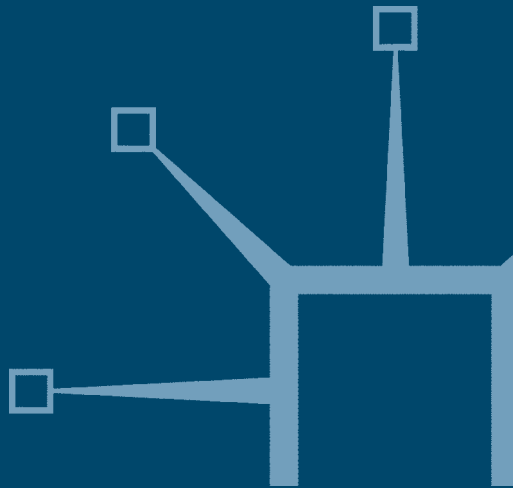


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Knowledge Management in Project-Based Companies

An Organic Perspective

Kaj U. Koskinen and Pekka Pihlanto



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*This book is dedicated to the memory of my mother,
who taught me humility and diligence (KK)*

*I dedicate the book to my wife Pirjopäivi,
who has always greatly supported my work (PP)*

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Foreword

I am certainly delighted to be able to contribute to this volume on knowledge management in project-based organizations, for at least two reasons.

First, this book adds to the growing scholarly literature related to social science on the management of projects and temporary organizations. Fifteen to twenty years or so ago, project management was a matter almost exclusively for the engineering sciences and for practitioners in the field. It now appears that social scientists have come to realize that the research field of projects and temporary organizations is in need of attention. In a world where increasingly more of the most important economic activities are run as projects, the relevance of the research field is undisputed. For me personally, having seen the development 'from the inside' since the late 1980s, it is certainly a joy to see all the good work being done in the area. The literature on projects has expanded from relatively simple books of a 'how-to-do-it' type on project planning and follow-up in the 1980s to modern books based on scholarly work on project teams as temporary organizations, on the role of projects for economic development, on the effects of project proliferation on working life, etc. These efforts to legitimize the area for scholarly attention have certainly been successful. Theses are written and articles published in highly prestigious journals covering a variety of subjects related to projects and temporary organizations. Furthermore, the movement is international even though at times researchers outside the Nordic countries consider the Nordic practitioners to be at the forefront of the development. The research efforts in Denmark, Finland, Norway and Sweden have been called 'The Scandinavian School'. Even though the denomination is improper geographically, it stresses the impact we have had together on the research scene. It might even be that we are currently witnessing something that one day might be classified as nothing less than a scholarly revolution where the Nordic countries took the lead.

The second reason for feeling delighted is that this volume treats some of the most interesting but also least understood aspects of the field, namely learning and knowledge in a project context. The debate on the 'why and how' questions of learning and knowledge has been fierce at times. Transforming experiences to learning has always been described as difficult in a project context, especially in project-based firms where

participants run off to a new project as soon as the old one is finished: the 'renewal paradox' is too common an observation for project-based firms. Renewing project handling should be easy since a new project always involves procedures being adapted to what has been learned in the past. The paradox is that renewal is not as easy as one might expect. The reasons why are still under debate: practise always to look for remedies to problems.

In the current book, a fresh look is taken at the mechanisms of knowledge handling in project-based firms and some quite intricate social science approaches emanating from organization theory are applied to the project management field. In particular, the discussion on autopoietic learning and the notion of the holistic concept of man (HCM) are rewarding for the reader, to mention only a couple of the contributions made by the authors.

ROLF A. LUNDIN
Professor of Business Administration
Jönköping International Business School
Sweden

About the Authors

Dr (Tech.) Kaj U. Koskinen has worked for many years as project manager in several international engineering companies, including Outokumpu and Honeywell. His main experience derives from process automation. Since 1997 he has been a Senior Lecturer (Docent) in Industrial Management and Engineering at Tampere University of Technology, Pori. Dr Koskinen's research interest is focused on knowledge and project management, and he has published several articles on these research areas.

Professor Pekka Pihlanto held a Professorship in Management Accounting at the Turku School of Economics (TSE) from 1985 until he retired in 2003. He continues his research work at TSE Corporate Research and Education. Professor Pihlanto's main research interests include behavioural management accounting and accounting methodology and philosophy.

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I would like to extend my best thanks to the Finnish Cultural Foundation, the Satakunta Regional Fund, which has given financial support for this book.

KAJ U. KOSKINEN

I would like to thank Professor Lauri Rauhala, who developed the holistic concept of man we apply in this book. He has always encouraged me in applying the holistic concept of man to business studies and to other disciplines as well.

PEKKA PIHLANTO

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1

Why Knowledge Management in Project-Based Companies?

It was the 1980s when knowledge was supplanting physical assets as the dominant basis of capital value and when the current interest in knowledge and possibility of creating more and using it better began. Knowledge management emerged as a new branch of management theory, starting with the evidently knowledge-led industries, and progressive companies were quick to take up the idea. Their experience fed back into research, and understanding of the processes by which knowledge is acquired, shared and used, and how they can be improved, grew rapidly.

Knowledge management comprises a range of organizational processes, information processing technologies, organizational strategies and culture for the enhanced management and leverage of human knowledge and learning to the benefit of the organization. However, knowledge management is not a separate management function or a separate process. It is a set of cross-disciplinary organizational processes that seeks the ongoing and continuous creation of new knowledge by leveraging the synergy of combining information technologies and the creative and innovative capacity of human beings. To bring about business benefits, knowledge management has to be aligned to the company's strategic thrust. This is, if knowledge management is a new organizational paradigm, it is so only in the sense that attempts are now being made to systematically manage it.

Interest in knowledge management can be categorized in many ways. One of the ways is to divide it into academic and practitioner interests. Academics have been heavily occupied with defining and classifying what constitutes knowledge (Fahey and Prusak, 1998), discussing the knowledge-based view of the organization (Spender, 1996) and so on. This debate received a major push when Nonaka and Takeuchi (1995), in their seminal work, declared that organizations wishing to become

strategically innovative must move beyond the traditional model of processing information to one which incorporates the creation and management of knowledge.

The practitioner community, on the other hand, is far more interested in pragmatic outcomes (Davenport and Klahr, 1998) – in particular, ways of leveraging knowledge to develop competitive strength for the organization (Earl and Scott, 1999). Capturing and implementing best practices is one of the major reasons why companies would consider engaging in the management of knowledge and learning.

Knowledge management discussion, in general, has polarized into two principal camps. One is rooted in information technology and information control (e.g. Cole-Gomolski, 1997). The other concentrates on knowledge, know-how and skills as well as on their management from the perspective of the management of people and organizations – i.e. management is seen from an *organic perspective* (e.g. Brown and Duguid, 2001). From this it follows that general company management can also utilize two different types of knowledge management processes – codification and personalization. When codification is used, the process centres on computers. Knowledge is carefully codified and stored in databases, where it can be accessed and used by the authorized individuals. In the use of personalization, the process centres on individuals. Knowledge is then closely tied to the people who have developed it and is shared mainly through direct face-to-face contacts. The chief purpose of computers is to communicate knowledge, not to store it.

Thus, the strength and challenge of knowledge management comes from its interdisciplinary approach. For example, if knowledge management concerned purely information systems, current tools and business processes would suffice. However, the reality is that different information systems approaches, such as data processing, management information systems and strategic information systems, have been found wanting. There are numerous examples of major investments made in this area that have yielded little or no benefit to host organizations. Instead, the real synergies in knowledge management are more likely to occur from boundary-spanning individuals who can see beyond the narrow margins of their own disciplines and recognize the value of dialogue and debate with other fields.

Given the multidisciplinary nature of knowledge management, it is not surprising that the variety of current definitions comes from a number of different perspectives. Some come from an information systems perspective (Mertins *et al.*, 2000) while others suggest a human resource perspective (Skyrme, 1999; Swan *et al.*, 1999). A few definitions have

begun to adopt a more strategic management perspective, recognizing the importance of knowledge management practices for gaining competitive advantage (uit Beijerse, 2000; Newell *et al.*, 2002).

With such different definitions of knowledge management, it is clear that any advances in this field need to adopt an integrated (Davenport and Prusak, 1998), interdisciplinary and strategic perspective. The strategic purpose of knowledge management activities is to increase intellectual capital and enhance organizational performance. There is a human dimension of developing knowledge in individuals, teams and organizations, and this fundamentally occurs through different learning processes. Once knowledge is created, the sharing of knowledge remains one of the fundamental challenges in this field. As human beings, individuals need support to help explore and exploit knowledge more fully. There is a wide variety of tools, technologies and systems that can fulfil these functions. However, knowledge management tools and organizational processes are insufficient in themselves to achieve success. Many well-planned initiatives have proved futile when they failed to acknowledge the human and cultural dimensions of successful implementation.

Successful knowledge management programmes highlight numerous potential benefits (Ahmed *et al.*, 2002) such as:

- Improved innovation leading to improved products and services
- Improved decision making
- Quicker problem solving and fewer mistakes
- Reduced product development time
- Improved customer service and satisfaction
- Reduced research and development (R&D) costs.

Knowledge management in projects and project-based companies is also becoming a prerequisite to sustain a competitive advantage (Love *et al.*, 2005a). It is argued that without managing knowledge in projects, knowledge assets can be lost when a project is completed. This results in organizational knowledge fragmentation and loss of organizational learning (Kotnour, 2000). However, in project-based companies and projects in general, activities such as knowledge acquisition and sharing, which are a part of knowledge management, are often very complex tasks. This is due to the fact that project teams are often a set of diversely skilled people working together over a limited period of time, and they often include members who have never worked together before and who do not expect to work together again (e.g. Dawes, 1994).

As according to DeFilippi and Arthur (1998), projects are often 'one-off' and relatively self-contained, and therefore discontinuities are created within the organization that make it difficult to develop steady-state routines and maximize the flow of knowledge and learning between projects. However, fortunately projects are increasingly seen not only as flexible and adaptable organizational forms (Drucker, 1993a; Hobday, 2000), but also as vehicles of change in traditionally structured organizational settings (Ekstedt *et al.*, 1999; Grabher, 2002b). Managing knowledge effectively in project-based companies therefore has wider implications for understanding learning and knowledge transfer in these companies.

Published research and case studies on knowledge management focus overwhelmingly on large, often multinational, corporations, and it is by no means clear that what works for them is a good approach for project work and project-based companies. In other words, the literature is so extensive and dense that it is difficult in a busy project practice to find time to study it and work out what to do. Therefore, this book aims to fill some of the gaps. The concepts discussed in this book are those that seem to be the most relevant in project practices, but not all will be appropriate for every practice. And the suggestions that have been given are not intended to be prescriptive. They are simply intended to help people involved in project work to understand how the theoretical principles translate into practicalities, to stimulate thought, and to provide a starting point for experiment and for developing systems which suit a practice's individual needs.

Various views have been put forward on knowledge management strategies, and many of them can be seen as complementary rather than mutually exclusive (Stewart, 1997). However, as said above, knowledge management discussion has polarized into two different camps: codification and personalization. This book focuses on the latter, and aims to serve especially those individuals and companies who are involved in *an organic project work environment*.

Keywords of the book

- Project-based company
- Knowledge management
- Organic perspective
- Holistic concept of man (HCM)
- Autopoietic epistemology.

Structure of the book

- *Chapter 1* highlights the emergence of knowledge management, what knowledge management consists of, and the significance of knowledge management to projects and project-based companies.
- *Chapter 2* describes briefly the project work context. The purpose of the chapter is to give general ideas to what are meant by the concepts of Project business, Project-based company, Project team, Project team building, and Project team members.
- *Chapter 3* is about the basic frameworks. The chapter presents the epistemological assumptions and an analytical tool, the 'Holistic concept of man' (HCM). Because the project-based companies, and individual projects within them, can be seen as knowledge-intensive units, which can be approached in terms of the quality and quantity of knowledge, the chapter focuses on epistemological assumptions with the purpose of gaining a better understanding of knowledge and how it develops. The HCM is used as a tool in analysing learning and knowledge sharing in a project work context.
- *Chapter 4* deals with knowledge and knowledge-related project work environments. The basic idea is to describe the concept of knowledge management and different types of knowledge and competencies, focusing especially on their mechanical and organic characteristics, as well as their connection with the human actor – the project participant.
- *Chapter 5* analyses learning. The first part of the chapter is divided into two main sections: Types of Learning and Organizational Memory. Learning taking place at different levels of the project-based company is analysed with the help of the HCM, and the understanding of that learning is based on autopoietic epistemology. The second part of the chapter describes factors that affect learning and organizational memory development. It is divided into seven sub-sections: Foresight, Hindsight, Error harvesting, Problem with success, Resistance to change, Creative tension and Absorptive capacity.
- *Chapter 6* is about knowledge sharing. The first part of the chapter is divided into eleven main sections: Dependence on others, Basics of knowledge sharing, Language, Media, Imitation, Boundary brokering, Shared understanding with the help of boundary objects, Benchmarking, Internet, Storytelling and Mentoring. Because there are numerous factors that either advance or weaken knowledge sharing in a project work context, the second part of the chapter deals with twelve of these factors: Project leader/Project manager, Motivation to share

knowledge, Trust, Caring attitude, Physical systems and proximity, Organizational culture/Project culture, Values, Norms, Beliefs, Attitudes and assumptions, Creating an effective project team culture in a project work context and Implications for project leaders.

- *Chapter 7* deals with strategic knowledge management and strategic intellectual capital management in project-based companies. The chapter aims to describe briefly the role of strategic management in integrating knowledge and intellectual capital managements in project-based companies.
- Finally, the *Epilogue* sums up the conclusions of the book.

2

The Project Work Context

Project business

During the second half of the twentieth century, there has been a shift from the functional organization to the project-based organization (e.g. Prencipe and Tell, 2001). This shift has been caused by the changing nature of work from mass production, with essentially stable customer requirements and slowly changing technology, to the current situation in which every product supplied may be against a bespoke design, and technology changes continuously and rapidly (Turner and Keegan, 1999). In that sense, project-based work is a part of the wave of 'new organizational forms' that has entered most industries during the past two decades (Kerfoot and Knights, 1998; Packendorff, 2002).

Project business thus denotes the activities of a company that carries out project deliveries to its customers. As a whole, project business includes the key business-related activities of project companies, such as project sales and marketing, financing, as well as operation support, maintenance and other after-sale services. In essence, companies engaged in project business can be divided into four categories: manufacturing-oriented companies, designers, integrators and companies contracting for project management services (Artto *et al.*, 1998). This scheme of categories can be used to depict the key segments of a company's activities and what core knowledge its operations are based upon. However, many companies have expertise in more than one sub-field of the categorization. For example, suppliers of complex capital goods (e.g. telecom networks, paper machines and ships) design, produce and sell complex products and services as one-offs or in small tailored batches to meet the individual needs of business or institutional customers (Hobday, 1998).

Thus, increasingly technology-based as well as service-providing companies, operating in dynamic environments, organize their operational and development activities in projects (DeFilippi and Arthur, 1998; Gann and Salter, 1998; Hobday, 2000; Prencipe and Tell, 2001; Grabher, 2002a). Therefore, companies that privilege strongly the project dimension, and carry out most of their activities in projects, are referred to as project-based companies.

Project-based company

Project-based companies are organizations in which the majority of products are made against bespoke designs for customers. These types of organizations may be stand-alone, making products for external customers, or subsidiaries of larger firms, producing for internal or external customers. They may also be consortiums of organizations that collaborate in order to serve third parties (Turner and Keegan, 1999).

Project-based companies are often involved in several projects simultaneously. A typical example might be a consulting company. The company as an organization with an identity is permanent, but its mode of production is dominated by projects. The governance of such companies is a challenging task. Their heavy reliance on projects implies that a high degree of discretion is granted to lower levels. These projects may be interrelated, which calls for knowledge sharing efforts among projects: projects that seem to be separate and independent may compete for resources, attention, commitment, and legitimacy (Blomquist and Söderholm, 2002). Since projects enjoy autonomy, they easily become separated from each other, with the risk of turning the company into a series of disconnected projects. Therefore, project-based companies will tend to suffer from certain weaknesses – e.g. failure to bring about company-wide development and learning (Hobday, 2000) and difficulties in linking projects to firm-level business processes (Gann and Salter, 2000). Furthermore, projects typically comprise a mix of individuals with highly specialized competences, belonging to functionally differentiated worldviews (Dougherty, 1992) making it difficult to establish shared understandings, a common knowledge base.

Indeed, project-based companies tend to be not only strongly decentralized, but also quite loosely coupled (Orton and Weick, 1990). This also applies to the knowledge dimension. Relevant pieces of knowledge are distributed (Tsoukas, 1996) into a multitude of local settings and a great amount of knowledge resides in individual members. Governance in such a context must take into account the organization's fundamental

dependence on its knowledgeable individuals, and its potential weaknesses in dealing with issues of company integration and development.

As said above, a project-based company is often involved in several projects simultaneously. These projects are intended to meet an often vague, but unique need for something new. Within a project-based company an individual project is an organization of people dedicated to a specific purpose or objective. Projects often involve large, expensive, unique, and high-risk undertakings that have to be completed by a certain date, for a certain amount of money, within some expected level of performance. At a minimum, all projects should have well-defined objectives and sufficient resources to carry out all the required tasks. However, unfortunately, this is often not the case (e.g. Steiner, 1969; Pinto and Kharbanda, 1995; Cicmil, 1997; Kerzner, 1997).

The temporary nature of a project means that starting and completion dates are specified for the assignment. Assembly line production (i.e. part of a functional organization) is an example of an activity that goes on without specified starting and completion dates. The key to understanding the nature of project work, as opposed to assembly line production, is that unlike assembly line production that can continue into the indefinite future, a project is a temporary enterprise (see also Lundin, 2000; Lundin and Hartman, 2000a, 2000b). A project fulfils its goal within time and money limits – i.e. project constraints. The differences between an ordinary functional organization and a project organization can be described as in Table 2.1.

However, the division between functional and project-based organizations is not at all clear-cut. According to Lundin (2000), functional organizations (i.e. permanent organizations) and project-based organizations (i.e. temporary organizations) are bonded more closely than present theory indicates (see also Anell and Wilson, 2002). That is, the functional organizations appear to be growing more projectified and the

Table 2.1 Functional vs. project-based organization

Functional organization	Project-based organization
Continuous operations	Temporary arrangement
Emphasis on working processes	Emphasis on goals
Stable	Dynamic
Inflexible, hierarchic	Flexible, non-hierarchic
Centralized decision making	Decentralized decision making
Bureaucratic	Adhocratic

project-based organizations growing more routinized – i.e. taking on characteristics from the functional organizations.

In any case, the time and money limits of individual projects may cause problems when it comes to knowledge sharing. These limits can lead individual team members to act in an extreme hurry, in an untrustworthy manner, to avoid caring, and to refuse to offer their feedback during the learning process. In other words, time and money limits may make a project reactive rather than proactive, and unpleasant as a place to work (cf. von Krogh *et al.*, 2000). A related problem is that during a project implementation there is hardly any time for reflection and learning between projects due to over-optimistic time schedules and a constant shortage of resources (Packendorff, 2002).

Project team

A project team is a group of people working together for a common goal. It shares responsibility and resources to achieve its collective mission: problem solving and decision making are natural activities of a project team. While projects have quite specific goals or expectations, it is up to the team to find out how the problems should be solved. Project teams thus typically enjoy a considerable amount of autonomy within the limits set. (cf. Lundin and Söderholm, 1995; Lindkvist and Söderlund, 2002)

Briner *et al.* (1990) divide the project team membership into ‘visible’ team members that are part of the organization but not permanently in the project, and ‘invisible’ team members that are stakeholders in the project while non-members of the organization. Examples of the latter would be subcontractors and suppliers. The heart of the visible team is the core team that is permanent but not necessarily full-time. Other visible team members are temporary in the project. According to this definition, project team membership does not necessarily involve mutual social awareness, commitment to the common goal, the same performance norms, or accountability for the outcomes (Mäkilouko, 2001).

Among a well-functioning project team, open and informal communication is prolific. Project team members motivate, respect and support each other. According to Smith and Berg (1987: 140), ‘It is clear that a group can function only if the members are able to depend on each other. It is ultimately the mutual dependency that makes the group a team. To deny this dependency or to try to make it into something other than what it is retards the group’s capacity to come together a whole.’ This means that organising a project at the very beginning of the project life

cycle forms a base for the building of a successful project team. In other words, at the beginning of a project, the tuning of a group to work as a team is the most intensive task of the project management.

A number of authors have studied teams, looking for the characteristics that make a team successful. Larson and LaFasto (1989) found high-performance groups as diverse as a championship football team and a heart transplant team, but detected eight characteristics that are always present:

- A clear, elevating goal
- A results-driven structure
- Competent team members
- Unified commitment
- A collaborative climate
- Standards of excellence
- External support and recognition
- Principled leadership.

Thus, a project team must know how to work together in order to be productive and successful. If a team can work together, they will be able to raise and resolve issues that are standing in the way of accomplishing a goal (e.g. LaFasto and Larson, 2001). Working together may not be easy at first, but with proper training the team will be able to adapt quickly. If people are working together effectively rather than working by themselves, a lot more work will be accomplished.

According to Kerzner (1997), in exemplary companies teamwork has the following characteristics:

- Employees and management share ideas with each other and establish high levels of innovation and creativity in groups work
- Employees and managers trust each other and are loyal to each other and to the company
- Employees and managers are committed to the work they do and the promises they make
- Employees and managers share knowledge freely
- Employees and managers are consistently open and honest with each other.

Constructive co-operation is critical both within and outside the project team. Relationships between team members and with customers, suppliers and other teams are important. All the members, especially the team leader, must set the example. Project team members can develop

the behaviours necessary to work as a team through observation and imitation. Informal communication is essential in most team activities: the strength of the team lies in the individuality and experience of each of its members.

Project team building

Project team building is generally defined as a process of taking a collection of individuals with different needs, backgrounds and expertise, and transforming them into an integrated and effective work unit (e.g. Ruuska, 1999; Tissen *et al.*, 2000). In such a transformation process the goals and energies of the individual contributors merge and support the objectives of the team. Projects thus typically comprise individuals with different competences and different experience from other projects. When most team members are, for instance, engineers, they obviously have a certain degree of overlapping formal knowledge and similarities in general attitudes.

However, while the purpose of creating an effective and capable project team is clear, the process of developing such a team is more difficult to determine. Usually team building process is initiated by the project manager through the processes of communication, interaction, conflict resolution, acquisition of common vision and purpose, and achievement of demonstrable goals, in which individuals create an interdependent work group consisting of self-motivated, supportive, accountable and collegial professionals.

Thamhain and Nurick (1994) discuss the variables influencing a project team's performance. The task factors include such things as timely performance within the budget, a concern for quality, and technical issues, while the relationship issues are centred around the capacity to solve conflicts, build trust and achieve effective communication.

The technical aspects of team development are more clearly delineated, and are easier to measure, but misunderstandings usually arise from the inner working of multidisciplinary groups. Barriers such as different outlooks, priorities and interests, role conflicts, power struggles and inadequate communication skills can undermine the team process and quickly derail the task (cf. Bubshait and Farooq, 1999).

Project teams that are not established appropriately, or simply do not come together successfully, often produce poor results and are viewed as artificial and unsatisfying experiences by all concerned. Members of failed teams often have such a bad taste in their mouths that they go to

great lengths to avoid teams or cause them to fail fast to avoid the anticipated pain. Given this risk that a team may never come together again, a wise team leader will look carefully at the beginning at an individual's past teaming experience and determine if the risk reward makes sense. A failed team can be a real drain on the company, productivity and long-term team relationships. The team building idea needs to be successful if the power of teamwork in the company is to become a meaningful reality.

Unfortunately, because of the limitation of available human resources, the project leader is often unable to choose the particular members of the project team aggressively. All too often, senior executives select team members with minimal, if any, input from the project leader. However, in situations in which the project leader has a significant say in determining the composition of the team, it is important to consider the following (Flannes and Levin, 2001):

- Teams whose members are homogeneous generally complete a project more quickly than teams whose members are more heterogeneous
- Heterogeneous teams tend to create a more creative and innovative project than homogeneous teams
- The amount of help that team members offer each other decreases as the size of the team increases because of a perceived diffusion of personal responsibility. The team should be small, if possible; if the team is large, a core team, reporting to the project leader, with a series of sub-teams handling specific project areas, should be established
- Individual productivity decreases as team size increases, again because of the perception of a diffusion of personal responsibility.

These general guidelines suggest that the project leader must continually consider project needs.

To sum up, a group of individuals becomes a project team when they share a common commitment to achieving project goal that each member views as a win, and each member understands that the various members of the team are committed to achieving this goal. It is usually also quite clear that working only as a group of individuals will fail to achieve an equivalent desired end result, because there is not a genuine team.

Project team members

Drucker (1993b) makes the important point that, in many companies, the true source of competitive advantage is not so much technology or even knowledge itself. It is, according to him, people, the knowledge

workers – project team members – whose skills and expertise are the foundation of all progress. He continues by arguing that, on the one hand, knowledge workers need the organization (e.g. project) in order to put their knowledge to work and, on the other hand, they own the chief means of production, and can take their knowledge through the door at a moment's notice. 'The more an organization becomes an organization of knowledge workers, the easier it is to leave it and move elsewhere' (Drucker, 1993b: 11). As a result, every organization – project or project-based company – is always in competition for its most essential resource: qualified, knowledgeable people. The only way to attract and keep the best people is to provide them with an environment that allows learning and innovation to flourish. 'Loyalty can no longer be obtained by the paycheque. The organization must earn loyalty by providing to its knowledge employees exceptional opportunities for putting their knowledge to work' (Drucker 1993b: 13). Grant's writings (1996, 1997) on the 'Knowledge-based theory of the firm' also chime in well with Drucker's thinking.

However, projects are short-lived and therefore the people working for them have to engage in swift socialization and quickly find a way to carry out a complex task within the limits set. As witnessed by many, the project goals are very 'strong' and there appears to be little incentive, or even perceived time available, for engaging in private strategizing. The quite limited overlap among specialist competences also means that people can help others without risking that they would be able to capitalize extensively on people's advice (cf. Lindkvist, 2004).

A way to observe individual differences in the project team is to look for differences in individual style and personality (Flannes and Levin, 2001). 'Style' covers areas such as how people direct their energy, how outgoing or quiet they are, what their approach is in addressing a situation, how they make decisions and how they attempt to order their world. Because of these differences it is often difficult to form a project team that has the 'right mix' of personal styles and personalities. The right mix is the glue that holds the team together during the rough times of a project. It is also the right balance of styles that allows each team member to find an appropriate niche among project member functions.

As project work is typically carried out in rather public interaction, those who do not contribute actively and share their knowledge with others run the risk of developing a bad reputation and low demand for their services. Getting a reputation for non-co-operative behaviour would be devastating in many organizations, since this would mean that nobody would ask the individual to participate in projects or ask for

their advice. In a limited labour market no one can escape her history (cf. Lindkvist, 2004).

Summary

Project business – project-based companies in particular – denotes the activities that deliver projects for customers. Project business is no longer purely about delivering required projects on time: it is now about systematically creating a disciplined way of prioritizing effort and resolving trade-offs, working concurrently on all aspects of the project in multifunctional teams, and much more. This chapter has described some basic concepts of the project business, namely: project-based company, project team, project team building and project team member. Four of the key factors are:

- The *project-based company* is an organization in which the majority of products are made against bespoke designs for customers – i.e. the company's mode of production is dominated by projects. Production in project-based companies takes place through project teams.
- The *project team* is a group of people working together for a common goal – i.e. for project delivery. Knowledge sharing, problem solving and decision making are some of the main activities of a project team. Project teams typically enjoy a considerable amount of autonomy within the limits set.
- *Project team building* is the process of taking a collection of individuals with different needs, background and expertise, and transforming them into an integrated and effective work unit. Projects comprise individuals with different competences, and different experience from other projects.
- An individual becomes a *project team member* by interacting with other people. In this book, the concept of 'project team member' primarily means a knowledge worker, whose skills and expertise are the foundation of successful project implementation.

