focusing on the chain of responsibilities, agile teams talk about roles, which can be interchanged from one iteration to the next.

Scrum teams define the following three roles:

1. The **Scrum master**, who is the person responsible for measuring project progress and solving issues.
2. The **Customer**, who is the person responsible for the overall implementation of the Scrum process. Note that since teams are self-organizing, the Scrum master ensures that activities and artifacts are produced, that no impediments hinder work, and that the development can proceed. The Scrum master is also the interface with the *external world* and *shields* the team from external influences. By contrast with "traditional" project management, work is (self)assigned by the team.
3. The **Team**, which is responsible for the work. The team is self-organizing, with roles decided and fixed by the team at the beginning of each software development project. Programming in agile teams is often conducted in pairs, with one person writing code and the other advising and supervising the work. The person writing the code is called the **driver**, while the other is called the **navigator**.

A critique that is often made of agile teams is how they can be scaled up to manage complex projects. The standard solution is to use teams of teams. A **team of teams** is essentially a hierarchical structure with a twist. The lowest level of the hierarchy is, in fact, composed of agile teams. Higher levels of the hierarchy are agile teams composed by taking one person from each team at the lower level. In this way, teams are kept small and all teams participate in the decision-taking process, through the representatives appointed to participate in the teams of teams. This is shown in Figure 5.4.

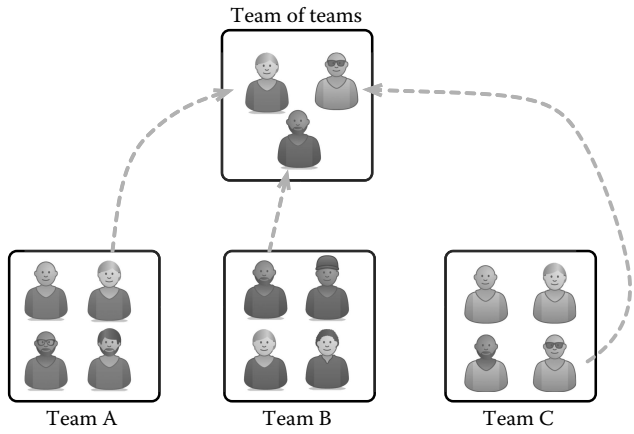

Figure 5.4 Teams of teams.

5.3 Managing Communication

A proper management of communications in a project ensures that information flows in a timely manner and reaches the appropriate stakeholders.

The types of information that are exchanged in a project include

- **Technical information**, which is necessary to carry out the work in the project. For software systems, one of the challenges in this area is to ensure that all stakeholders form a shared view about the system being built. This might require some attention to take into account the different skills and competencies of the stakeholders involved.
- **Project status information**, which is necessary to understand whether activities are being carried out as planned. This information is essential to evaluate and take action if any deviation occurs and to make sure that all stakeholders are aware of such changes. One of the points of attention in this area is to establish good and reliable data collection practices.
- **Project decisions**, which are necessary to ensure that the proper choices are taken and the project moves in the right direction.
- **Project action items**, which include all the information necessary to ensure that the plan is implemented, activities are actually started, and project outputs are actually collected and stored.
- **Project advertisement**, which is necessary to ensure that stakeholders are informed and engaged. Although not necessary in any projects, ensuring that a project gets proper publicity and dissemination can help create a favorable environment. Internal meetings, updates to senior management, and dissemination to the public, conferences, and workshops are some of the means.

5.3.1 Planning a Communication Strategy

Communication always happens through a **noisy channel**. That is, what we say is not always what we intend and what our listeners perceive is not always what we said. Simplifying a bit, we intend *ABC* and people perceive *ACD*. Various factors can influence the amount of *noise* we have to deal with in a discussion, including **cultural differences** (think, e.g., different etiquette in use by different cultures), **language barriers** (think, e.g., teams for which the project official language is not their mother tongue), **personality traits** (think, e.g., the different personality types we discussed in Section 5.1.4), **capacity to assert and listen** (which might depend on personality traits or the project environment, or circumstances), and **communication means** (think, e.g., the different impact a formal letter has with respect to the same topic sent by email or discussed in person).

The second consideration is that a good communication plan delivers the **right information**, to the **right people**, at the **right time**. The goal, in fact, is to make certain that the information raises the correct level of attention in the right stakeholders, when the moment arrives.

To make the point clearer, consider the opposite scenario, a situation in which all project information is distributed to all stakeholders, regardless of type and role. Since many pieces of information will turn out to be irrelevant to many stakeholders, they will soon lower their attention and miss the important information. Similarly for timing: send a communication about an internal meeting 4 months in advance and few will remember it (or, more likely, so many things will happen in between that the chosen time slot will have to be changed). Send it 1 h before the meeting and no one will be able to attend.