3

The Basic Framework

Epistemological assumptions

The literature of organizational knowledge reveals that companies – including project-based companies – can be regarded as knowledge-intensive systems of knowing (e.g. Newell *et al.*, 2002; Love *et al.*, 2005a). However, in this literature the epistemological assumptions have not been well clarified. The attempts to improve a knowledge-based theory of a company are thus also relevant here because it is assumed that knowledge has an important role to play in project-based companies' and projects' knowledge management (Spender, 1996).

Epistemology is a branch of the 'grand divisions' of philosophy, and deals with the ways of interpreting knowledge – i.e. the ways of knowing. With an organizational epistemology it is possible to construct a theory on how and why organizations, like project teams, and project-based companies, know. Organizational epistemology deals with some core questions: what is knowledge, how does it develop, what are the conditions for knowledge to develop (cf. von Krogh and Roos, 1995)?

Differences in the epistemology are manifested by different ways of categorizing knowledge. This means, for example, that by uncovering the epistemological roots of a project one can better understand the characteristics of knowledge creation needed in it. 'In order to manage knowledge assets, we need not merely to identify them but to understand them – in depth – in all their complexity: where they exist, how they grow, how managers' actions affect their viability' (Leonard-Barton, 1995: xii). According to Venzin *et al.* (1998), to be familiar with different possible epistemologies means having a larger knowledge management repertoire, and a better understanding of the limitations of each approach. The following two sub-sections provide short illustrations of

cognitivist and *autopoietic* epistemologies (cf. Varela *et al.*, 1991; von Krogh and Roos, 1995).

Furthermore, as said above, the field of management and organization studies has not paid considerable attention to the fundamental issues of epistemology. Knowledge has mostly been taken for granted, often as a 'fuzzy' and substitutable concept. Therefore the objective of the epistemological discussion here is to give the reader an observational scheme to better understand knowledge development on both the individual and the organizational scale.

Cognitivist epistemology

The traditional *cognitivist epistemology* is based on the idea that the human mind has the ability to exactly represent reality in a way that corresponds to the outer world, be it objects, events, or states. This is also frequently referred to as the 'intentionality of the mind' (cf. Goldman, 1986). Broadening the idea, the organizations like project teams and project-based companies are considered to be systems that develop knowledge by formulating increasingly accurate representations of their pre-defined worlds. Because knowledge is seen as a representation of these worlds, knowledge accumulation and dissemination are the major knowledge development activities in an organization: the more knowledge an organization can gather, the closer the presentation will be to reality.

Learning in the cognitivist epistemology means to improve representations of the world through assimilating new experiences (Varela, 1979; von Krogh *et al.*, 1996). According to Bruner and Anglin (1973: 397), an individual actively constructs knowledge by relating incoming information to a previously acquired frame of reference. In other words, when gathering information from the external environment a project team member stores facts, relates them to existing experiences and creates a picture of the world. The world is considered to be a pre-given object, event, or state, which can be perceived in an objective way. What varies from one team member to another is the ability to represent reality. The truth of knowledge is understood as the degree to which a team member's inner representations correspond to the world outside. As new things are learned, this truth will constantly be improved.

Autopoietic epistemology

The autopoiesis theory (Maturana and Varela, 1980), which is the basis for the *autopoietic epistemology* (von Krogh and Roos, 1995), has gradually

evolved into a general theory of systems (e.g. Luhmann, 1986; Mingers, 1995; Morgan, 1996; Bakken and Hernes, 2002). The theory's main thesis is that the components (e.g. pieces of knowledge) of an *autopoietic system* (i.e. an individual, a project team, a project-based company) are used to produce new components (i.e. new knowledge) and their relations so as to recreate the system. In other words, an autopoietic system is self-referential, which means that the components accumulated by the system (i.e. an individual team member, a project team, a project-based company) themselves affect the components of the system. From this it follows that the production of components (i.e. production of knowledge) does not depend on an input–output relation with the system's environment, but everything that the system needs for its production is already in the system. This also means that an autopoietic system is simultaneously open and closed. In the case of a human being, an individual is open to data (i.e. perturbations or triggers) but closed to knowledge from outside the system. An *allopoietic system*, conversely, does not produce its components but relies on other systems for its continued production (Mingers, 1995).

Indeed, compared to cognitivist epistemology, autopoietic epistemology provides a fundamentally different understanding of the input coming from outside a system. Input is regarded not as knowledge but as data – i.e. knowledge is data put into a certain context. This means that knowledge cannot be directly transferred from an individual team member to another team member, because data have to be interpreted by the receiving team member before becoming knowledge. According to autopoietic epistemology, information does not equal knowledge, but is a process that enables knowledge production and sharing to take place. Von Foerster (1984: 193) states that 'information is the process by which knowledge is acquired'. Books – for example, this book – manuals, memos, computer programs, etc. are data – not information.

Because the autopoietic system is self-referential, rather than an input–output relationship with the environment, it means that its structure is made up of closed components of interactions that make reference only to themselves. In this sense, it is autonomous. However, although the autopoietic system is autonomous, it will be perturbed by changes in its environment. For example, when a project team member, a project team, or a project-based company (i.e. autopoietic systems) interacts in a recurrent manner, data produced elsewhere reach them as perturbations. These perturbations trigger information processes in the receiving system (i.e. team member, project team, project-based company): the

perturbations trigger learning, but do not specify it. The receiver's own cognitive map (i.e. knowledge structure) determines which perturbations are allowed to enter the system, and what changes in the existing knowledge structure are available at a given point in time.

For example, when a teacher delivers a speech, two students build different knowledge. The transmission by the teacher is the same for both, but the knowledge created is different: knowledge therefore cannot be transmitted but only created or produced (Vicari and Troilo, 1999). The only way to acquire new knowledge (i.e. to learn) is to utilize existing knowledge. This means that within a project team people cannot directly transfer knowledge – i.e. when a team member (i.e. the sender) delivers a message to another team member (i.e. the receiver), the latter interprets the message before it becomes their new knowledge.

Unlike cognitivist epistemology, autopoietic epistemology does not claim that the world is a pre-given, but that cognition is a creative function. Thus, knowledge is a component of the autopoietic – i.e. self-productive – process.

The autopoietic epistemology is the basis of the understanding of learning, and knowledge transfer in this book. The choice is based on the desire to present a fresh *observational scheme* for the understanding of knowledge management in projects and project-based companies.

Holistic Concept of Man

The HCM provides a useful way of deepening the description of knowledge transfer between people that was presented above in terms of autopoietic epistemology. The HCM is based on Lauri Rauhala's philosophical work (Rauhala, 1986; see also Carr and Pihlanto, 1998; Pihlanto, 2000, 2002, 2005a, 2005b; Koskinen and Pihlanto, 2006) and it is a concept which consists of an individual's three basic modes of existence: consciousness, situationality and corporeality. These modes of existence are defined as follows:

- *Consciousness* is existence as a psychical–mental phenomenon, as experiencing; it comprehends the processes of the mind or, to put it simply, 'thinking'
- *Situationality* is existence of a person in relation to a certain part of reality – i.e. to the 'environment' called his or her *situation*
- *Corporeality* is existence of a person as an organism with organic processes – i.e. the body.

The HCM takes into account all human actors' (e.g. project team member's) thinking, bodily reactions as well as their relationships to the project and other environment – among other things a person's knowledge and skills used in the implementation of a project, and the knowledge and skills acquired while completing different things. The HCM is clarified in the following three sub-sections.

Consciousness

All kinds of psychical–mental activities, in the form of a continuous and almost uninterrupted process, constitute the consciousness of an individual. An object in the situation of an individual – for example, a task in a project – provides the consciousness with a meaningful content. A so-called *meaning* emerges in the consciousness as this content becomes referred to the object located in the situation of the person in such a manner that she understands what the object implies. This is, a person can understand an object only in terms of a meaning or a group of meanings. The network of all meanings accumulated in the consciousness is called the *worldview of an individual*. In accordance with autopoietic epistemology, the worldview is continuously redefined as new meanings emerge on the basis of new objects observed in one's situation.

Everything in this process occurs in terms of *understanding*, which means that a person knows, feels, believes in and dreams about phenomena and objects located in his or her situation in terms of their 'being something'. Understanding is complete only after a meaning has been generated. Meanings are components from which the world, as people experience it, is constructed. In the consciousness, a continuous restructuring of meanings occurs as a person actively acquires or passively gets knowledge from the situation – e.g. observes and learns new things. Meanings are often forgotten, fading into the unconsciousness and perhaps retrieved into the consciousness anew. An important condition is that all aspects of knowledge and skills are 'stored' in the worldview of an individual in terms of different kinds of meanings.

Situationality

Situation is that part of the *reality with which a particular individual forms relationships*. *Situationality*, then, is the totality of the relationships of this individual to her personal situation. It is exactly this personal relatedness that makes situationality an individually accentuated concept: every

individual's situation and situationality is unique, because it is only the person in question who lives exactly within this particular personal situation, and consequently has a totality of relationships exactly with this situation.

The situation of an individual consists of a multitude of *structural components*, which may be concrete or ideal. The former includes all kinds of physical factors, and the latter such 'soft' things as values, norms, human relationships as experienced contents, etc. Thus, situationality is the totality of the relationships of a person to all concrete and ideal components of her situation. According to the HCM, situationality is not simply the totality of the relations to the external factors which have a causal influence on an individual, but is more basic in nature: a human actor comprises not only consciousness and corporeality, but also situationality.

This view stresses the great relevance that the particular objects and ideas in a person's situation have in shaping her behaviour. For example, all the phases and features in a task implementation provide components of the situations of individuals working for the project in question.

In sum, situationality connects an individual actor to her 'environment' and even assimilates these two. In other words, situationality is linked with and dependent on the other two dimensions of an actor (consciousness and corporeality): an occurrence in one of these three has an immediate impact on the other two. This makes an individual an extremely complex phenomenon – a three-dimensional totality.

Corporeality

Corporeality, or the bodily dimension of an individual, must not be dismissed in a project implementation context, due to the fact that all three modes of existence appear inseparably linked: they can never be independent of each other.

While situation is the 'game venue' in which corporeality, but also consciousness (including worldview), is located and dependent on, corporeality establishes the physical side of the existence of a human being and simultaneously makes situationality and corporeality possible. Consciousness, thus, steers the course of one's physical existence in a situation in terms of understanding based on meanings, but is, of course, dependent on the physical processes of corporeality. In more ordinary terms, what we think is dependent both on the knowledge derived from the situation in which we are placed and the nervous system, brain and other corporeal functions.

Learning and knowledge sharing, concepts that are discussed later in this book, are both situation sensitive and embodied in the individual (e.g. Maturana and Varela, 1992). This means in terms of the HCM that knowledge is 'located' in an individual's worldview in the form of meanings and thus refers to objects in the situation of an individual. In addition, knowledge is at the same time – in terms of the brain, nervous system, etc. – also a feature of corporeality or the body. In the case of manual skills, this bodily connection is self-evident. Indeed, all the three modes of existence are inseparably linked.

Because the project-based companies and individual projects within them can be seen as knowledge intensive units, which can be approached in terms of the *quality and quantity* of knowledge, in the rest of the book we utilize the HCM in order to gaining a better understanding of knowledge, as well as learning and knowledge sharing in a project work context.

Summary

Our methodological basic framework can be characterized as a 'lens' through which we look at knowledge management in project-based companies. The framework covers both epistemological assumption and a view concerning the notion of the human actor – in particular, the project team member. Basically our perspective is organic, which means that knowledge is assumed to emerge within a certain context through interactions among participants involved.

Epistemology or theory of knowledge is a branch of philosophy concerned with the nature and scope of knowledge. It deals with such core questions as, what is knowledge, how is knowledge acquired, and what are the conditions for knowledge to develop. Therefore, what kind of epistemological assumptions we adopt influences decisively, how we interpret what is knowledge. Our choice here was the *autopoietic* epistemology.

Autopoietic epistemology differs sharply from the traditional and conventional *cognitivist* epistemology. The latter is based on the idea that the human mind has the ability to exactly represent reality in a way that corresponds to the outer world. Knowledge is seen as a representation of the world, and the more knowledge an organization – or a project team – gather, the closer the presentation will be to reality. The world is considered to be a pre-given for the project team member, and perceived by her in an objective way.

In contrast to cognitivist epistemology, according to autopoietic epistemology the input coming from outside a system is regarded not as ready-made knowledge but raw material for knowledge called data. Data becomes knowledge only after it has been put into a certain context. Therefore, knowledge cannot be directly and mechanically transferred from an individual team member to another, but data transferred have to be *interpreted* by the receiving team member before becoming her knowledge. Further, unlike cognitivist epistemology, autopoietic epistemology does not consider the world as a pre-given, but it must be interpreted by each team member, and therefore, it is, in principle, at least slightly different for every team member.

Because this view – and also the organic perspective stressing the role of a team member in knowledge creation – fit very well into the realm of the *holistic concept of man* (HCM), we utilize the HCM for deepening the picture about team member and the individually accentuated process of her knowledge creation – and the human accentuated features of knowledge management in project-based companies in general. The HCM defines an individual to consist of three basic modes of existence: consciousness, situationality and corporeality.

According to the HCM, knowledge is created in a project member's *consciousness* in the form of *meanings*, and this knowledge is stored into a team member's worldview (in psychological terms, 'memory'). Meanings – or knowledge – are formed in the consciousness in the basis of observations (data) acquired from the team member's situation, where she is located. Formerly created relevant knowledge stored in the worldview functions as the point of reference to which observations, e.g. a message received, are related. On the basis of this, a team member understands (interprets) the message.

A team member is also constituted of *situationality*, which means the totality of her relationships to all possible aspects of her personal situation – among other things to the team context. Hence, situationality connects a team member to all possible influences located outside her consciousness and *corporeality* (her physical existence, the 'body').

A team member is a 'living network' consisting of consciousness, situationality and corporeality. All these three modes of existence are intimately and dynamically interlinked. When something happens in one of them, it is immediately reflected into the other two in a way, which is unique for every individual. Therefore, each of these three modes contributes to creation and sharing knowledge of a team member.

In more ordinary terms, knowledge creation by an individual team member is not realized only in terms of her thinking processes (i.e.

consciousness), or brain activities and other corporeal functions, but in terms of a complicated interaction of both of the two, and, in addition, the totality of her relationships to the outer world, which consist of the team context, other team members, the task in question, etc. – indeed, all the objects and aspects that may call the team member's attention.

In conclusion, our view, according to which the team consists of several dynamic 'living networks,' i.e. the team members, accentuates the two interacting levels of dynamics inherent in the project work: the individual, and the team.

4

Knowledge Management and Knowledge-Related Project Work Environments

Knowledge management

Knowledge management comprises a range of practices used by organizations to identify, create, represent and share knowledge for reuse, awareness and learning. Knowledge management is typically tied to organizational objectives and is intended to achieve specific outcomes, such as shared understanding, improved performance, competitive advantage, or higher levels of innovation. One aspect of knowledge management, *knowledge transfer*, has always existed in one form or another. Examples include on-the-job peer discussions, formal apprenticeship and mentoring programmes. However, with computers becoming more widespread since the second half of the twentieth century, specific adaptations of technology, such as knowledge bases, expert systems and knowledge repositories, have been introduced to further simplify these processes.

Knowledge management programmes attempt to manage the processes of knowledge creation, accumulation and application across organizations. Knowledge management programmes attempt to bring under one set of practices various strands of thought and practice relating to:

- The idea of the learning organization
- Conscious knowledge sharing within the organization
- Various enabling organizational practices, such as boundary brokering and storytelling
- Various enabling technologies, such as knowledge bases and company intranets.

According to Nonaka and Takeuchi (1995), creating new knowledge and making it available to others is a central activity for organizations,

and is the defining characteristic of the phenomenon of knowledge management. Knowledge management at its heart involves the management of social processes at work to enable sharing and transfer of knowledge between individuals. Sveiby (1997) asserts that business managers need to realize that, unlike data, knowledge is embedded in people, and knowledge creation occurs in the process of social interaction.

Systematic and explicit knowledge management covers four areas (Wiig, 1997):

- Top-down monitoring and facilitation of knowledge-related activities
- Creation and maintenance of knowledge infrastructure
- Renewing, organising and transforming knowledge assets
- Leveraging (using) knowledge assets to realize their value.

Thus, in project-based companies and in individual projects knowledge management can also be seen as a set of these approaches and processes. Their purpose is to find and manage different knowledge-related functions in different project work environments. Of particular importance are the activities related to fostering individual behaviours that lead to knowledge creation and improved knowledge utilization. According to Wiig (1997), there are eight operational areas on which knowledge management should focus:

- Survey, develop, maintain and secure the intellectual and knowledge resources of the company
- Promote knowledge creation and innovation by everyone
- Determine the knowledge and expertise required to perform effectively, organize them, make the requisite knowledge available, 'package' them (e.g. in training courses, procedures manuals or knowledge-based systems) and distribute them to the relevant points of action
- Modify and restructure the company to use knowledge most efficiently, take advantage of opportunities to exploit knowledge assets, minimize knowledge gaps and bottlenecks, and maximize the value-added knowledge content of products and services
- Create, govern and monitor future and long-term knowledge-based activities and strategies – particularly new knowledge investments – R&D, strategic alliances, acquisitions, important hiring programmes, etc., based on identified opportunities, priorities and needs
- Safeguard proprietary and competitive knowledge and control use of knowledge to ascertain that only the best knowledge is used, that valuable knowledge does not atrophy and that knowledge is not given away to competitors

- Provide knowledge management capabilities and a knowledge architecture so that the company's facilities, procedures, guidelines, standards and practices facilitate and support active knowledge management as part of the company's practices and culture
- Measure performance of all knowledge assets and account for them – at least internally – as capitalised assets to be built, exploited, renewed and otherwise managed as part of fulfilling the company's mission and objectives.

Knowledge

The central insight of the knowledge in organizations is that knowledge inputs are necessarily embedded in a context – cognitive and behavioural, individual and social – which powerfully constrains their discovery, their transfer from one set of actors to another and their usefulness in different situations (Postrel, 1999). This insight, implicitly or explicitly, drives discussions of path dependence in capabilities (Penrose, 1959) (according to autopoietic epistemology, what you already know biases what you are likely to learn next), imitation of others' technologies (Cohen and Levinthal, 1990) (absorbing new ideas requires a basis of prior knowledge) and transfer of best practices from one site to another (Nelson and Winter, 1982; Zander and Kogut, 1995) (routines often rely on a context of tacit cues from other people or from machines, which must be articulated in an understandable way in order to be replicated).

This contextual understanding separates the knowledge perspective from research programmes that bear a superficial similarity. For example, the data processing approach (Burton and Obel, 1995) treats the organization as a communication net linking a group of individuals, who are regarded as a set of boundedly powerful sensors and processors. As Kogut and Zander (1996: 506, 509) point out, this approach assumes away the real difficulties of communication among people, which have to do with such things as conflicting conceptual categories and semantic ambiguities.

The contingency theory (e.g. Smith, 1984) has always had an appreciation of the existence of limits on understanding across individuals, but the different causes of these limits – such as motivational issues and bounds on attention and knowledge – tend to get blurred (Postrel, 1999). Knowledge is not a central construct in this tradition, although its properties may be implicitly included in discussions of other issues. The properties of the knowledge that organizations use to get work done end up buried in assessments of the simplicity or complexity of the environment, where they are relatively inaccessible to analysis.

Kogut and Zander (199: 505–6) identify this problem of knowledge division and co-ordination across individuals as being central to the performance of companies. They point out that the extensive specialization found in modern economic life results in a situation where each individual is largely ignorant of the activities of his fellows, and stress that bridging these ‘knowledge gaps’ in some way is essential to the co-ordination of economic activity. They argue that these gaps can be bridged by social identification processes, behavioural routines and evolved modes of discourse which allow different individuals to co-ordinate their activities over time at the cost of some inflexibility and sub-optimality of behaviour. This statement of the problem of the division of labour stimulates one to wonder how different patterns of the division of labour and knowledge affect output.

Knowledge types

The concept of knowledge has different definitions, depending on the discipline where it is used. Here the concept of knowledge means ‘human understanding of a specialized field of interest that has been acquired through study and experience’. Knowledge is based on learning, thinking and familiarity with the problem area. According to autopoietic epistemology, knowledge is not information, and information is not data. Davenport and Prusak (1998) define knowledge as ‘a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experience and information’. This means that to be able to manage knowledge, people need a clear understanding of the nature and characteristics of knowledge. Knowledge is a multifaceted construct and is difficult to come to grips with (cf. Ahmed *et al.*, 2002).

According to the HCM, all knowledge an individual has acquired is accumulated into her worldview in the form of meanings. Meanings can be classified in different categories, and therefore knowledge can be categorized accordingly. Knowledge can be defined in both a narrow and a wide sense. The former contains scientific research results and other more or less factual types of knowledge. In a wide sense, tacit knowledge (Polanyi, 1966) can also be considered as knowledge.

For instance, *intuition* is a type of meaning and therefore knowledge in a wide sense. Further, such mental conditions as *feeling*, *belief* and *will* are meanings, and therefore relevant to the understanding of phenomena by a team member. In a wide sense, all types of meaning are knowledge because a team member understands what the world is like on the basis of these types of meanings.

In addition to the complicated intermingling of different types of meanings, meanings are not always clear and unambiguous: they may be in many cases unclear, ill-structured, distorted, or even erroneous, but they are nevertheless meanings, on the basis of which a decision maker understands the issue at hand in one way or another. Meanings are not only concrete in content, but may also be abstract, or ideal (e.g. mathematical relationships), which means that the meaning has not emerged from any real object but instead from an abstract one. Moreover, in the mind, there occurs a continuous process of restructuring of meanings, in which meanings are also often forgotten, fading into the unconsciousness, possibly to be later retrieved.

A traditional way to categorize knowledge is to make distinction between data, information and knowledge. *Data* are seen as unprocessed raw facts. It is the symbolic representation of numbers, letters, facts, or magnitudes and is the means through which knowledge is stored and transferred. *Information* is the grouping of these outputs and placing of them in a context that makes a valuable output. In other words, information is an aggregation of data that have meaning. *Knowledge* is considered to be individual's perception, skills and experience. Knowledge involves the individual combining his experience, skills, intuition, ideas, judgements, context, motivations and interpretation. It involves integrating elements of both thinking and feeling. Thus, knowledge, information and data are, according to cognitivist epistemology, distinct entities, and the same is also true in the HCM, according to which these are all meanings in the worldview, where a team member has stored them. Moreover, data contained in computer systems is not a rich vessel of human interpretation, which is necessary for potential action. Knowledge is in the user's subjective context of action, which is based on data that she has interpreted.

Another way to categorize knowledge is whether it is *tacit* or *explicit* (Polanyi, 1966). Tacit knowledge represents knowledge – i.e. meanings – based on the experience of individuals. It is expressed in human actions in the form of evaluations, attitudes, points of view, commitments, motivation, etc. (e.g. Nonaka and Takeuchi, 1995) Usually it is difficult to express tacit knowledge directly in words, and often the only ways of presenting it are through metaphors (e.g. Tsoukas, 1991), drawings and different methods of expression not requiring the formal use of language.

On the practical level many experts are often unable to express clearly all the things they know and are able to do, and how they make their decisions and come to conclusions (Koskinen *et al.*, 2003). Tacit

knowledge is context dependent and situation sensitive (Varela *et al.*, 1991). '[K]nowledge depends very much on the point of observation. Where you stand or what you know determines what you see or what you choose to be relevant' (von Krogh and Roos, 1996a). This means that tacit knowledge is not abstract but is embodied in the individual in her worldview. In many cases, within the project work, tacit knowledge is seen as most important, one that is typically transferred from peer to peer through face-to-face interaction (Kazi *et al.*, 1999). Rosenberg's description (1982: 43) of traditional technological knowledge, accumulated in crude empirical ways with no reliance upon science, provides a good definition of tacit knowledge in technology companies as 'the knowledge of techniques, methods and designs that work in certain ways and with certain consequences, even when one cannot explain exactly why'.

According to Haldin-Herrgard (2000), the main problem in sharing tacit knowledge is related to perception and language. It is not so much that people have difficulty in expressing and articulating what they know, but that they may not be conscious of what it is that they know, or the interconnection between their tacit and explicit knowledge. Another problem concerns the time it takes for the internalization of tacit knowledge. For example, in project work practises, time is a scarce resource that is rarely set aside for the sharing of tacit knowledge.

According to Leonard-Barton and Sensiper (1998), there are three main ways in which tacit knowledge can be potentially exercised to the benefit of the organization:

- *Problem solving* The most common application of tacit knowledge is for problem solving. The reason experts on a given subject can solve a problem more readily than novices is that the experts have in mind a pattern borne of experience, which they can overlay on a particular problem and use to quickly detect a solution. The expert recognizes not only the situation in which he finds himself, but also what action might be appropriate for dealing with that situation. Writers on the topic note that 'intuition may be most usefully viewed as a form of unconscious pattern-matching cognition'.
- *Problem finding* A second application of tacit knowledge is to the framing of problems. Some researchers distinguish between problem finding and problem solving. Problem solving is linked to a relatively clearly formulated problem within an accepted paradigm. Problem finding, on the other hand, tends to confront the person with a general sense of intellectual unease, leading to a search for better ways of defining or framing the problem. Creative problem framing allows

the rejection of the obvious or usual answers to a problem in favour of asking a wholly different question. Intuitive discovery is often not simply an answer to the specific problem but is an insight into the real nature of the dilemma.

- *Prediction and anticipation* The deep study of a subject seems to provide an understanding, only partially conscious, of how something works, allowing an individual to anticipate and predict occurrences that are subsequently explored very consciously. Histories of important scientific discoveries highlight that these kinds of anticipations, and reliance on inexplicable mental processes can be very important in invention. Authors writing about the stages of creative thought often refer to the preparation and incubation that precede flashes of insight.

Explicit knowledge, unlike tacit knowledge, can be embodied in a code, or a language, and as a consequence it can be communicated easily. In other words, the meanings representing explicit knowledge in the worldview are rather clear and conscious, and therefore a project team member can easily retrieve them from her worldview. They represent knowledge in a narrow sense. The code may be words, numbers, or symbols like grammatical statements, mathematical expressions, specifications, manuals and so forth (Nonaka and Takeuchi, 1995). For example, explicit knowledge implies factual statements about such matters as material properties, technical information and tool characteristics.

However, there is no dichotomy between tacit and explicit knowledge: tacit and explicit knowledge are mutually constituted (Tsoukas, 1996). In other words, they should not be viewed as two separate types of knowledge, but intermingled in the worldview. This means that for any explicit knowledge, there is some tacit knowledge: explicit knowledge is an extension of tacit knowledge to a new level (Mooradian, 2005). Hence, if there is value in identifying tacit knowledge, it is in relation to making explicit knowledge understandable. Tacit knowledge is an enabling condition of explicit knowledge and of the sharing of knowledge. This means that tacit knowledge is knowledge that is active in the worldview (mind) but not consciously accessed in the moment of knowing. Therefore it grounds, enables, causes, or somehow brings about the explicit knowing connected with individual team members, projects and project-based companies. In addition to explicit and tacit knowledge, also other kinds of meanings – such as feelings and beliefs – are present in the worldview and mingled with them in a very complicated way.