Another important aspect to consider is the **means**. The same information, in fact, can be delivered in different ways: meetings, workshops, emails, letters, document repositories, chats, and phone calls, to mention a few.

An appropriate mean can be chosen by looking at the following factors:

- The **recipients** and, in particular, whether the recipient will be able to use the information with the mean we have chosen.
- The **logistics** and, in particular, the cost, in terms of time and resources, of delivering the information with the mean we have chosen.
- The **formality** and, in particular, the kind of impact the mean could have on the recipient. In fact, some information is better exchanged with traceable means and is better written than spoken. The opposite also holds, however, and some communications are better spoken in person, rather than written.

Bigger projects, therefore, will benefit from writing a **communication plan**. At a minimum, a communication plan defines

- **Information to be exchanged**. Starting from the *project plan* and the *list of deliverables*, the project manager defines what information is exchanged.

Associating a *level of confidentiality* to each deliverable, as we have seen in Chapter 3, helps to highlight the possible constraints.

- **List of stakeholders to be involved and lines of communication**. Starting from the *project roster*, the *stakeholder map*, and the *RACI matrix*, the project manager defines the line of communications, namely, who is made aware of what.
- **Communication means**. According to the project constraints and available infrastructure, the project manager will define how information flows and is made available to stakeholders. Digital assets might be distributed through **websites/wikis**, **mailing lists**, and **document repositories**, to mention a few. **Workshops** and **meetings** are also commonly used. Note that some of the means *push* the information to the stakeholders, while others require the stakeholder to be more active and *pull* the information they need.

More detailed plans will also include a specification of the **communication timings and triggers**, which specify the strategy chosen to deliver information. The simplest strategy is **event driven**: when a specific piece of information is available, it is distributed to the relevant actors. Deliverables are best distributed on an event-driven basis. Another possibility is to distribute the information **periodically**. On a regular basis, all new pieces of information are distributed to the project participants. Project status information is often made available periodically.

5.3.2 Communication Styles

Individuals have different **communication styles**. Understanding one's communication style helps to establish a good communication channel.

A common characterization distinguishes among

- The **aggressive** communication style, in which opinions are expressed clearly but without regard for other people's feelings or opinions. It is a communication style that can cause resentment and stress; on certain occasions, for instance, when a decision has to be taken quick, it can be an effective way to take an action.
- The **passive** communicators, who tend to hide their opinions and feelings or open up possibilities for others to disregard one's rights. It is an ineffective form of communication because it does not help to convey opinions and information.
- The **assertive** style—the most direct form of communication—in which opinions are clearly expressed without disregarding other people's feelings and opinions. It is the most effective form of communication.

Another characterization distinguishes between **open**, **reserved**, **indirect**, and **direct** communicators, according to whether one tends to express feelings openly or not (open/reserved) and focuses more on data rather than ideas and opinions. See, for instance, Rampur (2012).

See also Newton (2013); Academic Help (2013); Blume (2013) for some more resources on the topic.

5.3.3 Meetings

If you have ever worked in the IT industry, you probably know that meetings can become a consistent part of your work. Unfortunately, many meetings end up being useless or less efficient/effective than they could have been. Various books have been written on how to try and make meetings more effective. A recent search for "meeting management," in fact, showed 26,302 hits in Amazon's book section.*

In this section, we look at some common meeting types and some techniques to try and make them more effective.

5.3.3.1 Managing Meetings

Some general rules of thumb can help make your meeting a bit more effective.

The first and most important rule is to define the **meeting goals**, decide who has to **participate** to make the meeting effective, and **select a format** of the meeting so that the goals can be more easily achieved. (We will look at some common formats in the next subsections.)

Participants at meetings might have goals different from yours; some may be related to the project, like discussing a specific issue about a technical choice, and some may be just related to other agendas. To prevent a meeting from being *hijacked* and drifting, a second good rule is to ensure that the meeting remains on track. Thus, a good idea, is to define an **agenda of the items** to be discussed, possibly planning in advance a timing for each item, so that we fix both the start and the end time of a meeting. To make sure that the agenda is followed, another good practice is to appoint a **moderator** who takes responsibility for keeping the agenda and ensuring a good interaction among the participants.

When the goals, participants, and agenda have been defined, a **convocation** is sent out. The convocation should at least contain the goals of the meeting, participants, agenda, time, and location. If relevant information is required during the meeting, it is also a good practice to tell participants how to get prepared for the meeting.

The second rule is to stick to the agenda and goals during the meeting. First of all, ensure that each participant is provided sufficient context—in advance, if possible, or during the meeting otherwise—to actively participate in the discussion. Then, following the agenda, the participants discuss the different items. At the end of the discussion, a brief recap of the main findings and of the decisions taken helps share and agree on the findings and results.

* Search performed on April 28, 2013. This book might have increased the count by one.

The third rule is to maintain a track of meetings, outputs, and follow-up actions. This can be done in different ways. In brainstorming sessions, where notes are scribbled on a whiteboard, a picture of the whiteboard might be sufficient. Audio recording is another option.

Writing **meeting minutes** that recap the meeting outputs and actions is a more formal approach. Meeting minutes usually contain the following information:

- Coordinates of the meeting: time and location.
- Goal and agenda.
- Participants and, if required, whether the absentees are justified or not.
- When required, for each item, a recap of the discussion/main findings.
- Main outputs (findings) and actions decided during the meeting. These should include a description of the action, a person responsible for the action, a deadline.

Meeting minutes are an important record of a project, and sometimes drafting, commenting, and approving the minutes can be a delicate and tricky matter. Thus, in general, a good practice is to ask participants to approve the meeting minutes or to propose changes. In some cases, the approval is a formal requirement of the project.

Keeping a formal/written track of meetings and meeting outputs is also an important step in tracking actions and establishing effective change and configuration management practices. In fact, since meetings will be held to clarify or modify project requirements, choices, and so on, meeting minutes become an essential input to keep a consistent and clear vision of the project and project outputs.

5.3.3.2 Types of Meetings

5.3.3.2.1 Kick-Off Meetings

Kick-off meetings are held to get started with a project, a work package, or a significant task of the project. The goal is to ensure that all relevant stakeholders are provided the information necessary to carry out the activities about to start.

For this reason, the meeting can be structured in three parts:

1. An introduction of the participants and relevant stakeholders.
2. A presentation about the context and the specific goals that have to be achieved with the activity about to start. The presentation includes all relevant information, including constraints, standards to be followed, allocation of responsibilities, and timing.
3. A final question and answers session allows one to clarify any doubt or remaining issue.

5.3.3.2.2 Decision-Taking Meetings

An essential task of project managers is to establish a good context for taking decisions. We have already seen in Section 5.1.5 different management styles and how they influence the decision-taking process. In this section, we recap some rules of thumb for establishing an effective and participated decision-taking environment; see Harvard Business School (2006) for more details.

According to the Harvard Business School (2006), good decision making requires

- **Establishing a context for success:** providing time for ideas to form, creating an environment in which an open discussion can take place, and agreeing on the decisions taken.
- **Framing the issue properly** and **finding alternatives:** making sure that the process does not stop at the first formulation of the problem or the first solution encountered. Including opponents and skeptics in the discussion can help take different perspectives and points of view and find alternative solutions.
- **Choosing** the alternative that appears to be the best. Solutions can be measured according to qualitative and quantitative parameters. When choosing what alternative to take, both positive and negative impacts should be debated. The agreement on the decision can be in one of many different forms: **general consensus** and **majority** occur when everyone or the majority of participants agree; **qualified consensus** occurs when key selected stakeholders agree; and **directive leadership** can be the last resort, when no consensus can be found.

5.3.3.2.3 Audit and Review Meeting

Audit and review meetings are held to assess the status of a product or project.

These meetings are usually organized by identifying three roles:

1. The **auditors**, who are responsible for analyzing products or project documentation in order to form an opinion and an evaluation. Good characteristics of auditors include adequate proficiency to carry out the work, independence (so that no interests can influence one way or another the auditing process), and professional care in conducting the audits and in reporting it (EPA, 2000).
2. The **project members**, who are responsible for providing clarifications and explaining the choices and status.
3. The **moderator**, who ensures that the agenda is followed and the meeting environment remains productive. In fact, since auditors and the selected project members have seemingly conflicting goals, ensuring that a good attitude is kept also ensures that the meeting remains productive.

Audit meetings can be triggered by various causes, among which a periodic evaluation, a project deliverable, a potential problem, accidents, and improving performances.

An auditing process might include the following activities:

- Definition of the goals and boundaries of the audit
- Identification of the auditing committee
- Distribution of all the relevant material to the auditors
- Preparation of the auditing by the auditors
- The conduction of the analysis and auditing activities during the meeting
- Preparation of the final report.

Examples of auditing activities include quality inspections (e.g., code walkthroughs), accident investigations, and project progress assessment, to mention a few.

5.3.3.2.4 Brainstorming

Brainstorming is a technique described by Alex Osborn in Osborn (2008), a book first published in 1948, in which the author describes the techniques used in the creative firm where he worked. Although today the term **brainstorming** is used simply to denote a meeting to collect ideas, **brainstorming meetings** have a precise structure and precise rules.