Day and Wendler (1998) characterize knowledge as having seven components:

- *Knowledge is 'sticky'* Some knowledge can be codified, but because tacit knowledge is embedded in people's minds or worldviews, it is often 'sticky' as it tends to stay in people's 'heads'. Even with modern tools, which can quickly and easily transfer data from one place to another, it is often very difficult and slow to transfer knowledge from person to person, since those who have knowledge may not be conscious of what they know, or how significant it is. As knowledge is 'sticky', it often cannot be owned and controlled in the way that plant and equipment can.
- *Extraordinary leverage and increasing returns* Network effects can emerge as more and more people use knowledge. These users can simultaneously benefit from knowledge and increase its value by adding, adapting and enriching the knowledge base. Knowledge assets can grow in value as they become a standard or which others can build. This is unlike traditional company assets, that decline in value as more people use them.
- *Fragmentation, leakage and the need for refreshment* As knowledge grows, it tends to branch and fragment. Today's specialist skill becomes tomorrow's common standard as fields of knowledge grow deeper and more complex. While knowledge assets grow more and more valuable, others – like expiring patents or former trade secrets – can become less valuable as they are widely shared.
- *Knowledge is constantly changing* New knowledge is created every day. Knowledge decays and gets old and obsolete. Thus, it is hard to find and pinpoint knowledge.
- *Uncertain value* The value of an investment in knowledge is often difficult to estimate. Results may not come up to expectations. Conversely they may lead to extraordinary knowledge development. Even when knowledge investments create considerable value, it is hard to predict who will capture the lion's share of it.
- *Most new knowledge is context specific* Knowledge is usually created in practice for a particular use, and as such is context specific. Therefore the question is, what aspect of it can be transferred? This would suggest that concepts such as 'best practice' are of limited use.
- *Knowledge is subjective* Due to its subjective nature, not all employees might agree what specific knowledge is usable or best practice.

According to Hall and Andriani (1999, 2002) knowledge which is new to a project has to be either invented internally in the project or acquired

from external sources. This new knowledge may add to or substitute the project's existing knowledge base. Hall and Andriani categorize this new knowledge as either *additive* or *substitutive* knowledge (e.g. Nooteboom, 1996). Referring to the project type categorization (see later in this chapter), it is possible to conclude that delivery and investment projects use, by their nature, more additive than substitutive knowledge, and R&D and design projects use, also by their very nature, more substitutive than additive knowledge.

Thus, in the case of an individual project team member 'knowledge is the individual ability to draw distinctions within a collective domain of action, based on an appreciation of context or theory, or both' (Tsoukas and Vladimirou, 2001). This means that an individual team member's capacity to exercise judgement is based on an appreciation of context in the ethno-methodological sense, that a social being is knowledgeable in accomplishing a routine and taken-for-granted task within a particular context as a result of having been through processes of socialization.

Within a well-functioning project implementation, the knowledge of an individual team member is transformed into knowledge of the project. This is the most central function of the project: knowledge moves efficiently within the project, allowing everyone to know about others' problems and ideas. In this way, a common basis for discussions between different individuals is created. Among a project team the knowledge of individuals transform into shared understanding, uncodified routines, and written explicit knowledge (Figure 4.1). Furthermore, according to Ojala (1996), in an ideal case knowledge moves freely within a project and is refined through common interpretation. This common interpretation can be developed by improving conversational and interpersonal skills as well as taking into consideration various interpretations and perspectives within a project.

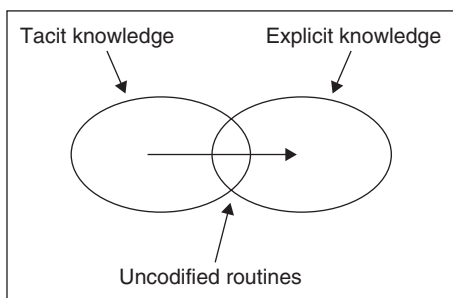


Figure 4.1 Transformation of individual team members' knowledge into project knowledge

Organizational knowledge has been evident since Penrose's (1959) work on the theory of the firm. According to her, firms have discretion over how they use their resources and, therefore, over the services derived from them. On this view, organizational knowledge is the set of collective understanding embedded in an organization – in a project team and/or project-based company – which enables it to put its resources to particular uses.

All the knowledge needed in a project implementation is visualized by the metaphor illustrated in Figure 4.2. The trunk of the tree describes the project output. The branches from the trunk are the main activities that affect the outcome of the project. Branching off from each of these main activities are sub-activities which, together with the main activities, collectively determine the outcome of the project. The shading of each activity represents the stage of knowledge. White (almost invisible) represents tacit knowledge, while black represents explicit knowledge. The thickness of each branch represents the activity's relative extent to the project. With the help of this metaphor it is possible to realize that a project may need many types of knowledge and that the knowledge management methods needed in a project implementation are often versatile. For example, a small sub-activity, where implementation needs utilization of rare tacit knowledge, may crucially render the outcome of a project.

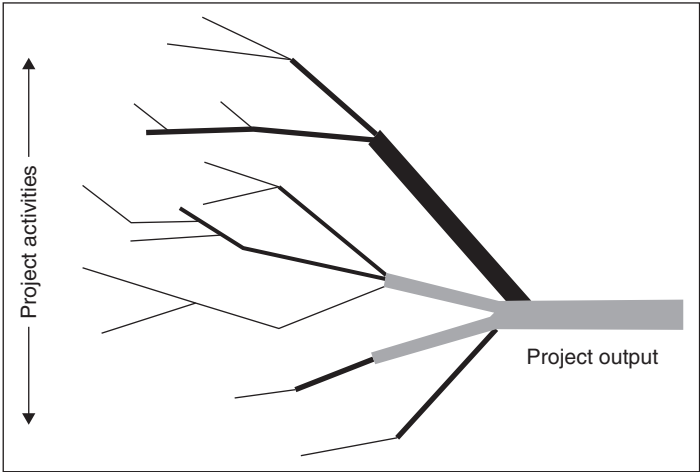


Figure 4.2 Project tree

Source: Adapted from the idea of Bohn (1994).

Competence

Competence is a term that is widely used but which has come to mean different things to different people. However, it is generally accepted to encompass knowledge, skills, attitudes and behaviours that are causally related to superior job performance (e.g. Boyatzis, 1982; Hamel and Prahalad, 1994; Boisot *et al.*, 1996). By the definition of Spencer and Spencer (1993: 9) competence is 'an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation'. Hofer and Schendell (1978: 25) describe competence under the heading of resource deployment. Specifically, they define competence as 'patterns of ... resource and skill deployments that will help the firm achieve its goals and objectives'. Strictly speaking, an individual's competence is simply the particular knowledge and skills that the individual possesses, and the superior way they are used. As Figure 4.3 suggests, an individual's personal competence can be divided into *knowledge-based* and *social-based* competencies.

Knowledge-based competencies consist of an individual's tacit and explicit knowledge (e.g. Nonaka and Takeuchi, 1995). As described above, tacit knowledge is knowledge that an individual has collected and stored in her worldview while she has performed different tasks and

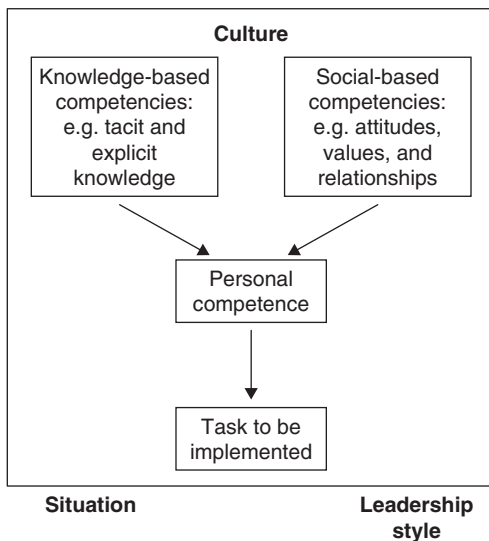


Figure 4.3 An individual's personal competence

Source: Koskinen and Pihlanto (2006); reprinted with the permission of John Wiley & Sons Ltd.

duties in different contexts and situations of her life. This means that tacit knowledge is acquired by an individual as a result of active work (e.g. Polanyi, 1966). However, tacit knowledge can also refer to distorted knowledge that is culturally assimilated, and thus passively given to an individual (e.g. Popper, 1977). Unlike tacit knowledge, explicit knowledge can be embodied in a code, or a language and is in the form of clear meanings in the worldview. Therefore it can be communicated easily.

Social-based competencies are abilities to integrate thinking, feeling and behaviour to achieve social tasks and outcomes valued in the context and culture of a company. In a project work context, these tasks and outcomes would include accessing a project's target and the company's mission successfully, and developing transferable skills and attitudes of value in the project and/or company. Recent evidence suggests that socially adept personnel contribute strongly to companies' success (e.g. Baron and Markman, 2000). Projects with people who are especially good at perceiving others' emotions accurately, and at expressing their own emotions clearly, earned significantly higher income from their businesses than projects with staff which scored lower on these skills.

For example, an individual's personal competence in a project implementation and/or in a project-based company context as a whole includes the mastery of a body of job-related knowledge and skills (which can be technical, professional, or managerial), and also the motivation to expand, use and distribute work-related knowledge to others (cf. Spencer and Spencer, 1993: 73). Acquisition and sharing of competencies depend on motivation as much as on technical knowledge involved. According to Spencer and Spencer (1993), these two aspects of an individual's competence are crucial in transforming knowledge and skills into effective project results. However, it is crucially important to understand that the usefulness of an individual's competence always depends on the context and her personal situation (in Figure 4.3, situation, leadership style, culture) in which that competence is utilized (e.g. Koskinen, 2003; Koskinen *et al.*, 2003). It must also be noticed that 'knowledge is about specific insights regarding a particular topic, *competence is about the skill to carry out work*' (von Krogh and Roos, 1996a: 424). From this it follows that the competencies of an individual project team member are not fixed properties. Rather, they are created continuously in her situated practices. When an individual's performance is seen as his or her dynamic engagement to a task, personal competence is understood as emerging from situated practices. The focus then is on understanding the conditions (e.g. human and infrastructural) under which the performance of an individual team member is more or less likely to be enacted.

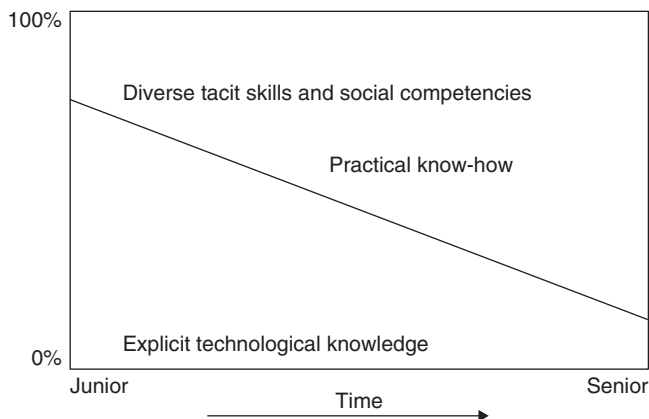


Figure 4.4 Competence transformation of an engineer in the course of a working life

Source: Koskinen and Pihlanto (2006); reproduced with the permission of John Wiley & Sons Ltd.

It is also important to understand that the performance of individuals varies over time. This means that persons' competencies evolve in the course of their lives as they cumulate new meanings into their world-view, which are shaping their performances, too. Figure 4.4 illustrates, in principle, how the competence of an engineer has changed in the course of his working life. The explicit technological knowledge that an engineer has gained in his or her formal education has transformed into diverse tacit knowledge, like work-related know-how, relationships between people, business skills, etc.

The competencies of senior-level project team members are often socially based and include a lot of tacit knowledge. This is because senior personnel have had many chances to work in different contexts and situations, and they have therefore also had chances to collect experiences that have become their tacit knowledge. This means, as said above, that the explicit knowledge which an engineer has gained being as a junior in a university has transformed in the course of his lifetime into diverse tacit skills. This type of reasoning is also supported by the significant evidence of Wagner and Sternberg (1985) and Sternberg *et al.* (1995), according to which old timers and more experienced people tend to utilize more tacit knowledge than juniors and less experienced people. Thus, senior-level project team members' competencies often equal practical know-how.

An important sub-concept within the main concept of competence is *core competence*. (Hamel and Prahalad, 1989; Prahalad and Hamel, 1990) The premise is that a company's strategy is based on learning, and learning depends on competencies. The core competencies arise from collective learning in organizations, especially from the co-ordination of skills and the integration of technologies. By nature, core competencies do not diminish in value but need to be nurtured as knowledge and skills are lost over time.

Emotional intelligence and emotional competence

Emotional intelligence refers to the *emotional side of life*, such as the ability to recognize and manage the individual's own and others' emotions, to motivate oneself and restrain impulses and to handle interpersonal relationships effectively (Goleman, 1995).

Emotional competence refers a *learned capability* based on emotional intelligence that results in outstanding performance at work. An individual's emotional intelligence determines her potential for learning practical skills based on five key elements:

- Self-awareness
- Motivation
- Self-regulation
- Empathy
- Adeptness in relationships.

Individuals' emotional competencies show how much of that potential has been translated into on-the-job competencies (Goleman, 1995). Thus, emotional competence refers to an individual's competence in expressing or releasing his or her emotions. It implies an ease around emotions, which results in emotionally competent people being relaxed about other people being emotional. The concept of emotional competence is rooted in the understanding of emotions as being a normal content of a worldview and a useful aspect of being human. Anger is a reaction to aggression and gives an individual the strength to repel it. Grief is a reaction to abandonment, of feeling unloved, and has the effect of eliciting sympathetic responses from others. Fear is a response to danger and has a clear physiological effect of heightening individuals' senses and speeding up their reactions. From this it follows that the suppression of emotion is not useful and that teaching people to suppress their emotions is part of trying to control them. Emotionally competent people will express emotions appropriate to the

situation and their needs and they will not seek to suppress emotions in others.

It is fairly widely believed that if appropriate emotions are not expressed, some sort of memory of them becomes stored in the world-view. Later events may trigger the old emotions resulting in inappropriate emotional responses. Releasing old emotions is a key feature of reciprocal peer counselling. Co-counselling is a grassroots, low-cost method of personal change based on reciprocal peer counselling. It uses simple methods that can be seen as a refinement of 'you tell me your problems and I'll tell you mine'. In particular, time is shared equally and the essential requirement of the person taking their turn in the role of counsellor is to do their best to listen and give their full attention to the other person. It is not a discussion; the aim is to support the person in the client role to work through their own issues in a mainly self-directed way.

Furthermore, emotional competence can lead to improved health through avoiding the stress that would otherwise result from suppressing emotions. This is an example of the intimate link between the corporeality and consciousness of human beings. Emotional competence can also lead to improved relationships since inappropriate emotions are less likely to be expressed and appropriate behaviour is not avoided through fear of triggering some emotion.

Humanistic approaches to assertiveness (Dickson, 1982, 2000) emphasise the importance of working with emotions. In particular they recognize the need to address manipulative or passive (an individual does not say what he wants) or aggressive (an individual tries to force another person to do what he wants) behaviour in which the manipulator exploits the feelings of the other in trying to get a result. Building up emotional competence is a way of learning to handle such behaviour.

Knowledge-related project work environments

According to Koskinen (2004), with the help of identification of the 'knowledge gap' between the existing knowledge base that is owned by the project team and the target knowledge base that is acquired by the project team, it is possible to identify different knowledge-related project work environments. The discussion in the following describes four different knowledge-related project work environments that illustrate circumstances and situations where knowledge management processes can take place in a project work context (see Figures 4.5 and 4.6).

Substitutive knowledge	Semi-mechanical PW environment (e.g. investments)	Organic PW environment (e.g. product development)
	Mechanical PW environment (e.g. house building)	Semi-organic PW environment (e.g. investments)
Additive knowledge		
	Explicit knowledge	Tacit knowledge

Figure 4.5 Four knowledge-related project work environments
Source: Koskinen (2004); reproduced with the permission of John Wiley & Sons Ltd.

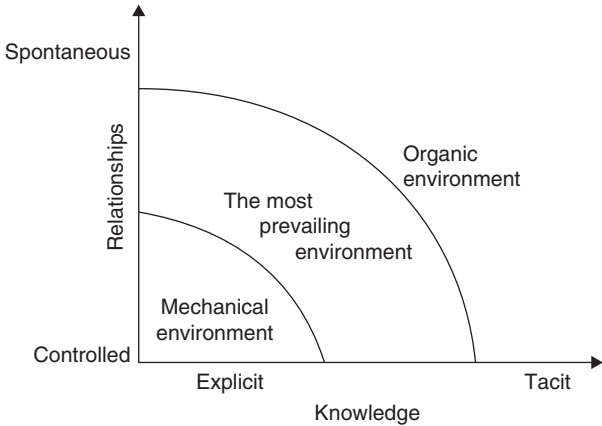


Figure 4.6 Knowledge-related project work environments
Source: Adapted from Stähle and Grönroos (1999).

Mechanical project work environment

In a mechanical project work environment (the left-hand lower part of Figure 4.5, and the left-hand lower part of Figure 4.6) a team tries to reach predetermined single-minded interpretations – i.e. the utilization of explicit knowledge is abundant. Moreover, in a mechanical project work environment the knowledge utilized is often an additive in its nature. Success in a mechanical project work environment requires that the team members are skilled in adapting instructions. The tasks are precisely defined and a large proportion of the relevant knowledge is

transferred in a written form – i.e. utilization of information technology in knowledge transfer is usually abundant. In a mechanical project work environment, knowledge moves from the project management to individual team members. Strictly speaking, knowledge is sent not for discussion but only to be obeyed. Because the knowledge in a mechanical project work environment is in a great part in explicit form, it can be sent to the people involved over vast distances. The mechanical project work environment fits in projects in which quality criteria must be met precisely.

For example, in fully standardized house building projects the handling of knowledge is seen as the processing of knowledge primarily in a written form, and every problematic situation is met by more processing of knowledge. In these types of projects the possibility of multiple interpretations is not usually taken into account. This means that a new standardized house is a manifestation of explicit and additive knowledge. The implementation of a standardized house building project takes place in the environment which is described here as a mechanical project work environment.

Organic project work environment

In an organic project work environment (the right-hand upper part of Figure 4.5 and the right-hand upper part of Figure 4.6) the ambiguity of knowledge is significant. The tasks involve inconsistent situations, and the changes that they produce and the challenges produced by circumstances do not necessarily have immediate answers. In the organic project work environment solutions to problems are directed by non-linear thinking (e.g. in R&D projects). People act on the basis of worldviews born of their intuition and experience. The elements of knowledge consist of the multidimensional knowledge stores of the project participants, which means that knowledge is often created with the help of face-to-face interactions.

Knowledge in an organic project work environment is frequently more difficult and multidimensional than in a mechanical project work environment. A lot of the knowledge and know-how of a project team is based on experience-based tacit knowledge. Moreover, in an organic project work environment the knowledge that is created is substitutive in its nature.

For example, when the manufacturer produces a concept of a new machine, then the concept is in great part a manifestation of tacit and substitutive knowledge. The concept creation may begin with team

members discussing a variety of personal experiences, but as it proceeds the expressions should converge through the understanding of individuals into one concept that becomes their common focus. The team members may apply creative techniques that make their insights and experiences more explicit, helping to bundle them into key words that finally form a concept. Crystallization of the concept is achieved when all the team members feel that the concept corresponds with what they know tacitly. In other words, this view on knowledge handling is fully in line with the assumptions of autopoietic epistemology and the HCM. The implementation of a product development project takes place in the environment which is described here as an organic project work environment.

Semi-mechanical and semi-organic project work environments

Semi-mechanical project work environments (the left-hand upper part of Figure 4.5) and semi-organic (the right-hand lower part of Figure 4.5), and in the middle of Figure 4.6, are probably the most prevalent. Knowledge is created with the help of both face-to-face communication and information technology. However, the utilization of information technology in knowledge creation and utilization is more abundant in the semi-mechanical project work environment than in the semi-organic project work environment, and face-to-face interaction-based knowledge creation and utilization is more abundant in the semi-organic project work environment than in the semi-mechanical project work environment.

For example, project delivery practices have a lot in common in the paper and pulp and steel industries, but there are a great deal of differences between house construction and product development projects. The same way of knowledge management does not fit all; there are obvious practical differences. The learning culture varies considerably; some practices are more authoritarian and have more formal procedures than others, some are one-off specials while others are diverse, and so on. All these differences have implications for knowledge management.

To take another example, in many investment projects the information technology-based document management is an important foundation for knowledge sharing. Engineers can access data on past projects, including plant designs. They can also use information technology for accessing reports from sales people and a directory of in-house experts. However, this explicit knowledge can often serve only as a basis for deciding what tacit knowledge to apply. This means also that explicit

knowledge is a subject to alternative interpretations, because everybody understands knowledge in a subjective way – i.e. depending on the content of their personal worldview and individually structured situationality. Therefore, it is difficult to know how to use this knowledge in an actual problem solving situation.

Summary

Knowledge and its management in different contexts and situations are concepts that are extremely meaningful, promising and hard to pin down. This chapter has explored notions of knowledge management, different knowledge and competence types as well as different knowledge-related project work environments. Some of the key claims and suggestions include the following:

- The *value of knowledge management* relates to the effectiveness with which the managed knowledge enables project-based companies (and the project teams within them) to deal with their current activities and effectively envision and create their future.
- Knowledge is an *individual's perception, skills and experience*, which are all dependent on what experiences the individual's worldview contains in the form of meanings. Knowledge involves the individual combining her experience, skills, intuition, ideas, judgements, context, motivations and interpretation, which all relate to the conditions regulated by the consciousness, situationality and corporeality of an individual.
- The traditional way to categorize knowledge is to make a distinction between *data*, *information* and *knowledge*. However, here we understood these terms by stressing the human dimension – i.e. that data are raw knowledge, information is an interpretation process and knowledge is located in the worldview of an individual. Furthermore, we put the emphasis on a categorization according to which knowledge is divided into *tacit* and *explicit* knowledge. In many cases within the project work tacit knowledge is seen as the most important knowledge that is typically transferred between team members through face-to-face interaction.
- An individual team member's competence is not only her knowledge, but it also includes *social aspects*, which arise from the situationality of an individual. Furthermore, an individual team member's knowledge is about her insight into the task at hand, and competence is about her skill to carry out task-related work. An individual's competence

evolves in the course of her life and is accumulated into her worldview in the form of different kinds of meanings. The individual's worldview is the 'place', in the consciousness, in which the competence is stored.

- Part of our normative advice for project team members is that emotionally competent project team members express emotions appropriate to the situation and do not seek to suppress emotions in others.
- There are at least four different *knowledge-related project work environments*: mechanical, organic, semi-mechanical and semi-organic environments. Although these identifications are relative rather than absolute in quality, they nevertheless help in the understanding of the different situations in which knowledge-related project work takes place. It is important to notice that if the environment in which the project implementation takes place is wrongly assessed, the project team may be either over-challenged or under-challenged. For example, if the environment is over-challenged, the measures adopted by the members of the project team will not be taken up. This is because the team members will either fail to understand the target of knowledge management, or they will see it as meaningless.

5

Learning and Organizational Memory

Types of learning

Knowledge and learning have a mutual cognitive dimension, both of which are intricately intertwined and assessed relative to the need for action. According to Dewey (1933), all learning is a continuous process of discovering insights, inventing new possibilities for action, producing the actions and observing the consequences leading to insights. According to autopoietic epistemology, learning thus involves the actions of using existing insight or knowledge to produce new insight or knowledge. In a similar way, according to the HCM, there exist previously acquired experiences and competences in the worldview that form the basis for acquiring new insights and knowledge from the situation – e.g. from a project. The worldview then functions as a kind of ‘melting pot’, in which learning proceeds on the basis of old and new ‘material’ – i.e. skills, competences and knowledge.

Knowledge (tacit and explicit) is a state of understanding that helps to guide the form and shape of actions. Learning and knowledge therefore mutually reinforce each other in a cycle. The act of learning provides knowledge and understanding, which in turn feed further learning in the worldview of a project team member. In other words, as knowledge is created and captured, learning can take place and the knowledge that is applied can then be embedded within individual, team and organizational processes (Liebowitz and Megbolugbe, 2003). Working in concert, the two create a *virtuous spiral of knowledge–learning* (see Figure 5.1).

Additionally, March (1994) has suggested that learning and knowledge accumulation are evolutionary processes. Simply put, this thinking suggests that learning and knowledge accumulation are not outcomes, but paths that lead to outcomes. In other words, looking for evidence that a

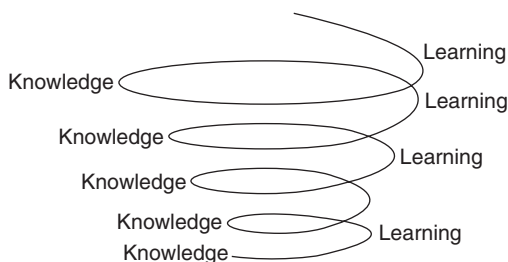


Figure 5.1 The knowledge–learning spiral

Source: Ahmed *et al.* (2002); reproduced with the permission of Butterworth–Heinemann.

project team has stored its knowledge somehow may be the wrong model in learning and knowledge assessment (Anell and Wilson, 2002). Instead, we suggest that both knowledge and learning are stored in individual project team members.

Argyris and Schön (1978) take the stance that there exist two types of learning: *adaptive* and *generative* learning. Adaptive learning, or single-loop learning, focuses on solving problems without examining the appropriateness of current learning behaviours (Argyris, 1992). Adaptive individuals and/or organizations focus on incremental improvements, often based upon their past track record of success. Essentially, they do not question the fundamental assumptions underlying the existing ways of doing work. This view is about coping.

Increasing adaptability is only the first stage of learning. The next level is *generative learning*, or double-loop learning, which should be the main preoccupation for organizations (Argyris, 1992). Generative learning emphasizes continuous experimentation and feedback in an ongoing examination of the very way organizations go about defining and solving problems. The essential difference between the two views is between being adaptable and having adaptability. To maintain adaptability, organizations need to operate as experimenting or self-designing organizations – i.e. they need to maintain themselves in a state of frequent, nearly continuous change in structures, processes, domains, goals, etc., even in the face of apparently optimal adaptation (Hedberg *et al.*, 1976).

However, the argument that one type of learning is superior to another (e.g. generative learning is more desirable than adaptive learning) cannot be sustained. As argued by Miner and Mezias (1996), the type of learning required is dependent on the individual task at hand, as well as the environmental demands. Learning therefore seeks to describe a process

of increasing the overall performance of an organization by encouraging knowledge creation and use in each of its value chain functions, in order to give each a source of competitive advantage. It seeks to do this by arriving at a wider view of each area, such that it can question the existing paradigms that underpin current operation and seek better solutions to the everyday problems.

An individual project team member's existing knowledge structure in her worldview determines how a piece of data (i.e. perturbation) is interpreted – i.e. what this team member learns. The interpretation may be influenced by the individual's previous experiences and situationality, e.g. her position within the company, current project team and environment. To establish uniformity of shared interpretation, there needs to be uniformity in knowledge structures in the worldviews of the people of a project team. This is easier when new knowledge is framed in a consistent and familiar manner (this is often the case in a mechanical project work environment). If new data are framed in a different manner around different people among a project team, it is likely that there will be a diversity of shared understanding of the perturbation (this is often the case in an organic project work environment). Shared interpretations that allow one team to understand and apply another's insights to its own context are therefore essential for the diffusion of knowledge (Orr, 1990; Weick, 1995; Orlikowski, 1996; Bresnen *et al.*, 2005). This means that all successful projects should provide the basis for constructing a shared system of meanings and learning. Moreover, it is important to understand that the creation, diffusion and application of knowledge are situated activities and thereby heavily influenced by the particular project context (Lave and Wenger, 1991).

A model of a learning process that is widely used is the Lewinian experiential learning model (Kolb, 1984) (Figure 5.2). This model has appeared in a variety of management guises: Deming's (1986) plan–do–check–act cycle, Schein's (1987) observation–emotional reaction–judgement–intervention cycle and Argyris and Schön's (1978) discovery–invention–production–generalization cycle. In the following each of these four aspects of the Lewinian learning model are applied as learning models of three different levels of the project work context – as individual, project team, and company-based learning models.