Concerning the structure, following an opening session, where the problem is framed and rules explained, brainstorming meetings are structured in rounds to collect ideas, possibly stimulated by the meeting organizer, or solicited by having each participant propose at least one idea. A wrap-up session allows one to collect all the information in a structured way.

Concerning rules, to ensure that ideas are properly elicited and collected, Obsorn suggests the following:

- **Focus on quantity** and **welcome unusual ideas**. The more ideas that are generated, the more chances there are of finding good ones; for this reason, unusual ideas are to be welcomed in the brainstorming process.
- **Withhold criticism**. In brainstorming, criticism should be withheld. Instead, participants should focus on extending or adding to ideas, reserving criticism for a later stage of the process. By suspending judgment, participants will feel free to generate unusual ideas.
- **Combine and improve ideas**. The underlying assumption is that the sum is bigger than the individual contributions, and therefore combining ideas yields better results.

An important aspect of the technique is highlighting associations among ideas, so that they can then be grouped and combined at a later stage. Brainstorming meetings can be conducted in many different ways. See, for instance, Colwell (2004)

for a discussion about the organization of brainstorming sessions and Mittleman (2013) for some variations to the technique.

Researchers have criticized some of Obsorn's assumptions, among which, ironically, the fact that criticisms have to be withheld. More radical criticisms question the need for the rules described above and attribute the effectiveness of the technique more to the interaction of different minds and mindsets than to other contributing factors. See Lehrer (2013) for a very nice recap on the matter.

5.3.3.2.5 Other Creative Techniques

Many other creative techniques have been proposed and are largely applied. We mention the **six hats technique**, according to which six different mindsets are defined, represented by hats of six different colors. People participating in the meeting are asked to take a hat and provide feedback according to the corresponding mindset. Mindsets are then shifted while the meeting continues; see Bono (2013) for more details.

Several references on the web mention techniques to foster creativity, among which are CreatingMinds.org (2013).

5.3.3.3 Delphi

The Delphi method was devised in the 1960s by Helmer et al. (1967) to improve the effectiveness of meetings. One of the goals was create an environment in which nonscientific factors such as "who has the loudest voice," "stubbornness," or "supposed authority" would not be allowed to bias data. The methodology focuses on collecting data, but the format is general enough to accommodate other kinds of information gathering.

The method is composed of the following steps:

- Deliver a set of question to the experts (best if in the form of a questionnaire), such as, for instance, the effort required for each activity of the plan.
- Have the experts use their techniques to come out with an answer (the original paper emphasizes the importance of simulation, but in general, any technique is fine).
- Collect answers and highlight the median value and the interquartile range, that is, the interval containing the majority of opinions.
- Ask the experts to reconsider their opinion and, if the estimations are still out of the interquartile range, have them, motivate their choices.
- Iterate, presenting also the motivations for outliers, till the closest match to the consensus can be derived.

5.3.3.4 Planning Poker

Planning poker is a modern (and fun) version of the Delphi technique, adopted by agile methodologies for the estimation of the difficulty associated with the

development of user stories and tasks. The technique can, however, be used for other purposes.

Planning poker takes its name from the fact that participants at the meetings are given a deck of cards and seem to be playing a card game. In more detail, the cards are organized in colors and each color contains all the possible estimations a person can give to a given user story. Note that the values are a limited set of numbers, for instance, following the Fibonacci series (e.g., 1, 2, 3, 5, 8, 13, . . .); two special values, "**infinity**" and "**?**," mean, respectively, *extremely complex* or *"I don't know."* Each person is given all the cards in a color.

The game proceeds as follows. For each user story, users are asked to provide their estimations. Following the Delphi approach, they do so in secret, by picking one card from their decks. Then everyone shows their cards at the same time. If the evaluations agree, the user story is assigned the weight chosen by the team. However, if there is significant disagreement in the evaluations, a discussion follows so that the players can justify their choices. Similar to Delphi, other rounds then follow till an agreement is reached.

As a curiosity, the technique also considers the case in which an agreement is not reached. Following the words of Grenning, the inventor of the technique, "the team can then discuss their different estimates and try to get to consensus. If you can't get consensus, don't sweat it. It is only one story out of many. Defer the story, split it, or take the low estimate" (Grenning, 2002).

5.4 Questions and Topics for Discussion

1. Discuss the commonalities and differences among the motivational theories presented in the chapter.
2. What are the motivations for micromanaging, if any? What are the risks of micromanagement?
3. Consider the different personality traits presented in the chapter. How would you position yourself? What software development better suits your characterial traits?
4. Discuss the merits and limitations of the different organizational structures we have seen in the chapter.
5. Define a communication plan for the Theater 3001 project.

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