Individual learning

The knowledge and experience of an individual shapes his actions through learning, enabling him to deal more efficiently with similar

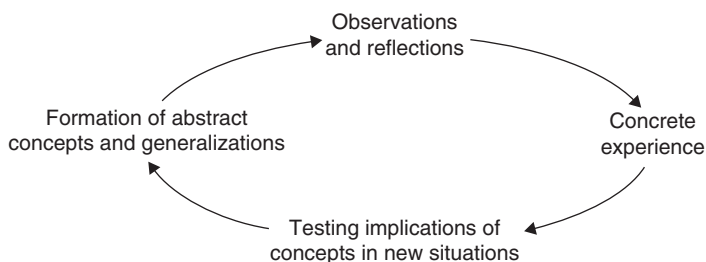


Figure 5.2 The Lewinian experiential learning model

situations and cope with different approaches to new situations. Learning occurs, according to autopoietic epistemology, when new data are interpreted and then compared with previously produced knowledge. The comparison is then reflected upon in order to evaluate a suitable behavioural route to the goals required. The HCM supports this view by also stressing the role of previously acquired knowledge stored in the worldview: new knowledge is reflected to the old knowledge in the worldview and, as a result of this, a new understanding or leaning is realized in the worldview and further stored there.

Thus, there are *internal* and *external* aspects to learning. The internal aspects address how new data are interpreted by an individual. External aspects cover the means by which new data are arrived at.

Data can be acquired by an individual using a method that is a combination of the two extreme learning methods: teaching and discovery (see also Revans, 1982: 'action learning'). Buckler (1998) finds advantages and disadvantages in both. The teaching method is useful for passing on solutions that may be copied and where conformance to specifications is required (e.g. in a mechanical project work environment). The advantage of teaching is that it is a low-risk method of passing on data in a consistent way. The disadvantage of prescriptive teaching is the increased potential it has for stifling motivation and reinforcing automatic responses to events that might otherwise have presented opportunities for learning.

In contrast, the discovery method allows theories to be developed and followed through (e.g. in an organic project work environment). It provides an opportunity to develop solutions individually, thus allowing creativity and innovation. The drawbacks of discovering new knowledge are that it can consume vast amounts of resources, it is subject to a higher risk of failure and it may allow the learning objectives to stray.

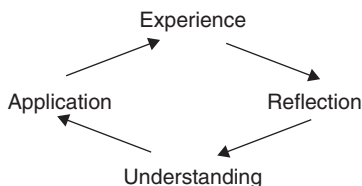


Figure 5.3 An individual team member's learning model

According to Kim (1993), individual learning is 'increasing one's capacity to take effective action'. This means that within a project implementation individual team members have to learn how to use their knowledge in a practical context, where action and results as well as swiftness are often the dominant governing norms.

So, the learning process and the development of skills and knowledge are complex and depend on a variety of related aspects of an individual's functioning. Perception, memory, motivation, cognitive ability and personality are all important in understanding how and what any individual might learn (Warr and Bunce, 1995). One consequence of this is the possibility that individuals may benefit most from different methods of learning such as teaching or discovery. Based especially on the latter method, Figure 5.3 describes each of the four aspects of the Lewinian learning model as an individual team member's learning model in a project work context. On the basis of the HCM, we stress that the materials for forming experiences mostly come from the situation of a team member, and reflection as well as understanding are then realized in the worldview. Application is also configured in the mental processes of the worldview, and its realization happens in the team member's situation – e.g. a project – from where experiences of the results are acquired and added to the individual worldview.

The traditional goals of individual learning are acquisition of knowledge (know-what), development of skills (know-how) and a change in attitude of the individual learner. However, through introspection, a learner can also learn about his or her strengths and weaknesses as a learner. Bateson (1987) coined the phrase 'deutero-learning' for individuals who became effective at 'learning to learn' and more skilled at problem solving. Defensive routines can create blockages in deutero-learning and inhibit further learning. This is particularly evident among smart and professional people, which means that there may be a disparity between what they say and what they believe (Argyris, 1991).

This defensive reasoning often arises from smart people's high aspirations for success and their equally high fear of failure which may lead to embarrassment and feelings of vulnerability and incompetence.

Team learning

Before a team can learn, it must become a team. According to Tuckman and Jensen (1977), there are four stages that teams have to go through to be successful:

- *Forming* When a group is just learning to deal with one another; a time when minimal work gets accomplished
- *Storming* A time of stressful negotiation of the terms under which the team will work together; a trial by fire
- *Norming* A time in which roles are accepted, team feeling develops and knowledge is freely shared
- *Performing* When optimal levels are finally realized in productivity, quality, decision making, allocation of resources, and interpersonal interdependence.

Tuckman and Jensen (1977) assert that no team goes straight from forming to performing. 'Struggle and adaptation are critical, difficult, but very necessary parts of team development' (Robbins and Finley, 1996: 187).

Team learning can also be viewed as the capacity of a group to engage appropriately in dialogue and discussion. According to Senge (1990), there are three characteristics of effective team learning:

- Ability to think insightfully about complex issues and bring together the collective intelligence of the team rather than the insight of the dominant individual
- Ability to provide innovative and co-ordinated action; this implies alignment of minds between team members and a conscious awareness of other team members and their actions
- Ability to share practices and skills between teams in the organization.

The discipline of team learning starts with dialogue. This is the capacity of its members to suspend assumptions and enter into genuine thinking together. Dialogue differs from discussion as it is the free flow of ideas that enables a team to think together. The discipline of dialogue involves learning how to recognize the patterns of interaction in teams, such as

the defensive routines that undermine genuine learning. Effective dialogue depends on effective communication and the co-ordination of its parts that represent different sub-cultures (R&D, marketing, production, etc.), through different 'languages' and priorities. An effective communication means that every team member 'opens his or her worldview' to such a degree that the above free flow of ideas and other knowledge is not blocked. One of the problems is that everybody's worldview is unique, and therefore there may be difficulties in understanding the 'language' used by the other team members. In the total situationality of a team member there may also be some other factors that may block the free flow of knowledge – i.e. other factors than the above-mentioned cultural ones.

Indeed, dialogue is the free and creative exploration of complex issues involving active listening and suspension of one's own view. The purpose of dialogue is to go beyond one's own understanding and become an observer of one's own thinking. This means suspending one's own assumptions and playing with different ideas. Dialogue means letting go of power differentials between team players and treating each member equally. It means exploring our assumptions behind our closely held views. Dialogues are particularly useful in organic project work environments where people want a richer grasp of a complex issue rather than simply fostering agreement.

Discussion is complementary to dialogue and is best employed in situations of convergent thinking and decision making. In discussion, different views are presented and defended and there is a search for the best view and arguments to support the decision that needs to be made (Senge, 1990). Discussions converge to a conclusion and a course of action. The assumption is that the best argument tends to win in discussions. However, it can be the best arguer using rhetoric or emotive language rather than logic that wins, as the objective criteria against which the quality and validity of an argument are rarely tested.

It follows from the above discussion regarding dialogue and conversation that the four aspects of the Lewinian learning model can be applied as a team's learning model in a project work context (see Figure 5.4).

According to Argyris (1992), even professionals often avoid learning, using entrenched habits to protect themselves from the embarrassment and threat that comes with exposing their thinking. The act of encouraging more open discussion is seen as intimidating, and they feel vulnerable. The missing link for Senge (1990) is practice. Team learning is a team skill that can be learned. Practice is gained through dialogue

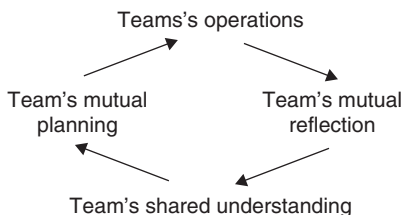


Figure 5.4 A team's learning model

sessions, learning laboratories and micro-worlds, which are computer-based microcosms of reality, in which one learns by experimentation.

Team learning is so important because teams are the fundamental unit in project-based companies. Individuals are, of course, important as well, because if individual team members do not learn, the team does not learn either. When teams really learn, they can produce extraordinary results. However, there can be defensive routines that can block effective team learning, especially if an individual digs in her heels and clings to her own perspective. This can lead to a team conflict, entrenched views and a block of energy flow in a team. Often the defensive routines can arise from individuals not wishing to confront their own thinking to save themselves from threat or embarrassment. This enables them to maintain an air of confidence in a situation based on past judgements and obscures their ignorance.

Company-based learning

The concepts about organizational learning (here company-based learning) and learning organization are relatively new, but the ideas themselves have existed for a long time. Ever since the 1950s, there has been discussion about systems thinking and socio-technical system aspects in relation to organizations. On the basis of these notions organizations can be imagined as organisms – i.e. living beings that, like other living organisms, are capable of learning.

Company-based learning is the vehicle for those project-based companies utilising past experiences, adapting to environmental changes and enabling future options. Interest in company-based learning has especially grown since managers were told that the economy had turned into a knowledge economy (Drucker, 1993a) and that knowledge and learning are of prime importance for creating and sustaining competitive advantage (Nonaka, 1994a). Many authors writing about company-based

learning have drawn inspiration from a variety of perspectives, including psychology, management science, production management, organization theory, evolutionary economics and innovation management. Each of these perspectives has resulted in valuable insights in the conditions, dynamics, or outcomes of company-based learning (Easterby-Smith, 1997).

However, compared with the systematic learning that takes place in functional organizations, the one-off and non-recurring nature of project activities provides little scope for routinized learning (Winch, 1997; Hobday, 2000) or systematic repetition (Gann and Salter, 1998, 2000). The problem with this perspective on project-based learning is that it equates project-based activities with non-routine behaviour. Davies and Brady (2000) argue that performance can be increased through exploitative learning because firms undertake 'similar' categories of projects in mature or new product markets, involving repeatable and predictable patterns of activities.

The perception that projects perform only unique and non-routine tasks often conceals many potentially transferable lessons. Learning can occur at several different levels – e.g. individual, project and company levels (DeFilippi and Arthur, 2002). Many firms are trying to create organizational learning mechanisms as deliberate attempts to capture the experience gained through projects (Prencipe and Tell, 2001). These mechanisms refer to the institutionalized, structural and procedural arrangements that allow companies to systematically collect, analyse, store, disseminate and use knowledge (Popper and Lipschitz, 1995). However, these project objectives are designed precisely to be achieved by *single-loop learning* (Bresnen, 2006). This does not, however, mean that projects cannot develop their own momentum that leads to the pursuit of new objectives. Nor does it mean that there is no possibility of learning within the parameters set for the project. Especially in an organic project work environment, the intent is to create a practice field, a space where people feel comfortable practising learning without the fear of failure, a space where they can raise difficult issues; a place where they do not resort to defensive behaviour. This means that creating 'psychological safety' (Schein, 1999) is a considerable challenge. It is not just a matter of intent; it requires very skilful behaviour that is developed over time as people learn to trust one another.

According to Raivola and Ropo (1991), company-based learning can be divided into three parts: informal, formal and non-formal learning. *Informal* learning consists of all that is related to the work process itself, to the doing of the work. At all levels and sectors of the work new things are

learned that affect the work processes one way or another either directly or indirectly. Informal learning is often not noticed or realized. Therefore, it can be called tacit knowledge and know-how accumulation. Tacit knowledge and know-how have a central significance for the professional identity and they form a part of qualifications that cannot be taught. In addition to work experience, professional training is required. More *formal* learning can be acquired as updating, continuation and/or additional training (formal learning). *Non-formal learning* means learning that takes place outside the daily routines of the company.

Sarala (1993) proposes small-team activity as a means towards company-based learning. According to him, the efficiency of working life today is increasingly based on a smooth and innovative co-operation of the parties (e.g. projects) working together. The results are monitored in more detail, and this concerns the teams and individuals as well, not only whole organizations. Payment of wages, salaries and bonuses are often connected to results, calling for an increased need to develop one's own work. An operating system can only be efficient if its parts are efficient. This calls for co-operation, planning and realization of operation in teams, and furthermore, development of creativity and increase of efficiency. According to Sarala (1993), the company-based learning and learning organization has a structure, which is depicted in Figure 5.5.

To most authors it seems obvious that individuals play an important role in company-based learning. Our view, based on autopoietic epistemology and the HCM, stresses the great relevance of individuals and individual learning. This means that individuals are seen as important *agents of learning* (Cyert and March, 1963; Argyris and Schön, 1978; Hedberg, 1981; Shrivastava, 1983). For this reason, the relationship

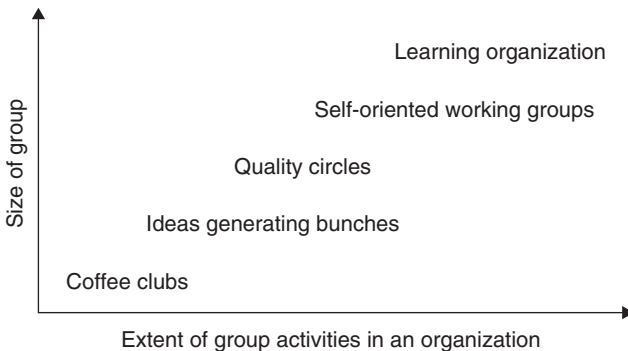


Figure 5.5 Construction of a learning organization

between individual learning and company-based learning has been discussed from early works on organizational learning, such as that of Argyris and Schön (1978) to more recent publications such as Vince (2001). Several answers to the question of how company-based learning relates to individual learning have been given.

A project-based company may exist independent of particular individuals, but it is important to understand that people working in projects need to acquire knowledge in the implementation of their tasks. However, according to autopoietic epistemology, interpretations of events, problems and solutions vary between individuals. This means that organizational interpretations (i.e. project teams' and project-based companies' interpretations) are made possible through the sharing of people's interpretations. With the help of this sharing, organizational interpretations can transcend the individual level of interpretations.

Thus, the operation of individuals and teams must become interlinked, and operational unity must develop as a company activity. Organizations are social communities that transfer models of thinking, activities and traditions from one generation to another. New and ever-better working methods and models of thinking should, according to Sarala (1988), be developed conscientiously in organizations.

In fact, the definition of individual learning is built on changes in cognitive structures, which are represented in the worldview, and on changes in behaviour. Translating this to company-based learning, changes in cognitive structures might be likened to changes in central common perceptions and values and changes in behaviour to changes in important routines. Therefore, as in the cases of individual and team learning the four aspects of the Lewinian learning model can be applied to the company's learning model (see Figure 5.6).

Two types of learning from different projects therefore might be surmised. On the one hand, there is learning about project management – i.e. the project-based company becomes more proficient at running

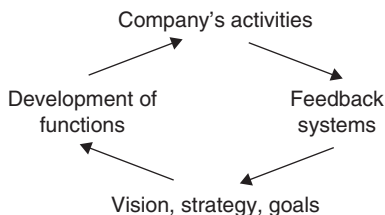


Figure 5.6 The company's learning model

projects. On the other hand, there is the learning to utilize the results from the output of projects. An example of the first type of learning could be that the company grows better at running product development projects, while an example of the second type might be that the company becomes more proficient at creating new products or product variations (Anell and Wilson, 2002).

A more recent ethno-methodology framework of company-based learning is based on the juxtaposition between *exploration* and *exploitation* (Crossan *et al.*, 1999; Bontis *et al.*, 2002). Renewal is based on organizations exploring and creating new knowledge at the same time, while exploiting the knowledge they already have. Furthermore, this framework considers knowledge creation at three levels: at the individual, team and company levels. This means that knowledge creation takes place at various levels – i.e. there is autopoietic knowledge creation at various organizational levels.

It is, however, important to note that the processes involved in company-based learning are somewhat different to those used in individual learning. Company-based learning is reflected in the company's culture, which consists of the values, meanings, symbols and beliefs of the company. Individual learning does not necessarily lead to company-based learning, but it is not possible to have organizational learning without individual learning (Love *et al.*, 2005a). This is simply because human individual is the only element that is capable of interpreting things and drawing conclusions. Human actors form meanings about culture – i.e. values, meanings, symbols, beliefs – and about all other objects in their situations, which are relevant in learning.

Cohen and Levinthal (1990) also emphasize that organizational learning is different from the sum of individual learning. Organizations represent patterns of interactions among individuals, especially through communication, and therefore learning in organizations to a large extent depends on the ability to share common understandings so as to exploit it (Daft and Weick, 1984). Organizational learning thus involves at least four phases: data acquisition, data distribution, data interpretation and knowledge storage in organizational memory, including knowledge retrieval (Huber, 1991). The link between individual and organizational learning is tied to the context of team learning (Crossan and Inkpen, 1992). The concept of individual learning is embedded in the context of team learning, which in turn is embedded in the concept of organizational learning.

In the opinion of von Krogh and Roos (1995), scaling up or down into different levels is a profound property of nature and, therefore,

possibility for autopoiesis. For example, according to these authors, an enlarged photograph is a scaled up version of the original in proportion to it. Because the knowledge is a product of the interpretation process that is continuously brought forth autopoietically on many levels, scaling up or down provides a means for better understanding knowledge creation and the linkage between individual and organizational knowledge in project-based companies. Moreover, 'a property of fractals is "self-similarity", which means invariance with respect to scaling' thus, 'self-similarity is about patterns, not at one scale or another, but across scales' (von Krogh and Roos, 1995: 79). Autopoietic learning does not take place on various levels in general, however, but similarly across levels – i.e. the learning takes place on different levels similarly, but, however, not identically (Figure 5.7).

Besides learning from the past experiences and establishing standard practices within the company, some companies have made conscious attempt to unlearn certain lessons learned from the past, and to engage themselves in a continuous process of 'creative destruction'. This process of 'unlearning' is said to prevent the development process becoming too rigid. In other words, the challenge is to avoid 'learning myopia' and retain some of the useful knowledge accumulated from the past, and at the same time throw away that part of knowledge that is no longer

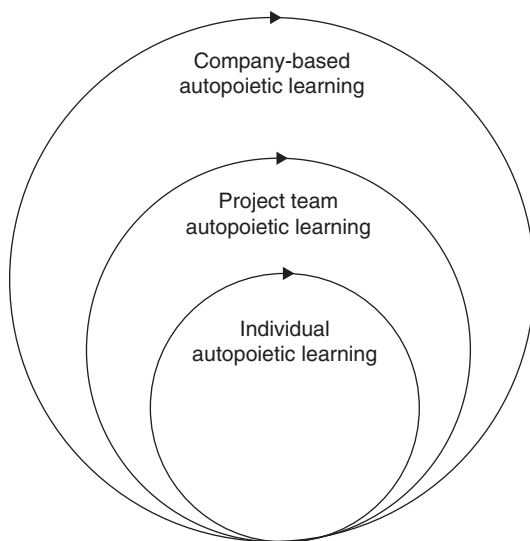


Figure 5.7 The three learning levels

applicable. However, according to autopoietic epistemology, unlearning is not possible. This is due to the fact that what an individual learns is influenced by what she knows and has learned before – i.e. what kind of meanings are stored in her worldview.

Action learning

Revans (1977) developed the notion of ‘action learning’ from observing managers and recognizing that their learning entails taking effective action rather than purely recommending or making an analysis of a given situation. He stresses the need to integrate cognition and action and theory and behaviour. This means that action learning is a process through which participants learn with and from each other, by mutual support, advice and questioning, as they work on real issues or practical problems while carrying real responsibilities in real conditions. It is a *social process*, carried out when participants cause each other to examine afresh ideas that they would otherwise have continued to take for granted. However, according to Flannes and Levin (2001), it is often hard to detach oneself from one’s own work product. However, reviews and inspections of work products can at least help improve the overall quality of the product. Furthermore, these authors suggest that the people – team members in a project work context – should stay open to the feedback of others, even when it may not be positive (see also Revans, 1982; Nonaka and Takeuchi, 1995; Allee, 1997; Sveiby, 1997).

For example, within the knowledge creation process between junior and senior project team members this means that the junior’s learning is not simply learning-by-doing or learning-by-using. This is because the junior does not only use the explicit knowledge that he has gained in formal education or in the work situation at hand, but in addition, also the senior’s tacit knowledge and social skills (cf. Koskinen and Vanharanta, 2000).

Von Krogh and Roos (1996a) argue that when the continuity of the performance of a task is interrupted by the appearance of a problem, people seek to interpret the task through their ‘current frame of reference’, which is a meaning structure in the worldview that directs a person’s observations and interpretations. When the performance of the task is perceived as problematic, the individual is not directly able to make sense of it with his current stock of knowledge. However, even if the problem is something outside the person’s previous experience, it may still be within the range of problems that his knowledge can address with the help of some outside guidance. In other words, a junior project team member

might not have earlier experienced the task he faces at the moment, but through interaction with a senior (i.e. in terms of action learning) he can acquire new knowledge that helps him to understand the task and make the necessary 'adjustments' in behaviour in accordance with the new interpretations.

When Mumford (1988) investigated what lay behind the cliché 'managers learn from experience' he found four key approaches. These approaches also apply well to project work:

- *The intuitive approach* involves learning from experience but not through a conscious process. The person using the intuitive approach claims that learning is an inevitable consequence of having experiences. If questioned, she is able to talk in detail about a variety of different experiences, describing what happened and what was achieved. The learning or developmental aspects are rarely, if ever, referred to. Someone using the intuitive approach finds it difficult and unnecessary to articulate what she has learned or how she has learned it. People are content that learning occurs as through some natural process of osmosis (cf. Sveiby, 1997).
- *The incidental approach* involves learning by chance from activities that jolt an individual into conducting a post-mortem. A variety of things can act as jolts but they commonly occur when something that is out of the ordinary crops up or where something has not gone according to plan. Mishaps and frustrations often provide the spur.
- *The retrospective approach* involves learning from experience by looking back over what happened and reaching conclusions about it. In common with the incidental approach, the retrospective approach is particularly provoked by mishaps and mistakes. In addition, however, people using this approach are more inclined to draw lessons from routine events and successes. They therefore extract learning from a diverse range of small and large, positive and negative, experiences.
- *The prospective approach* involves all the retrospective elements but also includes an additional dimension. Whereas retrospection concentrates on reviewing what happened after an experience, the prospective approach includes planning to learn before an experience takes place. Future events are seen not merely as things to be done that are important in their own right, but also as opportunities to learn.

To sum up, action learning is very effective method to transfer knowledge. Lectures and audio-visual presentations are examples of knowledge

transfer by explicit knowledge. Learning-by-doing and learning-by-using are an example of tacit knowledge transfer by action learning.

Organizational memory

Psychological research makes a distinction between learning and memory (e.g. Postman, 1976). Learning has more to do with acquisition, whereas memory has more to do with retention of whatever is acquired. In reality, however, separating these two processes is difficult because they are tightly interconnected. '[W]hat we already have in our memory affects what we learn and what we learn affects our memory' (Kim, 1998) (c.f. autopoietic epistemology). The concept of memory is commonly understood to be analogous to a storage device where everything we perceive and experience is filed away.

On an individual level, we defined memory above on the basis of the HCM as the worldview, into which all individual experiences accumulate in the form of different kinds of meanings. Parts of these meanings are unclear and some of them are lost on unconscious levels of the worldview. Organizational memory, then, relates the dialectics of planning, communicating, decision making and knowledge management in organizations. For example, Argyris and Schön (1978: 11) claim 'for organizational learning to occur, learning agents' discoveries, inventions, and evaluations must be imbedded in organizational memory'. Weick (1979) argues that organizations must accept and live with their memories because memory is an important co-producer of the personality of a company. Furthermore, Schatz (1991) generalizes these observations by suggesting that organizational memory provides knowledge that enables an organization to function effectively. This means that in order to carry out their work, project team members frequently need to learn things already known in other projects (i.e. they need to acquire and assimilate organizational memory). And this means, in turn, that the project team members draw both on the company's memory and contribute to it. The more effectively they carry out these actions, the more effective they are and the more effective their projects and companies will be (e.g. Lundin and Midler, 1998; Huber, 1999; Love *et al.*, 2005a).

The literature (e.g. Walsh and Ungson, 1991; Cross and Baird, 2000) mentions numerous different types of repositories (e.g. minds or worldviews of people and company databases) which form an organizational memory, and where organizational knowledge is maintained and into which newly acquired knowledge is deposited for later use by other people and teams of companies. Especially in an organic project work

environment the minds of project team members may play an important role in solving different problems. One form of organizational memory is the different routines and machinery that individuals meet when they move to new projects.

The knowledge connected with implementing of projects and running a business is partly explicit, and transferring it with the help of documents and computers is fairly easy. On the other hand, the transfer of tacit knowledge requires personal contacts and interaction. According to Davenport and Prusak (1998), it is generally felt that the more tacit knowledge there is in a company the more technology should be used in distributing that knowledge. However, only explicit knowledge can be stored in databases. In large companies efficient transfer of explicit knowledge is not possible without information technology. In any case, it is the values, norms and behaviours of individuals that finally determine how efficiently knowledge needed in projects is transferred.

Nevertheless, in many organizations, *distributed technology* is at the heart of organizational memory (e.g. Burt, 1987; Szulanski, 1996). Most initiatives have concentrated on identifying relevant data in various places of an organization in order to build a technical infrastructure to support the capture and dissemination of knowledge. Knowledge repositories often contain reports, memos and other work documents. Ideally, these technologies allow an organization to apply its collective intellect to any problem, regardless of time or geographic location. However, according to Cross and Baird (2000), databases only complement the personal networks of those seeking answers to problems. No matter how robust the search is functionally, a person's network of human relationships often determines which knowledge she can access. People usually take advantage of databases only when colleagues direct them to a specific point in the database. Rather than engaging in an extensive search through an organization's repository of knowledge, employees turn to friends and peers to learn where to find relevant knowledge.

In any case, in practice only seldom does a single person know enough to solve the complex problems in projects. In many projects knowing how to find and apply relevant knowledge efficiently is more practical than trying to master a large amount of knowledge. However, it is often assumed in projects that people turn to databases and procedure manuals to obtain data. In practice people often rely upon a network of relationships for knowledge and advice (cf. Rogers, 1995). Rather than turning to databases they seek knowledge from trusted and capable colleagues. According to Handy (1994), people are about five times more

likely to turn to friends or colleagues for answers than to other sources of knowledge. In short, *whom* you know significantly affects *what* you eventually know (Cross and Baird, 2000).

It should be understood that organizational memory is often more than the sum of individual worldviews. Part of what an individual knows is shared by other members of a project team and company. Like holograms, individuals maintain the values, norms and images of the organization (Stein, 1995). Mead (1962) likens these networks of minds to a 'social mind', and Smith (1982) refers to culture as a means to retain organizational memories through icons, symbols and stories, which are manifestations of a collective mind. However, it should also be understood that social systems are notoriously resistant to adopting new ideas and practices. Organizational memory is thus essential to organizational learning, while learning is a necessary condition for organizational memory.

In fact, the concept of archiving and using learning histories is already an old one in project-based companies. For example, in many companies it is considered good practice to create documents of what has been learned in a project. However, according to Conklin (2001), even in those companies in which this practice is normal routine, it is very difficult to find instances of the resulting document actually being referenced in the next project. In addition to this, some project teams have attempted to capture their learning by videotaping their meetings. However, these teams often end up with a staggering volume on tape. The important pieces of data they need later on are in there somewhere, but no one has time to watch to it all to find them.

These two examples in capturing organizational memory seems to give an impression that project-based companies cannot create a useful memory store just by capturing lots of data, but must somehow organize it in ways that create a coherent whole. These examples also give an idea that the creation and use of organizational memory cannot be a by-product, an extra bit of work hanging on the side of the organization's main production process (Conklin, 2001). Moreover, the people working for project-based companies do not necessarily have time to reflect, being bombarded by urgent problems and pressing deadlines (Jashapara, 2004). Therefore, the project-based companies should find ways of preserving the asset of knowledge they have to look within the practices of everyday teamwork.

In any case, in project-based companies knowledge management systems also need to be designed to collect, share and utilize knowledge

produced in projects. For project-created knowledge, Conroy and Soltan (1998) have defined three knowledge bases to include knowledge that is created and used in project implementation:

- The organization knowledge base, which includes the knowledge specific to the organizations and environments in which the projects are implemented
- The project management knowledge base, which includes the knowledge of the theory and application of project management
- The project-specific knowledge base, which includes the project-specific knowledge acquired within the project implementation.

The knowledge produced within the implementation of a project is especially project-specific knowledge. But, according to Conroy and Soltan (1998), the bases of organization and project management knowledge are also developed during project implementation. However, the new knowledge of all three knowledge bases is initially held only by project team members. Therefore, it is necessary to identify, capture, and make this knowledge available to the organizational memory of the company.

Conroy and Soltan (1998) divide project-created knowledge into three general categories:

- *Technical*, relating to the techniques, technologies, work-processes, costs, etc., involved in the production of the discipline-specific issues of the project; new knowledge needs to be fed back to the company's organizational memory
- *Project management*, relating to the methods and procedures for managing the implementation of projects; this knowledge should be available to all project managers working in the company
- *Project-related*, knowledge of customers and other things that are of value for the future business of the company.

Memory aids

Memory aids are devices or strategies that are deliberately used to enhance an individual's memory (Intons-Peterson and Fournier, 1986). Simple and ordinary as the memory aids may seem, they may play a major role in a project work context.

Memory aids may be classified into two different types (e.g. Harris, 1980, 1984):

- *Internal memory aids* involve reliance on an individual's internal memory or worldview as in the cases of mental rehearsing (i.e. mentally repeating to oneself what one wants to remember) and alphabetic searching (i.e. going through the alphabet one letter at a time to see if it sparks a memory).
- *External memory aids* involve the use of tangible, physical aids such as making lists (i.e. writing down on a piece of paper or in a calendar, address book, note book, etc., what an individual wants to remember), or putting an item in a special place where she will be sure to see it).

Internal aids thus roughly correspond to the variables that are often tested in laboratory research (Intons-Peterson and Fournier, 1986), whereas external aids corresponds to the techniques people – for example, project team members – claim to use as memory prompts in their work duties.

The characteristics of external memory aids suggest that they are likely to be used for the following conditions (cf. Intons-Peterson and Fournier, 1986):

- Situations with a long temporal interval separating learning and recall, as when an individual has solved a problem and struggles with the similar problem some years later; diary notes seem appropriate in this context
- Situations in which an individual's memory must override the potentially interfering events that often separate learning and recall; for example, remembering to send technical specifications on time
- When there is a high premium on highly accurate remembering or when internal aids are not trusted to yield accurate memory
- When the knowledge to be remembered is difficult, does not cohere readily, and so forth, and external aids are needed to preserve important aspects of it
- When memory load is to be avoided; this situation may occur when full attention must be allocated to other activities, and one does not wish to risk possible practice interference from knowledge that is being held in memory.

Thus, as said above, external memory aids may come in many forms – e.g. making notes in a meeting, entering an appointment in a calendar,

photographs, drawings, maps and the like (Intons-Peterson and Newsome, 1992). Asking someone else can also be used as an external memory aid. This means that external memory aids are used to retrieve memories from the past. The use of external memory aids to facilitate remembering in the future is also very common: people write notes in a diary. Some external memory aids are distinctly verbal in nature (e.g. reminder notes, calendar entries), others are more spatial (e.g. pictures, maps).

Indeed, remembering is not something people have to do forever, so they commonly rely on placing reminders in different places or on following their calendars (Meacham and Leiman, 1982). The repositories like these are not only used as an aid, they are often the central storage areas for large bodies of data that cannot be retrieved elsewhere. The scrawls an individual team member makes in a diary may become the only record of many solutions made in a project. When an individual team member is not able to reconstruct a problem solution without recourse to a diary, the diary often provides reminders. Through the creation of such personal notes, it is possible to make an individual less vulnerable to loss of knowledge about problem solutions.

Transactive memory

The performance of project teams can be improved by helping team members learn more about one another so that they can make better use of the team's human resources (cf. Moreland, 1999; Lindkvist and Söderlund, 2002; Lindkvist, 2005). Among these resources, the project-related knowledge of team members, often referred to as the team's *intellectual capital* or *knowledge assets*, is important. An analysis of how team members can share project-related knowledge with one another can be found in Wegner's work on transactive memory (Wegner, 1987, 1995).

Transactive memory is memory that is influenced by knowledge about the memory system of another person's worldview. Retrieving knowledge stored in another person's memory system, however, depends on transactions (i.e. communication) between individuals. Furthermore, a person's tacit or explicit decision to learn and remember new knowledge may be based on the expectation of such transactions. Thus, transactive memory develops as a function of a person's beliefs about the knowledge possessed by another person and about the accessibility of that knowledge. Transactive memory itself consists of meta-knowledge about what

another person knows, combined with the body of knowledge resulting from that understanding (cf. Lewis, 2003).

Stored knowledge is retrievable only when an individual knows what it is and where it is. In the search for a solution to a problem, for example, an individual team member may know what the problem is but not know the possible solution. To retrieve a solution for the problem she may need to look it up in the old documentation, ask other team members, or have a look at 'Yellow Pages' (i.e. directories containing data about staff, including their contact details, experience, interests, skills, etc.). The successful retrieval of the solution thus requires the prior knowledge of what the solution might be and where the solution might be. Knowing where the possible solution is to be found can be more important than merely knowing the solution.

Factors affecting learning and organizational memory development in a project work context

There are numerous factors that either advance or weaken learning and the development of organizational memories in a project work context. The following sub-sections describe some of them: Foresight, Hindsight, Error harvesting, Problem with success, Resistance to change, Creative tension and Absorptive capacity.

Foresight

Foresight is a systematic process for seeking out relevant knowledge and bringing it to bear on new projects (Bartholomew, 2002). It focuses on tacit knowledge because that is where most memory of previous lessons learned is stored. Especially importantly, the foresight process provides a forum for interaction between fresh and experienced minds that can be intensely creative. Furthermore, the foresight process is most worthwhile when a project presents unusual design, cost, time, or client relationship challenges, and when project members have more relevant experience than the design team (e.g. in an organic project work environment).

With the help of the foresight process a project team can reduce project risks. According to Kähkönen (2001), within the project risk management process 'risk knowledge' (e.g. databases, experiences, lessons learned) can be used to judge findings in project data scanning (Figure 5.8). Project data (e.g. plans, drawings, contracts, etc.), is scanned in order to identify risks. Within this process, 'risk knowledge' is the basic

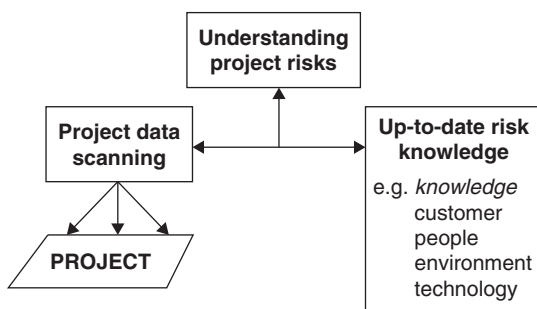


Figure 5.8 Risk knowledge in the project risk management process

Source: Adapted from the idea of Kähkönen (2001).

reference for project management that can explain the existence of risks in a project.

The basic message is that a project should never be initiated without sufficient preparation, but unclear project goals are an intrinsic element of project management. People have to accept that planned project goals can never be more than qualified guesses about the future. Hence, while the planned goals define the project's demarcations, its content has to be created through practical action. Through the practical actions of project implementation, expectations regarding future outcomes can be concretized. Experiences are gained from actions performed and time elapses and, therefore, future outcomes gradually get closer. At the end of the project, knowledge exists that was impossible to acquire at the beginning: *ex post*, we always know more than *ex ante* (cf. Engwall, 2002).

Hall and Andriani (1999, 2002) have suggested a 'tool' (Figure 5.9) that enables project managers to analyse the risks contained in the knowledge associated with a project. For example, some projects may require knowledge and know-how that is contained solely between the ears of one engineer (the left-hand lower part of Figure 5.9) or his worldview. Can this knowledge and know-how be obtained for the use of the project and, if it can, at what price? On the other hand, someone's knowledge and know-how may be in written form but still not available to the project (the left-hand upper part of Figure 5.9). The situation is perhaps easiest when the knowledge is published and can be bought (the right-hand upper part of Figure 5.9). However, even then the applicability of the knowledge may need tacit skills, as explained above.

To get the right mix of knowledge and competencies in the project is extremely important. Yet, it must be recognized that due to the

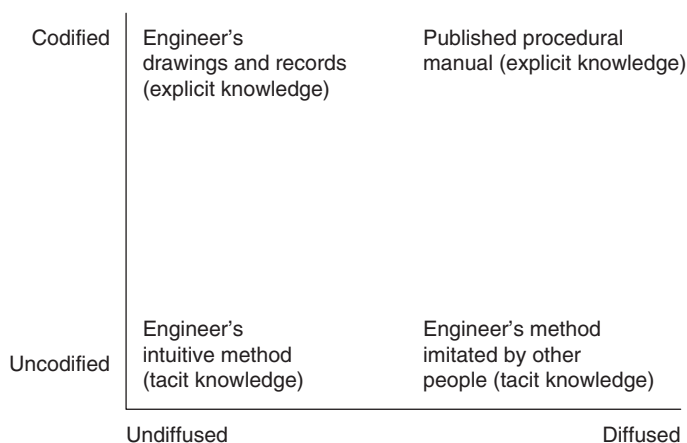


Figure 5.9 Assessment of knowledge quality within a project

Sources: Adapted from the ideas of Boisot (1983); Hall and Andriani (1999, 2002).

complexity of the problem solving processes involved, it is not possible to know this with precision *a priori*. Project managers have to 'guess', who should be able to contribute and how to get a broad enough mix, hoping that the team as a whole will manage the task challenge. In other words, it is an important thing to gather together all those people who can contribute. The potential project members usually have a reputation for professional competence, previous experience, ability to work with others, etc., acquired in earlier project engagements. Although project managers do not know in any great detail what kind of problems may appear during the project, they may have a good intuition as to what individual members and what mix of interacting members are needed – i.e. what sort of team is likely to be able to manage a given project task.

Foresight and knowledge-related risk management processes are especially needed within the *pre-implementation* phase of a project. These processes include organized means of identifying and measuring knowledge-related risks, and developing, selecting and managing the options for handling those risks. However, according to Frame (1995), project managers are not always very familiar with 'people issues', which means that the behaviours of project team members are not predictable. Knowledge-related risks are therefore also often difficult to predict and solve.

To gather the right mix of people possessing the appropriate competencies for the project is crucially important. However, in practice

it is often an impossible task, due to the fact that in many project-based companies, for financial and other reasons, there is not a wide base of experts available.

Hindsight

Learning through projects is one of the main ways by which project-based companies interact with, and are changed by their environment. Using knowledge gained from failures or successes that have occurred in projects is vital for the long-term competitiveness of the business (e.g. Schlichter, 2001; Williams *et al.*, 2005). Unless the experience gained in one project is transmitted to subsequent projects, learning may be dissipated and the same mistakes repeated.

According to Fong (2005), the value of looking back at completed work should be self-evident, and most design practices should intend to carry out post-project 'close-out' reviews. However, the common experience is that they rarely happen and, when they do, the reports are little read. Getting on with a new project seems to be more appealing than doing an unrewarding chore (e.g. Bartholomew, 2002). This is unfortunately a missed opportunity – potentially valuable lessons will be forgotten, not shared, or never learned. Experience in many industries has shown that a well-designed hindsight process can produce tangible increases in professional skills and process efficiencies while being personally rewarding for the participants as well.

The hindsight process systematically addresses any shortcomings by a conventional *close-out review*:

- Hindsight gathers the facts about what has happened by extracting the lessons learned and sharing the results. This process makes sure that each step receives due attention, helps to develop good habits of reflection and learning and keeps the purpose of each activity clear
- Hindsight is a group effort, involving the principal actors of the project and other collaborators such as clients and contractors. Experience shows that many valuable insights about the reasons for successes and difficulties come from juxtaposing multiple perspectives and understanding why they differ.

Hindsight is often based on semi-structured discussions in workshops – as in the classical 'after-action reviews' – but it can also be based on individual interviews, or a mixture of the two. Group discussions can be

productive with one speaker sparking ideas. It also helps to develop networks and provides social rewards. Individual interviews, on the other hand, can avoid the difficulties of gathering busy people together at one place and time. The interviews often allow abundant inputs from different participants, and can be particularly useful when there is a risk of strained relations inhibiting frank discussion (e.g. Bartholomew, 2002).

It is crucially important to realize that the project evaluation (e.g. hindsight) practices that encourage knowledge sharing and communication are important learning mechanisms, and have value in disseminating insights about a completed project throughout the company (Meredith and Mantel, 2000). Successful project outcomes are often related to the ability and willingness of project stakeholders to learn from each other within a single project, and across projects over time and space (DeFilippi, 2001; Bresnen *et al.*, 2003; Flyvbjerg *et al.*, 2003).

Error harvesting

We live in a culture where failures and mistakes are often not tolerated, leading to behaviours where people do not talk about them, dissociate themselves from them and never freely admit to such experiences. Yet failures and mistakes occur on a daily basis in organizations and they can be costly if there is no culture of 'error harvesting', where people tell about their mistakes and share their hard-won lessons with fellow colleagues. In project-based companies, this could prevent costly mistakes from recurring due to dominant 'blame cultures'.

When a project qualifies as a 'failure', little learning or no learning has taken place in relation to the decision making behind contemporary projects (Cicmil, 2005). For example, Flyvbjerg *et al.* (2003: 49) claim that 'the reason for the lack of learning is that projects and their ... impacts are rarely audited *ex post*, and without post-auditing learning is impossible'. Post-project reviews are effective in correcting errors in individuals' knowledge, especially their knowledge about other functions within the organization, or about other parties within the project coalition or specific groups of project stakeholders, and predicting how alternative practices would have turned out (Busby, 1999).

Failure allows organizations to learn through experimentation and to make adjustments from their mistakes (e.g. Fong, 2005). Major failures are to be avoided as they can lead to the ultimate demise of any company; however, modest failures can be tolerated to enhance the levels of risk taking and foster experimentation. Failure challenges traditional norms and promotes greater introspection and analysis of what went wrong. People tend to focus on the inconsistencies of the outcome and

draw attention to problems that may have been overlooked. This stimulates much greater experimentation with new strategies, procedures and processes. Such varied outcomes and resulting knowledge can lead organizations to be more adaptable to unexpected environments. Moderate levels of failure can thus lead to increased innovation and improve an organization's resilience to adapt to differing environments.

Successful forms of 'error harvesting' cultivated in projects should include project teams coming together on a regular basis and discussing problems, issues and collective appraisals about remedial measures and future actions.

Problem with success

Success tends to uphold the status quo and short-term stability as people are rewarded for their successes and follow their tried and tested ways. The danger is that success can lead to complacency, restricted search and attention, risk aversion and homogeneity (Sitkin, 1992). Success can lead to reduced motivation to change the company's ways as existing behaviours are reinforced. The tendency is towards risk-averse and conservative behaviours connected with decision making: managers want to guard themselves against the embarrassment and danger of undertaking risky options that may backfire. Companies prefer to pursue the traditional ways that have worked in the past and have led to their success. Given the nature of the dynamic external environments such 'play-it-safe' behaviours can provide reliable performance only in the short term.

It is clear that project-based companies can be weighed down by their history, their past experiences and the traditions laid down by their predecessors. But how far is history a driver for learning? Company-based learning from history may be restricted to small samples of experience in any given situation (March *et al.*, 1991). If a company's experience was successful in the past, that learning and behaviour may become embedded in its actions. If there are different perspectives and cultures in a company, this may lead to several different lessons being learned from the same experience and increasing a company's repertoire of interpretations.

Resistance to change

Resistance to change – or the thought of the implications of a change – is a common phenomenon. It is the action taken by individuals and teams

when they perceive a change that is proposed or is occurring as a threat. The threat need not be real or large for resistance to occur.

Resistance to change can take many forms, and it is often difficult to pinpoint the exact reasons. The forces against change in companies include: ignoring the needs and expectations of people; when people have insufficient knowledge about the nature of the change; or if they do not perceive the need for change. Fears may be expressed over such matters as employment levels and job security, deskilling of work, loss of job satisfaction, wage rate differentials, changes to social structures and working conditions, loss of individual control over work and greater management control.

Some common reasons for individual resistance to change within organizations (Mullins, 2007) include:

- *Selective perception* People's interpretation of stimuli present a unique picture or image of the 'real' world and can result in selective perception. This can lead to a biased view of a particular situation, which fits most comfortably into an individual's own perception of reality, and can cause resistance to change.
- *Habit* People tend to respond to situations in an established and accustomed manner. Habits may serve as a means of comfort and security, and as a guide for easy decision making. Proposed changes to habits, especially if the habits are well established and require little effort, may well be resisted. However, if there is a clearly perceived advantage – for example, a promotion to act as a project manager – there is likely to be less, if any, resistance to the change.
- *Inconvenience or loss of freedom* If the change is seen as likely to prove inconvenient, make life more difficult, reduce freedom of action, or result in increased control, there will be resistance.
- *Fear of the unknown* Changes that confront people with the unknown tend to cause anxiety or fear. Many major changes in a project and/or company present a degree of uncertainty – for example, the introduction of new methods of working. A person may resist promotion to act as a project manager because of uncertainty over changes in responsibilities or the increased social demands of the higher position.

Although project-based companies have to adapt to their environment, they tend to feel comfortable operating within the policies and procedures that have been formulated to deal with a range of present situations. To ensure operational effectiveness, they often set up defences against change and prefer to concentrate on the routine things they

perform well. Some of the main reasons for organizational resistance against change are:

- *Organizational culture* Recall that the culture of a company develops over time and may not be easy to change. The pervasive nature of culture in terms of 'how things are done around here' also has a significant effect on organizational processes and the behaviour of personnel. An ineffective culture may result in a lack of flexibility for, or acceptance of, change.
- *Maintaining stability* Companies, especially large-scale ones, pay much attention to maintaining stability and predictability. The need for formal organization structure and narrow definitions of assigned duties and responsibilities, established rules, procedures and methods of work, can result in resistance to change. The more mechanistic the structure, the less likely it is that the company will be responsive to change.
- *Past contracts or agreements* Companies enter into contracts or agreements with other parties, such as other companies, suppliers and customers. These contracts and agreements can limit changes in behaviour.
- *Threats to power or influence* Change may be seen as a threat to the power or influence of certain groups within the company, such as their control over decisions, resources, or knowledge. Where a group of people have, over a period of time, established what they perceive as their 'territorial rights', they are likely to resist change.

Thus, *path dependency* (Teece *et al.*, 1992) means that the earlier history of an individual can limit her future behaviour. 'Our experiences are not like water in a glass which can be emptied and then refilled' (Flöistad, 1993: 73): this means that a person's knowledge and know-how are often bound to a specific context and era and therefore they can be difficult to utilize in other times and situations. Path dependency also favours present technology (Steele, 1989) – people whose careers are associated with a given field always see continued opportunities for improvements. They are slow to accept that a field may be maturing, because that threatens their own feeling of self-worth. In other words, people whose lives are intertwined with existing technology resist suggestions that the field is maturing. This, in turn, means that the effective management of change must be based on a clear understanding of human behaviour at work. People are not detached from their work, but experience a range of emotional involvements through their membership of the organization,

and therefore they feel threatened and disoriented by the challenge of change. Emotions such as uncertainty, frustration, or fear are common reactions.

Change management is thus an important driving force in the learning organization. In rapidly changing situations the value of *directing, sharing the vision, leading people and facilitating learning* by all possible means is crucially important.

According to Elliot (1990), change is a complex, psychological event and therefore needs to be respected and managed. Managing change places emphasis on employee needs as the highest priority; change, however, impacts each person differently and therefore the management must accept the individual nature of change (Elliot, 1990). In a similar vein, Riches (2004) refers to the 'emotional stages' of change, and to the feeling of loss arising from unexpected and unwanted changes.

The management that is committed to a realistic perception of the need of a change has also to be committed to open dialogue without fear of retribution. While there are many characteristics of this type of management, the fundamental framework of creative tension described in the next sub-section is an essential factor.

Creative tension

In an organic project work environment, creative tension is the primary source from which individuals derive their power. One can compare creative tension to a bow and arrow. The bow is non-functional as a weapon until tension is applied. When the arrow is placed on the string and pulled, it increases the tension. The potential power of the weapon is then developed. Therefore, the power and effectiveness of the arrow lies in the tension exerted on the bow. Creative tension is not emotional tension or anxiety. It is the awareness of the gap between an individual's personal vision and her current reality. This gap can be a source of creative energy in the situation of change (Fritz, 1989; Senge, 1990).

There are three components of creative tension: *the vision, the current reality and the gap between them*. Identifying a clear vision of what an individual wants, and how that overlaps with an organization's (e.g. project's) vision is the first step. Vision must be clear enough that if the result occurred, one would recognize it (Fritz, 1989). However, it is also important to realize that it is difficult for many people to separate what they want from what they think is possible.

The second component of creative tension is a clear understanding of the reality of the current situation. This includes a disarmingly simple

and profound strategy: *telling the truth* (Senge, 1990). This means a relentless willingness to root out the ways individuals limit themselves from seeing what is the truth.

The gap between them is the comparison of the vision that has been formulated and the realistic perception of the current situation. According to Fritz (1989), this gap creates tension, and the most people have some level of tolerance for that tension. However, if an individual has intolerance of discrepancy, he will tend to resolve the tension in favour of continuing his present circumstances rather than working toward his vision. If the creative tension is perceived as real, there is adequate intrinsic motivation to reduce it.

Readiness for change has implications for the learning path selected (Balogun and Hailey, 2004). Readiness exists at two levels. The first is the extent to which individuals are aware of the need for change. The second is the amount of personal commitment there is towards changing individual skills, attitudes, behaviours, or work practices. Absorptive capacity (highlighted in the next sub-section) of both the company as a whole and its individual employees plays an important role in the selection of a changing and learning path.

Absorptive capacity

According to autopoietic epistemology, the premise of absorptive capacity is that the company, and the people working for it, need prior related knowledge to assimilate and use new knowledge. Research on memory development also suggests that accumulated prior knowledge increases both the ability to put new knowledge into memory, and the ability to recall and use it. Similarly, the HCM stresses that the prior knowledge in the worldview is a necessary condition for an individual to understand what is happening in situation and to acquire new knowledge.

With respect to the acquisition of knowledge, Bower and Hilgard (1981) suggest that memory development is self-reinforcing in that the more objects, patterns and concepts are stored in memory, the more readily is new knowledge about these constructs acquired and the happier is the individual in using them in new settings. The concept of self-reinforcing that may lead to the neglect of new knowledge provides insight into the difficulties that companies and individuals face when, for example, the technological basis of an industry changes. In other words, for a company a discontinuity in knowledge means either adaptation or extinction. If a company has all its resources committed to the existing knowledge, and does not possess the absorptive capacity to

develop the required new knowledge, it may find itself locked out of the market (Schilling, 1988).

Summary

There is a growing need in project-based companies and the projects within them, to move beyond solving the problems at hand to continuously improving knowledge and skills in the face of changing conditions and situations. Learning has emerged as the most important activity of the project-based company and, moreover, the ability of a company to learn faster than its competitors is the only sustainable form of competitive advantage. This chapter has explored concepts of learning and organizational memory development in a project work context. Some of the key claims and suggestions include the following:

- While in a functionally-based company, departments act as 'knowledge silos', the pure project-based firms lack the *organizational mechanisms* for the knowledge acquired in one project to be transferred and used by other projects.
- Two issues impair *organization-wide learning* in project-based firms: the unique and the temporary nature of projects. Projects differ from each other in several, critical aspects. They entail heterogeneous activities that may not easily be repeated in successive projects. Because projects exhibit one-off characteristics, the project-based company confronts the difficult task of 'learning from samples of one or fewer'. In addition, projects may be characterized by relatively long life cycles, requiring similar project activities to be retrieved and repeated after long time intervals.
- Compared with the systematic learning that takes place in functional organizations, the one-off and non-recurring nature of project activities provides little scope for *routinized learning* or *systematic repetition*. The problem with this perspective on project-based learning is that it equates project-based activities with non-routine behaviour. However, performance can be increased through exploitative learning because companies undertake 'similar' categories of projects in mature or new product markets, involving repeatable and predictable patterns of activities.
- The perception that projects perform only unique and non-routine tasks often conceals many potentially *transferable lessons*. Learning can occur at several different levels – e.g. individual, project and company levels. However, the project objectives are designed precisely to

be achieved by single-loop learning. This does not, however, mean that projects cannot develop their own momentum that can lead to the pursuit of new objectives. Nor does it mean that there is no possibility of learning within the parameters set for the project. Especially in an organic project work environment the intent is to create a practice field, a space where people feel comfortable practising learning without the fear of failure, a space where they can raise difficult issues; a place where they do not resort to defensive behaviour.

- The paradox of project-based learning is that while individual projects with shared vision and passion may offer an environment conducive to learning, they may also create strong barriers to the *continuity of learning beyond the project boundaries*. Project-based learning should relate to both short- and long-term company goals. Unless there is an explicit sense of purpose for the long run, project-based learning cannot be sustained.
- It is crucially important to understand that in project work, over time, people usually learn only a little about the other members' specialist areas and the 'interfaces' between their own specialty and neighbouring ones. This means that people are not able to develop a shared project-relevant knowledge base in any strong sense. What people learn is rather a matter of how to *interact with other specialists* in problem solving processes. Guided by their knowledge of what others are able to do, and how they approach various kinds of problems, they learn when and how they may contribute in the collective effort to bring about project goals.
- In project-based learning the explicit emphasis should be not only on the specific task at hand but also on *long-term investments in people*. For continuous improvement in project performance, a delicate balance between task and people needs to be maintained. However, most project managers are, unfortunately, focused on short-term results and the task at hand. This means that they are solely evaluated on their short-term performance (i.e. performing within time and budget constraints); this makes the investment required for learning and reflection a very low priority.
- Nevertheless, in project-based companies the autopoietic learning does not only take place on various levels in general (i.e. individual, team, and company) but similarly across levels (i.e. the learning takes place on different organizational levels similarly but, however, not identically). Moreover, on the basis of autopoietic epistemology, it is possible to conclude that the statement that knowledge is lost when particular people leave the company, is not completely true,

even if they carry out with them important tacit knowledge in their worldviews. This is because what people know is influenced by what they knew, and what people will know in future depends on what people know now. '[E]verything said is said from a tradition' (Varela, 1979: 268): in other words, although people leave projects and/or the company, part of the knowledge they have created while working on projects has become by communication the knowledge of other people and/or projects and the company (i.e. other autopoietic systems). This knowledge manifests itself as *different repositories* such as stories, products, documents, company features, etc.

- A project-based company may exist independent of particular individuals, but it should be recognized that people working for the organization need to acquire knowledge in the execution of their tasks. This means that individuals' cognitive activities play an important role in organizations' acquisitions of knowledge from their memories. However, interpretations of events, problems and solutions vary with individuals. This means that the organizational interpretations are made possible through the sharing of people's interpretations. With the help of this sharing, the *organizational interpretations can transcend the individual level*.

There are at least two important features that are useful for building organizational memory:

- Time spent interacting on work tasks establishes a sense of *reciprocity* and *trust* among colleagues. This social capital encourages employees to turn to colleagues to get useful assistance or advice about future initiatives
- Working closely together, colleagues can build an understanding of each person's particular knowledge and skills. This understanding allows employees to seek out the *right peers* for knowledge in the future.

It is important to realize that individual projects do not have 'organization memory' in the same sense and to the same extent as companies have. This is because they are temporary arrangements. In comparison with companies, which are supported by structure and routines to absorb knowledge, projects do not support similar knowledge storing mechanisms. However, individual projects do have organizational memories, but in only a limited fashion. The human memory or worldview seems to be very important as well – perhaps the most important

aspect – as it contains tacit knowledge, even if it is also rather unreliable because of human subjectivity and the natural tendency to forget details of knowledge.

The organizational memories of project-based companies are autopoietically produced and reproduced by team members. This paves the way for conceptualising the project-based company so that an individual project team member can learn (i.e. produce new knowledge) similar to the way a project team learns (i.e. produces new knowledge), which is again similar to the way a project-based company learns (i.e. produces new knowledge).

Finding viable ways in which project-based companies can ensure that knowledge is produced and communicated across project boundaries and up and down the organizational levels, is a very important issue. Autopoietic epistemology provides a lens through which we may advance our understanding of the dynamics of project-based companies' organizational knowledge and memory, both individualized and socialized.

6

Knowledge Sharing and Methods of Knowledge Sharing

Dependence on others

Many projects are often dependent on knowledge that is not in their possession (cf. Jones and Smith, 1997). Studies on project management have also demonstrated a lack of learning in projects (Ekstedt *et al.*, 1999) that can be connected to decoupling and separation. The ambition to decouple one project from others can contribute to the difficulty of sharing knowledge and competencies developed elsewhere (Bengtsson and Eriksson, 2002). In any case, knowing what others know is a necessary component for co-ordinated action to take place (e.g. Clark, 1985; Krauss and Fussell, 1991). Individuals working for a project communicate with each other by a number of different means – such as face-to-face conversation, telephone, electronic mail, snail mail, etc. (e.g. Koskinen, 2003; Koskinen *et al.*, 2003; Koskinen, 2004). The effects on problem solving, decision making and better understanding of technical issues are perceived as the most valuable effects of knowledge sharing.

Basically, knowledge sharing between individuals requires that the team members who share knowledge are located in each another's situations – i.e. they act as components in each others' situations. In this way, they form a network that consists of each member's situationality, consciousness and corporeality. In these interlinked 'situational circuits' knowledge moves from one member's consciousness to another member's consciousness. This knowledge transfer is complicated and problematic, because every member's subjective worldview and individual situationality influences the process.

On an organizational level, knowledge sharing mechanisms involve the establishment of particular structures and policies that are designed to facilitate the free exchange of knowledge (e.g. Pinto and Nedovic-Budic, 2002). For example, the structure of a project team and/or a

project-based company should be defined by specifying the roles, obligations, rights, procedures, knowledge flow and computational methods used in the team and/or the company (Kumar and van Dissel, 1996). Proper structure reduces ambiguity by formalizing the form, process and content of the relationships among the stakeholders. Meredith (1995) postulates that unambiguous structures (as are often the case in mechanical project work environments) lead to less resistance to knowledge sharing. Brown *et al.* (1998) acknowledge that ambiguous structures (as are often the case in organic project work environments) are an impediment, but did not find evidence that the converse was true: that is, that unambiguous structures necessarily secure positive outcomes.

In the opinion of many authors (e.g. DeFilippi and Arthur, 1998; Gann and Salter, 2000; Prencipe and Tell, 2001; Keegan and Turner, 2002), the problems of knowledge sharing are acute in project-based companies. According to Hall and Sapsed (2005), managers of many project-based companies have tried to solve knowledge management issues by converting tacit knowledge into explicit knowledge available through an intranet, but with limited success. Furthermore, according to Blackler (1995), Dutta (1997) and McDermott (1998), many companies have found that the codification of good practice and lessons learned is incomplete (see also Swan *et al.*, 1999). This seems to mean that the problem of applying of knowledge produced in one project to other projects has more to do with the knowledge embodied in individuals' subjective worldview than the disembodied knowledge found in expert systems or intranets (Cook and Brown, 1999). This means, in turn, that knowledge creation is much easier when the same project teams are reassembled for subsequent projects (Bartezzaghi *et al.*, 1997; Dixon, 2000): their situations have more common components than in the case of a quite new project team. But in many ways, however, it is just technology that has made knowledge sharing a reality in many situations. In the past it was impossible to share knowledge or work collaboratively with co-workers around the globe, but today technology has made it possible to enlarge a common situationality far beyond geographical borders. This seems to mean that those people who work in organic project work environments must obviously focus on human interaction, but must also be supported by an effective *technological infrastructure*.

Basics of knowledge sharing

As said above, according to autopoietic epistemology knowledge cannot be directly transferred from one individual to another. This is because

the message (i.e. perturbation or trigger) delivered by an individual has to be interpreted by the receiver before its becoming knowledge of the receiver. In other words, the knowledge sharing means *indirect transfer of knowledge between the worldviews of individuals*, and to be genuinely transferred, knowledge must be understood in the consciousness of the receiving party (Carr and Pihlanto 1998; Pihlanto, 2000, 2002, 2005a, 2005b; Koskinen and Pihlanto, 2006). In accordance with autopoietic epistemology, these personal worldviews are derived from the individuals' previous experiences – i.e. previous understanding – which is stored in their worldviews in the form of meanings. This previous understanding is acquired from their social and cultural environments or situations, and it is partly forged by the individuals' own awareness and efforts; it contains presuppositions and assumptions that the individuals have developed in the past. These worldviews are not something about which the individuals can readily give a comprehensive account, and part of the contents of an individual's worldview is even totally unconscious, but can still influence her behaviour.

Worldviews include all kinds of knowledge, including explicit and tacit knowledge. In accordance with autopoietic epistemology, the worldviews provide the context with the help of which an individual views and interprets new material, and these worldviews determine how stored knowledge is relevant to a given situation. They represent more than a collection of ideas, memories, and experiences. Kim (1993) uses colourful – although mechanical – metaphors in saying that worldviews are like the source code of a computer's operating system, the manager and arbiter of acquiring, retaining, using and deleting new knowledge. But they are much more than that because they are also like the programmer of that source code with the know-how (*tacit knowledge*) to design a different code as well as the know-why (*explicit knowledge*) to choose one code over another.

According to Senge (1990), new insights often fail to get put into practice because they conflict with deeply held internal images located in worldviews dealing with how the world works. These images limit people to familiar ways of thinking and acting. Developing an organization's capacity to work with people's worldviews involves both learning new skills and implementing the institutional innovations that help to bring these skills into regular practice:

- The organization must bring key assumptions about important business issues to the surface. Those assumptions, if unexamined, limit an organization's range of actions to what is familiar and comfortable

- The organization must develop the face-to-face learning skills. This is of special concern when an enterprise wants to be skilful with worldviews.

Everyone continuously develops their worldview – it is a natural part of human life and a natural consequence of experience acquired during a lifetime. In an organic engineering project, for example, which is, to a large extent, about the creation and combining of knowledge, the participants share their explicit and tacit knowledge with others and at the same time both parties' personal worldview develops 'automatically'.

What an individual project team member brings to the knowledge sharing situation has an important influence on what he can learn from another individual. This means that an individual's personal worldview profoundly influences the way by which he experiences the situation at hand. '[A]lthough it is the individual who learns, this individual is one who has a language, a culture, and a history' (Usher, 1989: 32) – all this is stored in his worldview. A project team member's personal worldview affects, for example, how he commits to the task at hand. Although he can in the first place understand about the knowledge shared. People always learn in relation to the experiences stored in their worldview, or what they have learned before.

Badaracco (1991) claims that a human being cannot take advantage of new knowledge unless he has earlier 'social software' connected to that knowledge. Cohen and Levinthal (1990), who introduced the 'absorptive capacity' concept, claim that an individual's capability to utilize new knowledge in problem-solving purposes depends largely on his earlier knowledge. The chances that a technology company will be successful in an engineering project, for example, can be dependent on the staff's experience of similar projects (cf. Koskinen, 2000). This means that when people, in the context of a technology-intensive project, attempt to solve their problems, they are guided by the knowledge (content of their worldviews) they have gained from earlier similar problems (see also Szulanski, 2003).

An expert functions intuitively on the basis of a worldview that is derived from her previous experience. A worldview is founded, among other things, on a deep understanding of explicit knowledge. The elements of knowledge that form a store of knowledge for the expert are so internalized, and have been thought about so often from so many perspectives that the expert is no longer able to return them into individual detail. For example, experienced designers have rich intuitions about

complex systems that they cannot explain. Their intuition, which wells forth from their worldview, tells them that cause and effect are not simply in a reason–consequence dependency relationship and that obvious solutions will produce more harm than good and, further, that short-term fixes will produce long-term problems. But they cannot explain their ideas in simple linear cause–effect language. They end up saying, ‘Just do it this way. It will work.’ An experienced automation designer may, when dimensioning a process valve, come to a different solution from the one given in the manual. However, he may not be able to explain clearly why his solution is correct and functional and why the solution presented in the manual is incorrect.

The fact that knowledge and know-how based on experience can be utilised in the engineering of sophisticated technology products is also supported by the findings of cognitive psychology research (cf. Ross, 1989). The results of these studies provide evidence for the important role of specific, previously experienced situations in the engineering of such products. Anderson (1983) indicates how people use some earlier situation as a model when they are solving a specific problem. All the above evidence proves how decisive is the role of the worldview of every person involved in a project, even if the literature cited above does not take on board this notion.

Many people in an organization have highly personal knowledge of how to accomplish particular specialised tasks (Badaracco, 1991). The work of Antonio Stradivari, the master violinist of the eighteenth century, vividly illustrates this sort of knowledge. One authority on the violin has written that ‘at the age of 50 he had perfected the Stradivarius model, and no living man, although thousands of attempts have been made, has been able to produce an instrument so faultless as a Stradivarius of this period. Admirable copies have been made perfect up to the smallest detail, but the soul is always missing’ (Bachmann, 1925: 42).

Indeed, engineering blueprints, and symbolic design records more generally, do not contain an exhaustive account of the methods involved in the actual exercise of a productive capability. Blueprints are often quite gross descriptions of what to do, and seldom define the detailed job breakdown, much less provide ‘how-to-do-it’ instructions at the job level (cf. Nelson and Winter, 1982). In the early years of the automobile industry workers depended upon the simple, often primitive, machine-powered, automatic, precision machines that became common after the

1920s and 1930s. They had to know how to set up their machines, maintain them and manage their erratic operations. They needed a 'feel' for their work (Gartman, 1986).

To sum up, all knowledge in a project is within the worldviews of its team members. In the use of knowledge in a project, what is critically important, is thus how well the worldviews of the personnel are known within the project. Although people do not always behave congruently with what they say, they do behave congruently with their worldviews. From this it follows that intuitive problem solving is not based on linear cause-consequence thinking. A person's intuitive skills are dependent on context – i.e. the situation at hand – and they can be only roughly evaluated by looking at his or her experience base.

Furthermore, it is important to understand that the worldviews of the personnel within a project can be both helpful and harmful in their various functions. The benefit/harm of the personnel's worldviews is always dependent on the context or situation – i.e. their impact on a project varies.

Intuition

Intuition is the immediate apprehension of an object by the mind without the intervention of any reasoning process. An individual who has an intuitive basis for an opinion probably cannot immediately fully explain why he holds that view. However, an individual may later rationalize an intuition by developing a chain of logic to demonstrate more structurally why the intuition is valid. In popular understanding, intuition is one source of common sense, and it may also help inductive thinking to gain empirical knowledge.

Reber (1989) says that knowledge acquisition in its different forms represents the epistemic core of intuition. Intuition is, according to Reber, a perfectly normal and common mental state and/or process that is the end-product of knowledge acquisition. In other words, intuition is a cognitive state that emerges under specifiable situations, and it operates to assist an individual to make choices and engage in particular classes of action. 'To have an intuitive sense of what is right and proper, to have a vague feeling of the goal of an extended process of thought, to 'get the point' without really being able to verbalize what it is that one has gotten, is to have gone through an implicit learning experience and have built up the requisite representative knowledge base to allow for such judgement'. Hall and Andriani (2002) describe intuition as a 'second

nature' that derives from the internalization of explicit knowledge (e.g. learning-by-doing and/or learning-by-using).

According to the HCM, intuition is a type of meanings in an individual's worldview (Rauhala 1995; see also Pihlanto 1996). Three kinds of human intuition can be defined:

- Intuition as immediate and obvious knowledge
- Intuition as a preparatory phase for knowledge
- Intuition as a paranormal skill.

The first kind of intuition is a question of knowing, which is by nature immediate and which is based more on sensory perceptions than on analytical thought. This kind of intuition is clearly something like tacit knowledge, brought about by the long experience of the team member.

The second kind of intuition is said to be a processing type of creative activity which prepares the way for a more conscious kind of knowledge that appears later in the worldview of the team member.

The third kind of intuition is not significant in a project work context.

Language

'We human beings are human beings only in language. Because we have language, there is no limit to what we can describe, imagine, and relate. It thus permeates our whole ontology as individuals: from walking to attitudes to politics' (Maturana and Varela, 1992: 212).

Drucker (1954) was among the first to point out the relevance of language in management: 'Managers have to learn to know language, to understand what words are and what they mean. Perhaps most important, they have to acquire respect for language as our most precious gift and heritage. The manager must understand the meaning of the old definition of rhetoric as the "art which draws men's hearts to the love of true knowledge." ' In the opinion of Duncan and Weiss (1979: 91) 'frameworks exist within organizations and are to a large extent particular to a specific organization. That is, a given organization is characterized by a paradigm that is shared by organizational members in their socialization. Indeed, an organizational member must learn the system of concepts used within the organization if he or she is able to communicate and understand the actions they are to take and the actions taken by others.'

Pondy and Mitroff (1979) treat language as a kind of technology for processing data (i.e. perturbations or triggers) and meaning – and, as is the case with any production technology, language will also determine

what inputs will be accepted and what transformations will be permitted. Pondy and Mitroff (1979) identify four distinct roles for language in organizational behaviour:

- *Control of perception* Those events for which language expressions do not exist tend to be filtered out of consciousness
- *Attribution of meaning* By categorizing streams of events, language gives meaning to our experiences
- *Facilitation of communication* Old and new meanings can be communicated better
- *Provision of a channel of social influence* Language is essential in the organization's power games.

The first of these (1979) four statements is, however, somewhat limited, because those expressions for which there is no language expression may still be located in an individual's worldview and also influence her behaviour. Of course, the most important meanings are usually those that can be clearly expressed.

Language does not passively mirror the world, rather speech is a practical act that shapes and negotiates meanings (Blackler *et al.*, 1998). This means, for example, that project team members operate within interpretative or discourse communities. The term 'project manager' makes sense only within the members of a project team, who understand the deep meaning of it.

Metaphors

Externalizing tacit knowledge into explicit knowledge means finding a way to express the inexpressible. One of the means to do so is the use of figurative language and symbolism. One kind of figurative language that is especially important is metaphor (e.g. Tsoukas, 1991). Using a metaphor is a distinctive method of perception. It is a way for individuals grounded in different contexts and with different experiences to understand something intuitively through the use of imagination and symbols without the need for analysis or generalization. Metaphors are special kind of meanings in a person's worldview. Through metaphors, people combine what they know in new ways and begin to express what they know but cannot yet say. As such, a metaphor is highly effective in fostering direct commitment to the creative process in the early stages of knowledge creation.

A metaphor can merge two or more different and distant areas of experience into a single, inclusive image or symbol, what Black (1962: 38) has

aptly described as 'two ideas in one phrase'. By establishing a connection between different things that seem only distantly related, metaphors set up a discrepancy or conflict.

Analogy

Nonaka (1994b) writes that while metaphor triggers the knowledge creation process, it alone is not enough to complete it. The next step is analogy. Whereas metaphor is mostly driven by intuition and links images that at first glance seem remote from each other, analogy is a more structured process of reconciling contradictions and making distinctions. By clarifying how the ideas in one phrase actually are alike and not alike, the contradictions incorporated in the metaphors are harmonized by analogy. In this respect, analogy is an intermediate step between pure imagination and logical thinking.

Once metaphors have provoked new ideas, analogies between one thing and another can then be used to find a resolution of the contradictions that have provoked people into thinking new things. Analogy is a structured process of reconciling opposites and making distinctions, clarifying how the opposing ideas are actually alike or not alike (Stacey, 1996). Nonaka and Takeuchi (1995) recount the story of Canon's development of the mini-copier. To ensure reliability, the developers proposed to make the copier drum disposable because the drum usually accounted for 90 per cent of maintenance problems. Team members were discussing, over a beer, the problem of how to make the drum easily and cheaply, when the team leader held up his beer can and asked how much it cost to make one. This led the team to examine the process of making cans to see if it could be applied to the manufacture of photocopier drums. Models are then used to actually resolve the contradiction and crystallise the new knowledge.

To sum up, closely operating organizations, as project teams often are, use language and expressions that are difficult to understand by outsiders. The outsiders do not have such metaphors, analogies and other special meaning structures in their worldviews. They are like foreigners, who do not understand all the words the natives use. At the start of a new project all team members may not understand all the terms used in the interactions within the project team.

Media

In daily practice, knowledge is acquired and shared through symbols with an efficiency that will vary depending on the characteristics of the

communication channels used for such sharing. According to Boisot (1983), the process of codifying a message for sharing involves a loss of knowledge that can be recovered only in situations where the receiver associates the same cluster of meaning (i.e. there are similar parts in their worldviews) with the symbols chosen as does the sender. Therefore the sharing of knowledge, which may give rise to uncertain or ambiguous interpretations (e.g. tacit knowledge), requires either the simultaneous activation of several channels of communication, in order to minimize the loss of knowledge caused by the use of a single channel, or a prior sharing of experiences out of which emerges a convention that reduces uncertainty for the use of certain symbols (Shannon and Weaver, 1949).

An instance of the first type of communication would be the transmission of behaviour patterns by, for example, sight and touch, which are used together to convey a message, as when a music master demonstrates the application of a skill to his pupils (Boisot, 1983). An example of the second type would be the use of the cross by Christians to convey an intangible cluster of meanings to one another that mix values, norms and expectations in inexplicable ways (Boisot, 1983).

According to Bengtsson and Eriksson (2002), projects must be linked to their context and such links develop if there is a flow of knowledge into and out of these projects. The flow can be characterized by both 'leakiness' and 'stickiness' (cf. Brown and Duguid, 1991; Szulanski, 1996). Some projects require an easy flow – i.e. leakiness – of relevant knowledge into them. Stickiness is the opposite of leakiness and refers to mechanisms that hinder the flow; if stickiness hinders the knowledge flow among the stakeholders of a project, it is negative for this project.

The leakiness and stickiness in different projects is related to the type of knowledge that is utilized (Bengtsson and Eriksson, 2002). Szulanski (1996) describes difficulties of transferring tacit knowledge as the stickiness of knowledge. Hansen (1999) distinguishes between simple and complex knowledge, and argues that simple knowledge (e.g. explicit knowledge) can be transferred in relationships with weak ties, as this type of knowledge is more leaky, whereas complex knowledge (e.g. tacit knowledge) must be transferred in relationships with strong ties, as it is stickier.

The richness of a communication medium can be analysed in terms of two underlying dimensions: the variety of cues the medium can convey and the rapidity of feedback the medium can provide (Berger and Luckman, 1966; Daft and Lengel, 1984; Trevino *et al.*, 1987). That is to say, media have varying capacities for resolving ambiguity, meeting interpretation needs and sharing knowledge, and they can be placed along

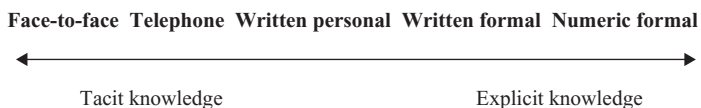


Figure 6.1 Media richness vs. knowledge communicability

a five-step continuum: (1) face-to-face, (2) telephone, (3) written personal, (4) written formal and (5) numeric formal (Daft and Lengel, 1984) (Figure 6.1).

Trevino *et al.* (1987) suggest that there exists a link between the selection of media and the ambiguity of the message to be conveyed. In situations characterized by a high degree of ambiguity, no established scripts or symbols are available to guide behaviour. 'Meaning must be created and negotiated as individuals look to others for cues and feedback to help interpret the message' (Trevino *et al.*, 1987: 557). Berger and Luckman (1966) argue that most experience of others takes place in face-to-face situations because the other person's subjectivity is available through a 'maximum of symptoms' – the here-and-now of each individual continuously impinges on the other, both consciously and subconsciously, as long as the face-to-face situation continues. The authors further argue that misinterpretation is less likely in face-to-face interactions than in less close media.

The knowledge utilization taking place in a project work context is not only about the processing of objective data but also requires that the subjective views, intuitions and inklings of the individual team members are presented, tested and taken into use. This is especially the case in an organic project work environment. These subjective views are largely shared through informal face-to-face interaction.

Imitation

Tacit knowledge is imperfectly imitative knowledge, which cannot be possessed by competitors since the exact content of the knowledge is unknown to both the owner and the potential imitator. According to Barney (1991), the reasons for such lack of imitativeness frequently lie in (1) the unique historical condition of the knowledge's development, (2) the ambiguity around the knowledge and (3) the social complexity of the knowledge. Once organizational knowledge is distributed throughout the organization and when it is difficult to localise, it frequently fulfils this criterion.

Knowledge is transferred (according to autopoietic epistemology, only indirectly) quite well when the recipient participates in the process.

Typically transfer of know-how by imitation happens when, for example, craftsmen transfer their skills through master–apprentice relationships. The master shows how the things are done, the apprentice tries to imitate them, and the master judges their efforts.

Because tacit knowledge is bound to the senses, to personal experience and to bodily movement, it cannot be easily passed on to others. Transferring tacit skill requires close physical proximity while the work is being done. Von Krogh *et al.* (2000) suggest five ways to share tacit knowledge in a project implementation context:

- *Direct observation* The team members observe the task at hand and the skills of others in solving this task, as in a master–apprentice relationship. Observers come to share beliefs about which actions work and which do not. They thereby update their worldviews and skills, and thus increase their potential to act in similar situations.
- *Direct observation and narration* The team members observe the task at hand and get additional explanations from other members about the process of solving the task, often in the form of a narrative about similar incidents or a metaphor. The beliefs of the observers are further shaped by these stories.
- *Imitation* The team members attempt to imitate a task based on direct observation of others.
- *Experimentation and comparison* The team members try out various solutions and then observe an expert at work, comparing their own performance with the expert's.
- *Joint execution* The team members try to solve the task together, and the more experienced offer small hints and ideas about how to improve the performance of the less experienced (i.e. action learning).

Sveiby (1997: 44) argues that if the objective is to enhance competence, knowledge transfer via explicit knowledge is not a reliable method. 'One needs more osmotic methods that resemble the traditional passing down of knowledge from master to apprentice.'

Imitation is thus an advanced behaviour whereby, for example, project team members observe and replicate the best practice of the other project teams.

Boundary brokering

The competencies needed in a project implementation are sometimes assumed to be apportioned among individuals in accordance with the 'work breakdown structure'. In other words, the sum of the individual's

competencies is equal to the total required and that there is little or no overlap. A project might require three different competencies, and thus it is possible to imagine one in which three experts independently performs each of these duties without any interaction with each other. However, in a project work context this pattern of competence distribution is not only very rare, it is impossible (cf. Hutchins, 1996).

At the other end of the competence distribution spectrum one can imagine a project in which everyone possesses all the competencies needed for the performance of all the duties of the project. This is also a rare pattern, because it is expensive. Splitting the project into co-ordinated fragments of competencies permits relatively poorly skilled people to contribute to project implementation. In practice, a typical situation is that in which people in one domain also know something about the other domains (cf. Hutchins, 1996).

In order for project implementation to be efficient and effective, it should take place without boundaries, involving multiple competencies and project team members. However, this is not always the reality. People tend to build up their own boundaries, practices, values and codes of conduct, often creating overly specialist terminology so that others cannot participate in what they do. In other words, identity hinges on difference: establishing these identities reinforces the boundaries between competencies within a project team. Such hermeneutically sealed boundaries can prevent learning from being transferred from one project to another. According to Sahlin-Andersson (2002), this may cause particular problems in project-based companies where there is a concern that experience gained in one project should be applied in others in the future. Projects should thus not be too isolated or delimited from each other.

Sometimes the boundaries between different fields are manifested with explicit markers – such as titles, dress, membership in professional groups, etc. However, an absence of obvious markers does not imply an absence of boundaries. The status of an ‘outsider’ can be shown in subtle ways without a manifestation of the boundary itself. The nuances and the jargon of a professional group distinguish the inside from the outside as much as do concrete walls. A ‘glass wall’ is sometimes more impenetrable in practice than any official policy or entrance requirement (cf. Wenger, 1998).

In a project work context the team members try to relate to one another in order to produce shared understanding – i.e. they are enmeshed in collectively produced ‘webs of meaning’ (Geertz, 1973) that enable the efficient use of individual competences. This means

that the reproduction of a common understanding is supported by a mutual exchange of ideas and opinions between individual project team members (e.g. Demsetz, 1991). This reproduction can be supported by a boundary broker, who networks fields of competencies and brokers contacts between experts in the different fields needed to realize project deliveries (e.g. Probst *et al.*, 1998). In other words, a boundary broker is a person who is responsible for the development of an interdisciplinary network of relationships and is thus a contact person for the brokering of contacts within a project.

According to Ancona and Caldwell (1992), the project teams that engage in boundary brokering are perceived to be more effective and are more likely to achieve their goals. This means that the connections provided by a boundary broker (some authors like Leonard-Barton, 1995 and Cross and Prusak, 2002 use the term 'boundary spanner'), introduce elements of one competence domain into another. And this means, in turn, that the ability of a project team member to act as a boundary broker is partly based on his or her perception of the extent and quality of existing boundaries. The better a team member understands the nature of existing boundaries, the better she can take actions that will help her to overcome them.

However, in a project work context the brokering of boundaries is sometimes a complex job, involving processes of interpretation, co-ordination and alignment. It also requires enough legitimacy to influence the development of project implementation and address conflicting interests. The individuals who act as boundary brokers must have the ability to link competencies by facilitating transactions between them (cf. Wenger, 1998). This ability is often based upon a boundary broker's caring attitude, a concept which is discussed later in this chapter. Moreover, a boundary broker can be an expert of one competence domain but is not an expert in all the fields germane to a project. Therefore she is more in the role of knowledge broker than knowledge expert and needs strong behavioural and interpersonal skills. In particular, the boundary broker must be an active communicator, an active listener and be able to capitalize informal communication channels. In other words, the role of boundary broker is played well by an individual who enjoys interpersonal contacts and has a good sense of existing and emerging problems. Such a boundary broker is critical to project team effectiveness since she can serve to make available up-to-date information.

In order to understand different aspects of a project, a boundary broker must also be able to grasp its technical aspects. In low-technology

environments, understanding can be developed through experience; in high-technology projects, qualifications are more rigorous, usually including a career in a technology environment and the knowledge of many fields of engineering (Gaddis, 1959). To be able to facilitate communication and integrate technical work a boundary broker has to know the jargon of the specialists of different competence domains: she participates in multiple domains at once.

Boundary brokers are often senior-level people. This is because such people have had many chances to work in different projects, and have had chances to collect experiences that allow them to act as multi-membership boundary brokers. A great part of the competencies of senior-level boundary brokers are social-based and include a lot of tacit knowledge.

Powerful comprehensive intuition is associated with the competencies of a boundary broker, along with a flexible ability to evaluate the knowledge and know-how required by the situation. These competencies reinforce the boundary broker's practical preparedness and allow concentration on the key activities of a project, since a part of her activity has become automatic through practice. These kinds of competencies, which involve quiet and non-verbal practical know-how, are difficult to study and define. Their structures are difficult to understand and cannot be fully comprehended or communicated. The question is to know how complicated project work situations should be managed, and problems tended to.

A boundary broker is both 'task' and 'maintenance' oriented. Task functions, such as elaborating, summarizing and evaluating enable the project team to solve problems. Maintenance functions, such as harmonising, compromising and diagnosing build and sustain team life. In the opinion of Wenger (1998), certain individuals thrive on being boundary brokers: they love to create connections and engage in 'import-export' and so would rather stay at the boundaries of many competencies than move to the core of any one.

A good boundary broker also realizes that people of different ages value different types of brokering. Young project team members may feel some uncertainty, because they cannot judge whether their working results represent valuable knowledge for others. Therefore in many cases a boundary broker may play a positive role through active questioning and alert observation in encouraging younger team members to share their knowledge. According to Juuti (2001), in many cases senior-level people are in situations in which juniors do not value their skills;

many juniors in fact look down on seniors' skills and thus weaken the possibilities of transferring them. A good boundary broker can create a 'caring-and-sharing' mentality between project team members who are of different ages.

Competence transfer is thus efficient when the relationships among project team members with similar practice and overlapping specialities are dense enough to facilitate the spread of knowledge. This is in line with Powell's (1998) argument that knowledge facilitates the utilization of a greater quantity of knowledge as a competence to assimilate and use knowledge in the environment of projects and project-based companies. Knowledge develops through practice, and when different practices are separated through the division of specialities the knowledge becomes 'sticky' to share. Thus, the greater the overlap in expertise shared by the stakeholders of a project, the easier the knowledge is to share. Bonds, common language, norms and values enhance the flow of knowledge and increase the efficiency of project implementation.

The role of project managers is often construed in terms of directing people. However, it is worth noting that a good part of their activities has more to do with brokering across boundaries between different competence domains. Although the project managers are the primary 'sponsors' in most situations of project implementation, multi-membership team members can also act as good boundary brokers, serving to buffer the team from unnecessary lack of competence. The selection of project team members is, as we have seen, a key factor for success and should be done very carefully. It is clearly in the project's interest to select boundary brokers capable of communicating effectively the ambiguous competencies needed for solving problems.

When a boundary broker needs to be identified, the following aspects should be taken into account (cf. Gunson *et al.*, 2004):

- How well the candidate is experienced in the project's tasks at hand
- How fluent a communicator the candidate is
- How the candidate has acted and reacted in his prior functions
- How he is perceived by his peers
- How the candidate perceives himself; Lorda and Brown (2001) define self-concept as a broad amalgam of knowledge and experience that an individual sees as self-relevant and self-descriptive.

All projects are not, however, in equal need of boundary brokering. Projects that are implemented in an organic project work environment

are particularly in a position in which boundary brokering can be a promoting factor to project success.

Shared understanding with the help of boundary objects

Due to the heterogeneity of divergent worldviews and situationalities of the people involved in project work, misunderstandings are commonplace. It is often the case that a project includes multiple views, since the people represent different business functions and, moreover, individuals are unique persons. Because of the heterogeneous character of people and their requirements for co-operation, the management of this diversity cannot be achieved via a simple pluralism or a laissez-faire solution. This means that the project stakeholders need a means of visualizing knowledge to establish a shared understanding.

A process automation delivery project, for example, is a *community of interest* (Arias *et al.*, 2000) that draws people from several different *communities of practice* (Lave and Wenger, 1991; Wenger, 1998). A community of practice is a group of people who do a certain type of work, talk to each other about their work and derive some measure of their identity from that work. The automation and process engineers of both the customer and the contractor are examples of different communities of practice in a process automation project. A community of interest also involves members of distinct communities of practice coming together to solve a particular problem of common concern. The automation and process engineers of both the customer and the contractor who together participate in the implementation of automation delivery project are an example of a community of interest.

A community of interest can expect to face more communication problems than a community of practice. As Arias *et al.* (2000) argue, fundamental challenges facing communities of interest are found in building a *shared understanding* of the task at hand. This means that members of communities of interest also need a means for visualizing knowledge to establish a shared understanding.

Shared understanding refers to mutual knowledge, mutual beliefs and mutual assumptions (Clark and Brennan, 1991). Without shared understanding, no success in project implementation can be achieved. In order for team members to become a goal-striving team it is vital that they develop a shared understanding of the underlying beliefs, values, and principles that will guide their work together. This shared understanding evolves when the people learn about each other.

However, the people working for a project often lack time to understand their environments, and act under pressure, overloaded with new knowledge, reports and environmental stimuli (Baumard, 2001). This means that they make sense of their environment or situation within the constraints of time and a bounded rationality (Cyert and March, 1963) and so frequently perceive only a reflection of their own beliefs (Starbuck and Milliken, 1988). According to Simon (1982), people only rarely act on the basis of perfect understanding. What is more, they may ignore the knowledge that they do have, or use knowledge that is irrelevant to a decision. People are bounded by their own subjective rationality, which is limited in all sorts of ways. However, in essence, the project team members usually do the best they can with what they have available to them, in other words, they act under the limitations of their subjective worldviews and individual situationalities. In addition to being thinking project team members, people are also emotional ones and emotions have a bearing on how people think and act (see the discussion of emotional competence on pp. 38–9; and Teale *et al.*, 2003). As we have pointed out earlier, every team member's worldview contains, among other things, emotionally characterised meanings, which may influence their behaviour sometimes even more than their explicit knowledge.

A *boundary object* (e.g. Star, 1989; Star and Griesemer, 1989; Bechky, 2003; Carlile, 2004; Koskinen, 2005a, 2005b) refers to an object that serves as an interface between different individuals and/or organizations. It is an entity that is located in the situations of the individuals concerned, and therefore shared by several different communities. However, it is viewed or used differently by each of them. As Star (1989) points out, a boundary object in an organization works because it necessarily contains sufficient detail to be understandable by the different parties; however, neither party is required to understand the full context of other parties. A boundary object serves as a point of mediation and negotiation around intent.

A boundary object is flexible in adapting to the local needs and constraints of several parties sharing them. These objects are robust enough to maintain a common identity across different stakeholders and can be abstract or concrete. Furthermore, they are often *weakly structured* in common use, and become *strongly structured* when they are used by individuals. With a shared context (i.e. mutual knowledge, mutual beliefs and mutual assumptions) 'perspective taking' occurs through boundary objects (Boland and Tenkasi, 1995). They are 'anything perceptible by one or more of the senses' – i.e. anything that can be observed consciously or subconsciously.

Boundary objects can be artefacts, documents and even vocabulary that can help people from different organizations to build a shared understanding. They are interpreted differently by different organizations and people, and it is the acknowledgement and discussion of these differences that enables a shared understanding to be formed. The meanings formed on the basis of boundary objects may be different in different persons' worldviews, but they are, however, similar enough that there is a question of a shared understanding.

Boundary objects can serve as a co-ordinator of perspectives of various constituencies for a particular purpose. For example, a contract that is produced in project business negotiations translates the consultations of supplier and customer into a common understanding that can be processed. This boundary object serves as a kind of co-ordinating mechanism between supplier and customer and, therefore, also between their different worldviews. According to Bowker and Star (2002, p. 297), 'the creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting communities'.

So, people entering into a project-based relationship have to create shared understanding. The interaction between the people involved in a project is a critical factor in enabling this mutual understanding. Therefore, a boundary object may function as a fostering factor in designing knowledge communication systems in heterogeneous cultural project settings. Successful communication between different project participants starts with clarifying their semantic differences and commonalities, and then proceeds with negotiated construction of coherence between the people involved (Harvey, 1996).

For example, a boundary object can be a helpful tool in combining the understandings of differently oriented project team members involved in a formation of a technology company's product development plan in an organic project work environment (Figure 6.2). While the business oriented team members' view could include a plan which is based on the company's technological resources and capabilities, they will tend to focus on products and markets to such an extent that the importance of technology is inevitably under-estimated. Business oriented team members are often lacking in the experience and culture to establish and lead a technology company for a maximum return. Although they accept risk, which is more or less quantifiable, many are temperamentally and culturally uncomfortable dealing with what they perceive as uncertainty in technology. They see the occasional successful results from technology development: a new product or a reduction

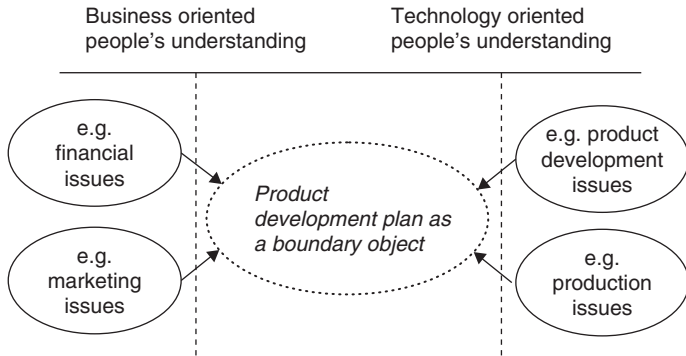


Figure 6.2 The product development plan as a boundary object

Source: Koskinen (2005b); reproduced with the permission of Interscience Publishers.

in costs. But they also know of multiple failures (cf. von Krogh and Roos, 1996b).

Moreover, when technology oriented team members identify and select new or additional technologies that the company seeks to master, this analysis largely determines how technological resources will be allocated toward product development. Because determining the directions in which the company intends to expand its technological capabilities is a major decision, it generally implies heavy investment, and thus such a decision has a decisive impact on the company's future. This, in turn, may mean that the business oriented team members do not understand all the technical jargon and the bases which technology oriented managers use to try to justify these investments. The knowledge developed by the technology oriented managers may thus be in conflict with the knowledge developed by the business oriented managers: there is a great need to create a boundary object to co-ordinate differently oriented managers' understandings.

In this creation process, *strongly structured boundary objects* (knowledge of business and technology oriented project people, described by thick lines in Figure 6.2) are transformed into a *weakly structured boundary object* (product development plan, described by a thin line in Figure 6.2) when the individuals collaborate to produce the plan. The plan emerges as more than an instrument for guidance: it becomes the individuals' interpretation of the project goal (i.e. new product development plan) made into a collective reality. The intersectional nature of the individuals' shared work creates a weakly structured boundary object which includes

multiple views simultaneously, and which must meet the demands of each. Different views of particular business functions are involved in this plan. Its boundary nature is reflected in the fact that it is simultaneously concrete and abstract. Thus, the developed boundary object (i.e. project development plan) is often internally heterogeneous.

The crystallisation of a boundary object is achieved when all the people involved feel that it corresponds to what they tacitly know. This means that the developed boundary object does not accurately describe the details of a project's goal; it is abstracted from all the business domains, and may be fairly vague. Nevertheless, it is adaptable to an individual domain precisely because it is weakly structured; it serves as a means of communicating and co-operating symbolically – a good enough road map for all project stakeholders. In practice, a goal arises gradually with differences in the degree of abstraction. It results in the deletion of individual contingencies from the common object and has the advantage of adaptability.

To sum up, when a boundary object is weakly structured, it may play a significant role in the sharing of knowledge and understanding between project stakeholders. In contrast, when a boundary object is strongly structured, it can function as a co-ordinating mechanism in the knowledge communication. What a boundary object gains in structure, it loses in creativity and tacit knowledge communication.

Benchmarking

A useful method of knowledge acquisition and sharing is benchmarking. This is a process used in management – and particularly strategic management – in which organizations evaluate various aspects of their processes in relation to best practice, usually within their own sectors. Benchmarking is the practice of being humble enough to admit that someone else – e.g. another project team and/or project-based company – is better at something, and being wise enough to learn how to match and even surpass them at it (APQC, 1993).

The benchmarking process is supposed to be continuous and effective as a self-improvement and management tool. The continuity is a necessity because practices change, customers change and project leaders become replaced by new leaders. Benchmarking implies measurement, which can be executed in two forms; internal and external practices are compared and illustrated with analytical measurements indicating gaps between the existing practices. These quantitative metrics are an important part of the process. However, the practices on which the metrics are

based must be pursued first. Benchmarking can be applied to all facets of project work including, for example, problem solving and project meetings. Benchmarking goes beyond the traditional competitive analysis because it does not only reveal what are the best practices, but also gives a clear understanding of how those best practices can be used. Benchmarking should be directed to those projects and business functions that are recognized as the best or as company leaders. However, 'Benchmarking is not a panacea for success; it is a tool to learn success' (Reider, 2000: xii). 'Benchmarking is a process for analyzing internal operations and activities, to identify areas for positive improvements in a program of continuous improvement' (Reider, 2000: 1).

There are many different internal and external benchmarking methods (e.g. Kleemola, 2005). In the project work context *internal* benchmarking methods are often useful tools. They involve making comparisons with other parts of the same company, which means with other projects, other departments, other sites, etc. Internal benchmarking is usually straightforward to organize. With the help of internal benchmarking, it is relatively easy to obtain all the data necessary for good comparisons to be made. However, it is unlikely to yield improvements that meet the world best practice.

Benchmarking is related to target setting and treated as a component of the formal planning process (Camp, 1989). The main focus of benchmarking is on the best performances and methods, operational principles and know-how. The benchmarking model itself consists of several stages. The starting point of the process and the number of stages in the process varies in different models, but the basic ideas as well as the targets of the processes are similar.

The basic philosophical steps of benchmarking are fundamental to success: know your own operation (weaknesses and strengths), know your leaders or competitors, incorporate the best practices (learn from leaders and/or competitors) and gain superiority.

Camp (1989, 1995) presents a formal ten-step process, which is commonly used and applicable to the project work context, although the number of steps may vary:

- *Decide what to benchmark* Identify the biggest possibility to improve performance in the project and/or company. This requires identification of the key processes, and prioritizing and flowcharting them for analysis and comparison of practices.
- *Identify whom to benchmark* Determine which other projects and/or superior practices can be adopted and adapted.

- *Plan and conduct the investigation* Determine what data are needed and how to perform the benchmarking investigation. Document the best practices found.
- *Determine the current performance gap* After completing the benchmarking investigation and observation, decide how much better the best practices are than the project's and/or company's current work methods.
- *Project future performance levels* Decide how much the performance gap will narrow or widen in the near future and what implications this has for the project and/or company.
- *Communicate benchmarking findings and gain acceptance* Inform all those who should know in order to gain acceptance and commitment what the findings are.
- *Revise performance goals* Convert the findings into operational statements that describe what is to be improved based on implementation of the best practices in the process.
- *Develop an action plan* Compile specific implementation plans, measurements, assignments and timetables for taking action on the best practices.
- *Implement specific actions and monitor progress* Implement the plan and report progress to process owners and management.
- *Recalibrate the benchmarks* Continue to benchmark and update practices to stay up to date with continuous industry changes. Determine where the organization is in its pursuit of quality and the implications for benchmarking.

Benchmarking thus represents a versatile management method that helps projects and project-based companies identify and understand what constitutes best operating practices.

Zairi (1994) divides benchmarking metrics into *financial performance indicators* (business performance), *technical performance indicators* (productivity measurement) and *efficiency indicators* (a human contribution measurement), which have to be continually calculated and reviewed. The basic idea should be that the quantification of the benchmark metrics can be accomplished by modifying existing metrics to reflect different practices in order to be able to see what the operation will look like after the best practices are adopted.

Qualitative word descriptions of practice and a statement of opportunity analysis are made not only to answer to the question 'what'. They are also necessary to answer to the questions 'why' and 'how'. For example, the performance gap (i.e. differences between the performance

levels of different projects) must be broken down and the processes must be described to the least significant components. The meaning of the benchmark results needs to be interpreted. To be able to make a qualitative analysis of an operation it has to be presented as a step-by-step process or as a flowchart. For each process there is an input, a process and an output. Reider (2000) calls these descriptions 'performance drivers', which is an exception to the typical terminology. He defines a driver as an underlying characteristic or factor of a project-based company or its environment that determines the amount and type of activities performed to meet stakeholders' demands.

Traditional managers understand very well the meaning of short-term financial results. Consequently, they have learned to manage systems and processes that reach across traditional departmental or functional boundaries measuring both financial and non-financial aspects, which are, in fact, *quantitative* benchmarks. However, a new generation of managers has created a *balanced scorecard* of operating metrics that enables them to monitor, maintain and improve the health of the systems and work flows. Typical non-financial benchmarks are measures of work process speed, quality, first-pass yields, employee turnover, reliability, productivity, innovation, training, employee involvement and learning (cf. Bogan and English, 1994; Reider, 2000).

Zairi (1994) defines the characteristic practices that describe internal and external business behaviours, which, in turn, tend to lead to the creation of a performance gap. Practices can be related to:

- The processes themselves
- Organizational structures
- Management systems
- Human factors
- Strategic approaches.

Benchmarking investigations should always concentrate on the understanding of practices before attempting to measure the results. For this reason, the qualitative measures will be stressed first (Camp, 1989). Comparing numbers will not help one to compete; it is necessary to compare the practices that have given rise to the numbers (Bendell *et al.*, 1993).

Benchmarking is a powerful management tool because it overcomes 'paradigm blindness', which can be summed up as the mode of thinking: 'The way we do it is the best because this is the way we have always done it.' Benchmarking opens organizations (projects and project-based

companies) to new methods, ideas and tools to improve their effectiveness. It helps crack resistance to change by demonstrating other methods of solving problems than those currently employed, and showing that they work because they are being used by others.

The Internet

The Internet is a worldwide, publicly accessible network of interconnected computer networks that transmit data. It is a 'network of networks' that consists of millions of smaller domestic, academic and business networks which together carry various data and services such as electronic mail, online chat, file transfer and the interlinked Web pages and other documents of the World Wide Web. The Internet is allowing greater flexibility in working hours and locations, features especially useful for a project, whose delivery installation may take place on a site far from home and in a different time zone.

Intranet

An intranet is a network that exists exclusively within an organization and is based on Internet technology. It can provide an e-mail system, remote access, group collaboration tools, an application sharing system and a company communications network (Laudon and Laudon, 2000). It protects data from unauthorised use through a software mechanism called a 'firewall' that blocks unwanted access from outside but allows internal users to gain access. Some traditional applications of intranets are:

- Access to databases
- Forum for discussion
- Distribution of electronic documentation
- Administering payroll and benefits packages
- Providing online training
- Frequently asked questions to provide answers to commonly raised questions.

Most organizations have adopted 'firewall' technologies to prevent intruders from gaining access to their sensitive organizational data. The most important goals of firewall systems (Loew *et al.*, 1999) are:

- Access control at different levels
- Control at the application layer
- User rights' administration

- Isolation of certain services
- Proof back-up and analysis of the log
- Alarm facilities
- Concealment of internal network structure
- Confidentiality
- Resistance of the firewall against attacks.

Firewalls examine every packet of data between networks (using packet filters) and analyse their characteristics, to decide whether to deny any unauthorised messages or access attempts. A high-level security firewall can be constructed using two packet filters, the weakness of one packet filter being supported by the other. Attacks on these servers will not endanger the internal network. However, there can never be any guarantee of total security; in the future, it is likely that encryption technologies will be used to strengthen the security of firewalls.

When building intranets, organizations need to be mindful of the dangers of developing large and sophisticated solutions that nobody visits. The technology needs to be user-led to meet explicit needs. Another danger is the use of intranets to develop 'electronic fences' in organizations contrary to the espoused principle of knowledge sharing (Swan *et al.*, 1999).

An intranet thus supports the sharing of documents, diagrams and conceptual models that aid thinking and decision making. Increasingly a shared computer work space becomes the meeting place where project team members generate and share data. Intranet technology helps people forge working relationships with each other and pull together team members; however, it is crucially important to realize that the data communicated with the help of the intranet needs to be interpreted by human beings. As pointed out above, these interpretations may be crucially different, and they may then cause misunderstandings and harm.

Text-based conferencing

There are a number of text-based conferencing channels through which individuals can share data. Usenet newsgroups are worldwide discussion forums on a multitude of topics where discussions take place on an electronic bulletin board, with individuals posting messages for others to read. Another public forum for sharing knowledge within predefined groups is the discussion lists that individuals can subscribe to. These lists are generally moderated, in comparison with newsgroups, which are not. An individual subscribes and joins a discussion group and receives e-mail messages sent by others concerning the topic. The individual can reply

to the group and their offerings are distributed to all subscribers to the group (cf. Jashapara, 2004).

Various chat tools have been developed to allow two or more individuals on the Internet to hold live interactive conversations. If the number of contributors increases substantially, chat groups can be divided into different themes and topic areas. Some enhancements are providing voice chat capabilities. Individuals can arrange to meet at predefined times to share their knowledge and ideas, particularly in cases where the phone may not be an appropriate medium. Discussion groups can also be set on a variety of topics on an organization's intranet to enable knowledge sharing. Sensitivities relating to the membership of these groups need to be considered so that full, frank and open discussions and dialogues can be promoted. For example, in a work context, people may be guarded in their contributions if they are aware that their boss or senior management may be party to the conference (cf. Jashapara, 2004).

Groupware tools

The *raison d'être* behind groupware is to encourage collaboration between people to enhance knowledge sharing. In commercial terms, the assumption is that greater collaboration will lead to increased productivity, lower costs and higher quality through better decision making. Groupware, as a concept, tends to be applied to information communication technologies that support collaboration, communication and co-ordination of activities over space and time as well as shared information spaces (Robertson *et al.*, 2001). Two common technologies used in groupware are e-mail and Lotus Notes discussion databases. Lotus Notes is generally considered as the first groupware product to provide discussion databases, e-mail with attachments, shared databases, workflow automation and applications development. Other systems (Williams, 1996) have included:

- Group decision systems with brainstorming, ideas generation and voting systems
- Collaborative writing and whiteboards
- Computer-based conferencing
- Schedule meetings and diary organizers
- E-mail-systems used proactively.

Advances in information technology have greatly simplified data sharing. Distributed databases, electronic reports and communication technologies have augmented the ability of project stakeholders to access and share data. Sharing technologies, such as the Internet, Lotus Notes

and internal webs, make it possible for people to self-organize around data sharing. Data mining tools and technologies help people working for projects to reach a shared understanding of essential data. However, it is important to note that *data management is not the same as knowledge management*. Being able to organize data are often a key organizational enabler for knowledge, but it is only one component.

Storytelling

Many authors (e.g. Gabriel, 2000; Laufer and Hoffman, 2000; Denning, 2001, 2004; Simmons, 2002; Walsh, 2003) have recognized the importance of stories and storytelling as a means of knowledge acquisition and sharing. Stories stimulate the imagination and offer reassurance (Bettelheim, 1976), they provide moral education (MacIntyre, 1981), they justify and explain (Kemper, 1984), they inform, advise and warn (van Dijk, 1975). Bruner (1990) claims that the story is the main mode of human knowledge, and in the opinion of Fisher (1987), the story is the main mode of communication.

Drew and Heritage (1992), Boden (1994) and Sachs (1995), have stressed the importance of informal conversations as well as storytelling and narratives. These knowledge sharing means are often framed in a community of practice that evolves around the sharing of experience related to work practice (e.g. Brown and Duguid, 1991; Wenger, 1998). This experience sharing relates to professional responsibilities, activities and vocabulary. Since the actual work practice often differs from the canonical practice described in manuals and directive documents, the community of practice plays an important role for socializing and sharing experiences of workarounds and trouble shooting.

By passing stories through communication networks, knowledge may be maintained for long periods of time even as organizational members come and go. Shared knowledge of norms and values emerge from these continuous processes of communication, contributing to the development of shared cognitive maps (i.e. knowledge structures) and culture. However, it should be remembered that one of the critical aspects of storytelling through social networks is that knowledge embedded in a story must be validated as it is passed from one individual to the next. Duncan and Weiss (1979) argue that such validation is necessary if personal knowledge is to become organizational knowledge.

On stories

A story requires at least three elements: an original state of affairs, an action or an event and the consequent state of affairs (Czarniawska,

1998). For example, in the story 'The project was about two weeks late, when the installation works started at the site. However, when a local contractor was hired, the project succeeded in catching up the time lag', the words 'The project was about ... started at the site' form an *original state of affairs*, the words 'However, when a local contractor was hired' form an *action*, and the last words 'the project succeeded in catching up the time lag' form a *consequent state of the project*. In addition, in order for these sentences to form a story, they require a plot – that is, some way to bring them into a meaningful whole. According to Czarniawska (1998), the easiest way to do this is by introducing chronology (as seen in the example above), which in the mind of the listener easily turns into causality.

Propp (1968) points out that the story has a double function: reporting on events, and putting these events into a meaningful whole. To bring an event into a whole, a plot is needed – e.g. ordering the events chronologically or in some other sequence. A story may thus be seen as a way of making sense of new events by integrating them into the plot, making them understandable in relation to the context of what has happened.

According to Mangham and Overington (1987: 193), stories and experiences are linked together. 'If we listen carefully to the talk around, it is not difficult to think that storytelling goes on almost non-stop. People transform their lives and their experiences into stories with practiced ease.' A story emerges as the privileged form of sense making, as 'the primary form by which human experience is made meaningful' (Polkinghorne, 1988: 1).

A story may contain an explicitly formulated point, or else listeners are supposed to provide one. For example, the story 'The customer demands a better performance for the system we deliver' carries some ambiguity and therefore it leaves openings for meaning. But the story 'The customer demands 10 per cent better output for the system we deliver' is better, because it describes exactly the demands of the customer.

The success of individual projects entails gathering stories that embody knowledge (e.g. Laufer and Hoffman, 2000). However, it is important to understand that there are often many versions of the same story. For example, Boddy and Paton (2004) tell about competing narratives, through which different people express different opinions about the objectives, progress, or success of projects. The versions of stories vary according to whom and by whom they are told. People remember different things, attach importance to different things and view projects from different viewpoints. For example, the literature mentions 'spring-board stories' (Denning, 2001) that communicate complex ideas and

spark action, stories that lead people into the future (Simmons, 2002; Denning, 2004) and stories that share knowledge. In the next two sub-sections the discussion deals with the latter type of stories – i.e. knowledge sharing stories in a project work context. Moreover, here the knowledge sharing stories are divided into *project company stories* and *project implementation stories*.

Project company stories

Project company stories are stories that are common for all the people of the project-based company. These stories are both inscriptions of past performances and scripts and staging instructions for future performances. However, it is important to note that they are highly charged narratives, not merely recounting 'events', but interpreting them, enriching them, enhancing them and infusing them with meaning (cf. Gabriel, 2000: 31). Omissions, exaggerations, subtle shifts in emphasis, timing and metaphors are some of the mechanisms that are used in the creation of project company stories. In other words, project company stories include a lot of tacit elements. The responses invited by project company stories are not to challenge facts but to engage with their meanings (cf. Reason and Hawkins, 1988). However, this does not deny the factual basis of project company stories, nor reduces the stories to elaboration of facts. Project company stories are, for example, about how to do well with a tricky customer. These stories are often less about *what* to do and more about *how* to do.

When a project contract has been won, the *kick-off meeting* is often a necessity to get things started. The project manager explains the particular project organization, outlines the procedures that will apply and answers questions about these issues. This meeting also gives team members an opportunity for storytelling. The team members, who are familiar with the customer, may tell stories about the customer's key people, organizational culture, and circumstances that are not otherwise known. Furthermore, at the conclusion of the assignment, each project team member contributes to the project-based company's organizational memory what she thinks she has learned when carrying out this particular assignment on this particular project.

Knowledge encoded in project company stories may be partly lost when existing patterns of interaction are repeatedly broken up or are not allowed to form. Companies that fail to reinforce storytelling may experience a loss of knowledge as relationships atrophy. On the other hand, organizational memories may be purposely eliminated to cope with change and to promote learning. Furthermore, stories about difficult

situations do not always flow easily, not only because of the fear of repercussions from admitting past mistakes but also because, in the flush of success, people tend to forget what they learned along the way. As a result project company stories cannot be demanded, they have to be teased out.

Project implementation stories

Project implementation stories are problem oriented and are told in the course of project implementation. These stories give ideas about whether the project is on the right track and about possible changes related to the implementation of the project. Project implementation stories are, for example, about finding solutions to technical problems. This means that project implementation stories are often accurate and explicit descriptions focusing on problems, and include explanations for the solutions. These stories often lack a detectable plot. They are about problems and how they got – or did not get – resolved, and why. In other words, project implementation stories typically contain the context, the solution and the explanation, which tells why the solution had the effect that it did. In Orr's (1990, 1996) ethnography of copy machine maintenance the 'war stories' served as an important tool in the process of solving problems as well as in the distribution of the maintenance workers' experiences. The service technicians shared knowledge not covered in manuals but achieved through practical experience. In Orr's study, the stories were mainly distributed during lunch breaks and other informal occasions. A project implementation story tells of the mechanism underlying the result.

Because project implementation stories are often about problems, they typically have a negative tone. Much of the challenge in storytelling lies in creating settings that enable members to talk about what has gone wrong, and how it can be fixed. However, irrespective of their form and content, project implementation stories can often give accurate explanations of the present problems of the project. This means that these stories are quite different from project company stories which are often inaccurate and in which the truth does not lie in facts, but in the meaning.

However, it should be remembered that neither of these two types of stories is ever a neutral, objective presentation, but rather a subjective indication of the significance of the project to an individual storyteller, project team, company, or other contexts, in which the stories are told. Also, there are rarely two different, pure forms of stories, but rather stories in which the current and past experiences interact. It is, however,

crucially important to hear many versions of the same stories. Performed storytelling entails a critical ambivalence. On the one hand a storytelling can subordinate people, subsuming all in one grand story. On the other hand storytelling practice in a project-based company can be liberating, by showing people that there are many stories, storytellers and storytelling events (Boje, 1995).

To sum up, the stories contain valuable knowledge about things such as technology, customer and organizational culture, which are often sources of problems. However, different stories create different understanding. For example, project implementation stories are about problems, and how they can be solved, while project company stories are more about meanings, including the cultural issues of the company. Narrative forms of knowledge sharing will enrich the understanding of problems existing in projects and project-based companies.

The managers of project-based companies are in a key position in advancing knowledge sharing with the help of storytelling. In the practice this means, for example, that:

- They proclaim the usefulness of storytelling by different means, such as in their keynote addresses and in the personnel bulletins of their companies
- They create a company culture in which personal and informal face-to-face interaction – and thus, also, storytelling – is valued
- They equip the known storytellers with appropriate storylines.

Mentoring

Mentoring can help to bring about change within project-base companies because it encourages the reflection on behaviours and actions as well as identifying options for doing things better (e.g. Whittaker and Cartwright, 2002; Swap *et al.*, 2004).

Mentoring is especially a relationship between two people – the mentor and the mentee – in which trust and respect enables problems and difficulties to be discussed in an open and supportive environment (e.g. Conway, 1998: 39). By sharing experiences, issues and concerns within an open and trusting environment, the mentee is able to develop and grow and so to maximise her respective potential. 'Mentoring is not about two people having a conversation' (Whittaker and Cartwright, 2002: 184); mentoring is a process that gives the mentee time and space to talk through issues, ideas and situations that are unique to her. Thus, the mentoring process is an activity by which competencies of a senior or

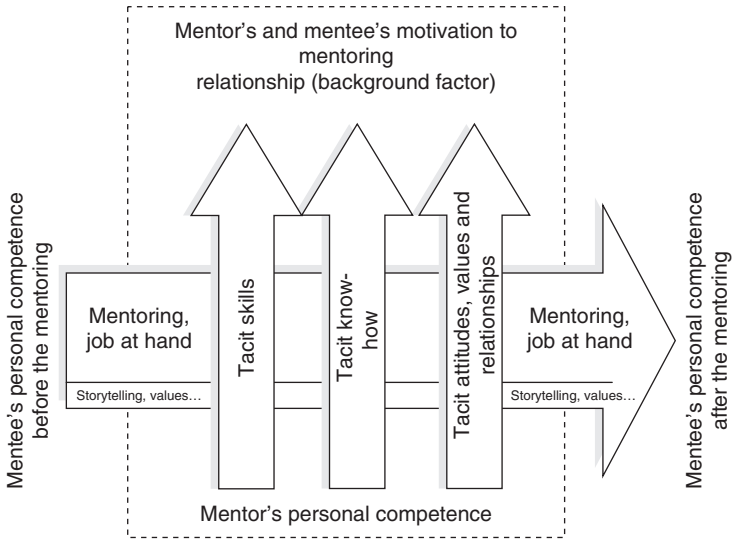


Figure 6.3 Competence transfer through mentoring

more experienced individual is transferred to a junior or less experienced individual (Figure 6.3).

In practice, mentoring can take place in an informal or a formal way. In both cases, mentoring is basically a one-to-one activity that can take place in many different contexts and situations. There are differences between informal and formal mentoring processes, however. Both forms of mentoring are valuable, and may happily co-exist within the company, but they are not the same thing.

Formal mentoring programmes are those that are formed by organizational managers and typically have a defined duration and purpose. For example, mentoring programmes used in training newcomers or less experienced people are typically formal activities. In these programs, mentors and mentees are assigned to work together, and the relationship has a specific purpose defined by the organization. Table 6.1 summarizes how the two mentoring forms are different.

Three key advantages concerning informal mentoring are:

- A relationship of trust and respect is present from the outset
- There is a high degree of compatibility and co-operation between the individuals
- The relationship is flexible and personalized.

Table 6.1 Informal and formal mentoring forms

Informal mentoring	Formal mentoring programme
Mentoring initiated and maintained solely by mentoring partners	Mentoring programme co-ordinator manages start-up, progress and evaluation
Mentoring partners matched by chance or serendipity; mentor often chooses mentee	Partnering is facilitated process, mentee has responsibility of choosing mentor
Aims of relationship may be non-specific, often suggested by mentor	Aims of relationship are specific, directed towards goals clarified by mentee
Primary criterion for accepting mentor is feeling of liking/respect	Primary criterion for selecting mentor is ability to assist mentee achieve identified goal(s)
Relationship may not be called/recognized as mentoring	Both partners identify relationship as mentoring and seek to apply appropriate skills/expectations
No mentoring agreement	Mentoring agreement is early cornerstone of partnership
Relationship grows with needs/circumstances	Relationship has agreed framework of frequency/meetings/timeframes/communication methods/structure, etc.
Relationship rarely, if ever, evaluated	Relationship frequently assessed and measures established for assessing progress towards goal(s)
Relationship may be very long-lived – sometimes for many years	Relationship has finite duration beyond which partners can elect to conclude/extend it or exchange it for a friendship
Win-win benefits possible	Win-win benefits probable for mentor/mentee/company

Three key disadvantages concerning informal mentoring are:

- This type of relationship with members of project teams is rare
- There is the risk of ambiguity in the relationship if it becomes too intense
- There is the risk of tension when changes occur in the relationship.

Four key advantages concerning formal mentoring are:

- Access to more people
- Support and recognition from the organization

- Easier clarification of roles and responsibilities
- Possibility of establishing made-to-order mentoring to meet the needs of specific teams.

Three key disadvantages concerning formal mentoring are:

- Pairing may be difficult, especially if the number of mentors is low
- There is a less flexible relationship and process
- There is the risk of poor pairing.

At the beginning of the mentoring relationship, both mentor and mentee are inclined to make judgements and form assumptions on the basis of the behaviours they can observe and their interpretations of the words they hear. Behind these behaviours lie a lot of motives, emotions, values, beliefs and attitudes, all factors that are part of the participants' worldviews. These factors usually lie unrecognised beneath the surface (e.g. Parsloe and Wray, 2004).

In order that the mentoring will be effective, the mentors encourage their mentees to analyse their task performance and identify their weaknesses and strengths. Moreover, the mentors give feedback and guidance on how any weaknesses can be eliminated or neutralised. They especially help mentees to recognise the tacit dimensions of skills, an important element in the development of the mentee's competence and know-how. 'Mentors act as a sounding board for their mentees' ideas, and support them as they try out new behaviours and take risks' (Beardwell *et al.*, 2004: 300); this means that through mentoring the mentee gradually begins to identify and practice different skills needed in her work. The mentor stimulates, encourages, guides and cautions, acts as a role model, nurtures learning-to-learn, and encourages the adoption of a better orientation in the future.

Knowledge transferred through mentoring is most often problem oriented and gives ideas about whether the task executed by the mentee is on the right track, and about possible changes related to task implementation. This means that the advice (i.e. perturbations or triggers) given by the mentor is often an accurate and explicit description focusing on a problem and includes explanations for solutions. In other words, the transferred knowledge is about problems and how they get – or do not get – to be resolved, and why. Knowledge typically contains the solution and explanation that tells why the solution has had the effect that it has had.

Mentors certainly need to share their 'how to do it so it comes out right' knowledge. Personal scenarios, anecdotes and case examples, because they offer valuable, often unforgettable insights, can be shared with the help of mentors. This creates powerful lessons that provide valuable opportunities for analysing mentees' realities. Mentors who talk about themselves and their experiences establish a rapport that makes them 'learning leaders'.

Different types of mentoring are particularly appropriate in project-based companies:

- The type of mentoring appropriate to a project and/or company depends on its unique needs
- Informal mentoring that is openly encouraged and supported by the company may be desirable where there are few participants and the project lasts a long time
- The ability for informal mentoring to be successful within a company will depend on whether the parties involved have the skills required and the context of the project is supportive – e.g. training in project management skills, installation works, cultural understandings
- As informal mentoring is often not available for some groups within the organization (e.g. the company's permanent administrative personnel) or when informal mentoring does occur for these groups there is little success, a formal mentoring programme which specifically addresses these people or an organization wide program which addresses issues such as general project work may be appropriate; a formal or structured programme can also be flexible
- A leading author in the area of mentoring Ragins (1997) concluded that, in terms of outcomes, it did not matter whether the mentoring was informal or formal, it was the *quality* of the mentoring which was important. Establishing effective formal programmes can be a way of trying to ensure higher-quality mentoring for a majority of relationships. However, promoting both formal and informal mentoring and mentoring skills in an organization that has a culture that supports such attitudes may also result in high-quality mentoring.

To sum up, through the mentoring the matching of the mentee's world-view with the mentor's worldview takes place, giving the mentee an access to a level and range of practical experiences, skills and knowledge (tacit knowledge in particular) that would be difficult to replicate through written material (i.e. explicit knowledge) only.

Furthermore, although there is no detailed profile of a good mentor, it is suggested here that the mentor must be sensitive to the *mental state* of the learners he is working with. A good mentor is good motivator and is perceptive, able to establish a good and professional relationship, and accessible and knowledgeable about the mentee's area of interest. A good mentor is sufficiently senior to be in touch with the company's structure, sharing the firm's values and able to give the mentee access to resources and knowledge.

Factors affecting knowledge sharing in a project work context

There are numerous factors that either advance or weaken knowledge sharing possibilities in a project work context. The following sub-sectors describe factors: Project leader/Project manager, Motivation to share knowledge, Trust, Caring attitude, Physical system and proximity, Organizational culture/Project culture, Values, norms and Beliefs, attitudes and assumptions.

Project leader/Project manager

Project management is a dynamic process of leading, co-ordinating, planning and controlling a diverse and complex set of processes and people in the pursuit of achieving project objectives (Pinto and Kharbanda, 1995). The successful management of projects is both a human and a technical challenge, requiring a far-sighted strategic outlook coupled with the flexibility to react to conflicts and problem areas as they arise on a daily basis.

Project managers have always managed their projects according to three criteria: cost, time and quality; all other considerations are often regarded as subordinate. This approach, however, has often not been successful for any of these criteria, let alone the entire project (e.g. Bubshait and Farooq, 1999). This is due to the fact that project managers have traditionally not given much weight to a very important criterion – *people*. However, the handling of people affects the outcomes of projects. Neglect or mismanagement of project team members can significantly affect cost, time and quality. Successful project managers recognize the importance of people because they know that without people and their competencies, no project would exist in the first place. They also recognize that team members play an integral role in completing quality projects within budget and on time (Kliem and Ludin, 1992). People are the initiators, developers and users of any project.

Leadership and management are two related but distinct sets of behaviours for guiding and supporting people through the stages of a project. Management focuses on creating plans and assessing performance. Leadership emphasizes defining a vision and taking action to increase the chances that the vision will become reality. Management focuses on systems, procedures and data; leadership focuses on people. Management creates order and predictability, leadership helps people to address change. In short, management deals with processes and systems and leadership deals with actual people. It is important to realize that although leadership and management are not synonymous, nor are they mutually exclusive: they both complement and contribute to organizational success.

It is commonly agreed that leaders have great influence on the performance of their teams. Senge (1990) argues that leaders must be capable of building shared vision, inspiring commitment, translating emerging ideas into workable goals and empowering people. This requires that the leaders who have the ability to reflect on their views expose their reasoning and encourage others to be inquisitive (Ayas and Zeniuk, 2001). The leadership model in project-based learning is therefore very different from the standard company management model. It reflects the emergent structure and the evolving culture. Leaders may evolve where and when necessary and leadership is not equated with position in the project hierarchy.

The leader, as a reflective practitioner, sets the tone for learning. Leaders should ideally also take a significant role in the change process by engaging in personal transformation, and become coaches and facilitators serving others. Sustainability and continuity of learning initiatives seem to be much more prevalent in organizations where leaders lead by learning and are fully engaged in the process, assuming a leadership role in the transformation. Leaders may be unaware that their behaviour is inconsistent with what they espouse; they cannot see themselves and they need others to help them to do this.

According to Senge (1990), the core leadership strategy is simple: *be a model*; commit yourself to your own personal mastery. Talking about personal mastery may open people's minds somewhat, but actions always speak louder than words. Senge argues that there is nothing more powerful you can do to encourage others in their quest for personal mastery than to be serious in your own quest. This means that the leadership model in project-based learning and knowledge transfer is very different from the usual company management model (Ayas and Zeniuk, 2001).

Indeed, the personality of a team leader plays a critical role in how the team performs. A leader must understand the kind of personality they need to have in order to gain the respect from team members. According to Leslie and van Velsor (1996), there are four personality traits of ineffective managers: poor interpersonal skills (being insensitive, arrogant, cold, aloof, overly ambitious), inability to get work done (betraying trust, not following through, overly ambitious), inability to build a team and inability to make the transition after promotion.

In the opinion of LaFasto and Larson (2001), the most important contribution a team leader can make is to facilitate a climate that enables team members to speak up and address the real issues preventing the goal from being achieved. This is understandable considering the great influence a person's situationality has on his consciousness or thinking processes. What kind of meanings – negative or positive – a team member forms on the basis of the situation, determines what he or she thinks and how motivated they are.

A leader with good communication skills must be able to speak the truth and deal with problems openly. The goal should be to promote listening, to understand different viewpoints and to work toward a resolution. It is important for a team leader to make other team members feel comfortable enough to express their needs and their wants. Members want to feel that they know what is going on at all time and are informed about things such as plans, priorities and the progress the team is making.

Sveiby (1997) writes that the art of leading knowledge creating organizations (e.g. projects) is the art of handling people, particularly the experts, and the task of leadership in such organizations is to provide the people with the conditions under which they can exercise their creativity for the benefit of customers while not letting the organization become entirely dependent on them. The role of the leader in an organization is to be the provider of *context* and *situation* for knowledge creation.

According to Pinto and Kharbanda (1995), a consensual leadership style is wasted, unless the members of the team have access to, and are able to collect, necessary knowledge. The effective project manager must have good interaction relationships with four groups of project stakeholders – customers, subordinates, peers and superiors (Figure 6.4).

Leadership in a project that creates new knowledge is largely a matter of giving people creative freedom within a framework devised by the leader. To do that, the leader must know enough about the field of specialization to be equipped to judge performance in relation to context. Furthermore, the members of a project team can succeed only if its leader is aware that

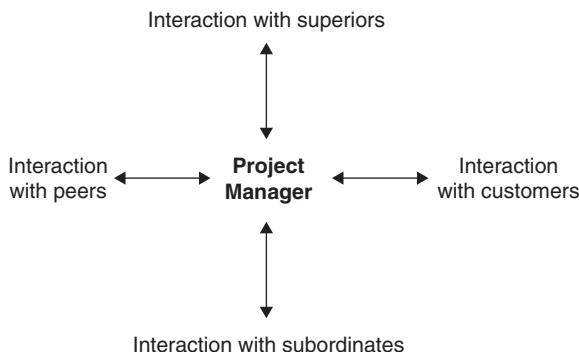


Figure 6.4 Four interaction relationships of the project manager

Source: Adopted from Pinto and Kharbanda (1995).

the height of his personal aspiration will determine the quality of the products/services the project creates.

In the case of a new task, the project manager works at developing what Boam and Sparrow (1992) have termed 'transitional competencies'. The need for transitional competencies arises when people are given tasks they are unfamiliar with, and fraught with conflict, stress, or uncertainty. Under the guidance of a project manager who has some experience of the task at hand, a team member can go through a learning process in which she creates the explicit and tacit knowledge required to accomplish the task (see also the concept of action learning on pp. 58–60).

Twelve key characteristics or skills are required of any project leader in order to lead an effective team:

- Having an interest in the job
- Being action oriented
- Having a tolerance for ambiguity and change
- Having a vision
- Having objectives and priorities
- Being able to facilitate team development
- Being able to motivate people
- Being able to manage conflict
- Being able to assist in decision making
- Being able to gain organizational support
- Being able to communicate
- Having credibility (PM Tutorial, 1993).

Stevens and Campion (1994) argue that a good project leader must have the following goal setting and performance knowledge, skill and abilities:

- To help create specific, challenging and accepted team goals
- To monitor, evaluate and provide feedback on both overall team and individual performance.

The following planning and task co-ordination knowledge, skill and abilities are also needed:

- To co-ordinate and synchronize activities, knowledge and task inter-dependencies between team members
- To help establish task and role expectations of individual team members and ensure a proper balancing of the workload.

Knowledge sharing thus requires clear leadership. Among the many roles that project leaders must have is to serve as the impetus for requiring and monitoring knowledge sharing. There is a natural organizational inertia that can inhibit the willingness of people to provide knowledge willingly; there are often also bureaucratic barriers that serve as communication roadblocks across organizational boundaries (Pinto and Nedovic-Budic, 2002). Having strong leadership is extremely important for maintaining the momentum to collaborate with multiple project stakeholders. Such leadership, to be most effective, should be *distributed*. That is, it is highly desirable to have leaders like boundary brokers, impelling an atmosphere of open communication within each of the members of the project.

If the project leader is unable to structure activities and change the behaviour and/or attitudes of others, leadership ceases to exist. The transformation should be at a deeper level of change in the follower than just immediate behaviour. The project leader also influences the attitudes and behaviour of not just one person, but a whole team (Parry, 1998).

Fortunately project management nowadays has begun to emphasize behavioural management over technical management, and situated leadership has also received more attention. Effective interpersonal relations have become an important contributory factor in sharing knowledge between the project team members. Project leaders now need to be able to talk with many different people in many different functions and situations.

Motivation to share knowledge

Motivation is an internal psychological process, which starts, reinforces, directs and supports goal-directed behaviour. In engineering projects the question is often how to get people interested in the project and involved in dialogue. When one speaks of motivation, one generally means how to keep a person's interest and how to keep him going despite difficulties (cf. Buchanan and Huczynski, 1997).

Osterloh and Frey (2000) make a distinction between *extrinsic* (i.e. pay for performance) and *intrinsic* (i.e. undertaken for one's need for satisfaction) motivational approaches. They argue that the latter are crucial when tacit knowledge is to be transferred between teams and team members, as explicit motivations (i.e. pricing systems) are unlikely to work because the transfer of tacit knowledge cannot easily be observed or attributed to an individual. They further note that inappropriate organizational forms can hinder knowledge transfer: extrinsic incentives may crowd out intrinsic motivation. They propose that the tendency to hoard knowledge will be reduced if control mechanisms match the nature of the task and motivational factors (Figure 6.5).

Intrinsic motivation is a key driver of knowledge sharing. Extrinsic interventions, such as rewards and evaluations, may even adversely affect knowledge sharing motivation because they appear to redirect attention from 'experimenting' to following the rules or technicalities of performing a specific task. Apprehension about evaluation can also divert attention away from the knowledge because individuals become reluctant to share or take risks in an environment where individual

		Motivation	
		Extrinsic	Intrinsic
Control mechanisms	Social	Hoard	Share
	Mechanistic		Hoard

Figure 6.5 The propensity to hoard or share: control mechanisms and motivation

performance or failure may be negatively evaluated. In contrast, a sharing and learning environment (e.g. an organic project work environment) permits individuals to be creative, allows the freedom to take risks, play with ideas and expand the range of considerations from which new innovative solutions may emerge.

According to Barkley and Saylor (1994), motivation is the behaviour of an individual whose energy is selectively directed toward a goal. Performance is the result of having both the ability and the motivation to do a task. These authors argue that motivation depends on satisfying the needs of individuals. Traditionally, motivation was equated with extrinsic rewards such as compensation, promotion, and additional benefits. The aim was to satisfy the basic needs of individuals for housing, food, and clothing (cf. Maslow's hierarchy of needs, Maslow, 1943). 'Today, people need to be motivated by a higher order of needs, such as a sense of belonging, a feeling of accomplishment, improved self-esteem, and opportunities for personal growth' (Barkley and Saylor, 1994: 191).

Rewards and recognition are thus essential to an individual in the promotion of his motivation. Intrinsic rewards are often sufficient to start an implementation of a task. Once an individual is established, he covets higher-level intrinsic rewards. According to Barkley and Saylor (1994), a good example of a reward that is effective in today's environment is an inclusion in personal development workshops. During personal development, recognition is particularly effective in reinforcing positive behaviour. An example of recognition could be a public announcement of a worker's achievements.

Badaracco and Ellsworth (1989) write that people are motivated by self-interest and by a search for power and wealth. However, in the opinion of Senge (1990), if people are interested only in themselves then the organization inevitably develops an atmosphere where they are no longer interested in common organizational objectives. In Senge's opinion an alternative model could be one where people want to be part of activities – like projects – which are greater and more significant than their personal and selfish goals. They want to contribute toward building something important, and they value doing it with others.

However, it is crucially important to understand that knowledge can be used to take action and to enforce spheres of influence and then passing knowledge to colleagues might grant them these potentials. Those who do not own this knowledge are deprived of the capacity to act or to influence. From a project-based company perspective, this applies, for instance, to knowledge about procedures, methods, technology, suppliers, customers and individuals to ask about problems. An individual who

passes his knowledge to another loses the exclusiveness of his influence, which might have created some job security and respect.

Indeed, 'knowledge is power' is a well-known line to describe situations where people with rare knowledge have the highest reputation and monopoly of knowledge, which causes knowledge *hoarding* instead of knowledge *sharing*. Ego can play an important role in the knowledge sharing process (Brown and Starkey, 2000). According to Davenport and Prusak (1998), especially in situations where job security is low, knowledge as a power base becomes vital for an individual, and private knowledge may be even seen as a kind of insurance against losing a job.

People rarely give away something without expecting anything in return. Hall (2003) argues that knowledge is a private commodity and it is up to the owner to decide whether to share it or not. Thus, to entice project team members to share their knowledge as part of a social exchange transaction they need to be persuaded it is worth doing so. The stakeholders in a project work context expect mutual reciprocity that justifies the expense in terms of time and energy spent sharing their knowledge.

A lack of motivation to actively share knowledge across project boundaries leads to less than optimal project performance. Such lack of sharing impedes the optimal development of projects (Pinto and Onsrud, 1995), and also hinders the development and utilization of a project technology's full potential (Frank, 1992). Such impediments to sharing are both technological and cultural in nature, with the latter often being harder to overcome.

In industries like engineering employees often compete directly with each other through their special knowledge and talents (cf. Disterer, 2001). It may be part of the individual culture of high-performing employees that they voluntarily enter into competition for scarce seats on a career path because they like to compete and to excel on principle (Quinn *et al.*, 1996). But the drawback of such competition is obvious: people are very cautious to share their knowledge openly with colleagues, because they will possibly give up an individual edge. In these companies competition and the corresponding incentives and rewards often urge people to build a unique expertise in a certain area, and in order to prove that expertise – e.g. relations to clients or whom to ask to solve problems – they do not share it with colleagues.

Transferring knowledge may also be seen as an additional chore because communication takes time (cf. Disterer, 2001). Some individuals may not expect any reciprocal benefit from transferring their knowledge because they do not believe in this benefit or they do not experience

it necessary. Even if individuals do expect a payback for their contributions, an answer to the natural question 'what is in it for me?' is often not clear for those people who suffer from a lack of motivation. According to Quinn *et al.* (1996), there is a need for employees to have some self-motivated creativity and some sense of 'care-why' in order to foster knowledge sharing.

In many cases project team members can be motivated to share knowledge by the use of higher pay, promotion, travelling, etc. Researchers (e.g. Locke, 1984; Morris, 1988; Senge, 1990; Nonaka and Takeuchi, 1995; Leskinen, 1997) believe, however, that genuine commitment and motivation derive from interesting content in the work and from the goals of the job being significant. 'If the work is valuable and the goals significant a person will endure dull stretches. In my opinion, it is not sufficient that the work is interesting, it must also be valuable' (Leskinen, 1997).

Fortunately, many projects offer significant goals (e.g. Ayas and Zeniuk, 2001). This means that when project team members work to create something new the task at hand is clear and there is pride and passion around what they create. This is especially clear in the mechanical project work environment, but is also very applicable to projects implemented in organic project environments.

To sum up, to achieve successful knowledge sharing, projects and project-based companies need to convince people to reject the old-fashioned way of thinking that they are being measured by what they know and do individually. Such thinking only perpetuates knowledge hoarding and the development of 'knowledge repositories' from which little value-adding transfer takes place. One way by which this can be achieved is to build conscious knowledge sharing practice into daily work processes such as performance appraisal (Robertson and Hammersley, 2000; McDermott and O'Dell, 2001). Reward and appraisal systems can encourage people to participate in knowledge sharing activities in a way that it can be seen to be valued by the company. They can reinforce and convey the desired culture by providing tangible evidence of what it values. The efforts of the company to reward those individuals and teams who share their knowledge in a spirit of collaboration and innovation are therefore congruent with creating the type of learning organization. The concurrent emphasis on rewarding team performance rather than just the excellence of the individual is also supportive in a project work context.

The acquisition and sharing of knowledge within a project is assisted by a person's strong motivation concerning the goals of the project. Situational external factors, such as management style and project culture, are

often critically important to the success of knowledge sharing in project work. It is also important to remember that for knowledge sharing to occur the motivation (i.e. both individual and organizational) has to be positive and in this, the attitude of the project stakeholders in the sharing relationship is crucial. More intensive sharing of knowledge will come about when the people involved are committed to sharing, willing to negotiate and prepared to work on the different issues related to sharing in a co-operative way. The successful project-based company has a committed and motivated and entrepreneurially minded core personnel and a management approach that strongly supports their working conditions.

Trust

Knowledge and trust share several properties and characteristics (e.g. Huemer *et al.*, 1998). Knowledge, like trust, is history-dependent and context-sensitive (von Krogh *et al.*, 1994). Consequently, neither trust nor knowledge can be universally defined but must be dealt with according to history, relationship and context. Both knowledge and trust reduce uncertainty and complexity: 'Trust cannot reasonably exist without knowledge, i.e. we might hope or even be ignorant, but we cannot trust' (Huemer *et al.*, 1998: 140).

When the relationship between a project company and a customer is based on trust, many benefits are achieved by both parties (see Table 6.2). According to Huemer *et al.* (1998), in a project-based company customer relationships, single sourcing, outsourcing, early supplier involvement and the just-in-time (JIT) philosophy are different phenomena that all have a bearing on trust. When parties recognize that they have common interests, co-operative relations more readily ensue. In situations of high probability of future association, however, parties are not only more likely to co-operate, they are also increasingly willing to punish defectors (e.g. Powell, 1996).

The assumptions of self-interest seeking with guile and opportunism seem unjustifiable (e.g. Huemer *et al.*, 1998). But so do assumptions of trustworthiness (e.g. Ring and van de Ven, 1994). In other words, the idea of trust depends on assumptions that allow for uncertainty and diversity in human behaviour. The claim resonates well with Ghoshal and Bartlett's (1994) view, which reflects a relativistic perspective on personal attributes, and more a view on human behaviour.

Some authors (e.g. Baier, 1986; Meyerson *et al.*, 1996; Rousseau *et al.*, 1998) define trust as an individual's reliance on another person under conditions of dependence and vulnerability. *Dependence* means that

Table 6.2 Benefits of trust in project company–customer relationships

With trust	Without trust
Long-term contracts, repeat business, and sole-source contracts	Continuous competitive bidding
Minimal documentation	Massive documentation
Minimal number of customer–project company meetings	Excessive customer–project company meetings
Team meetings without documentation	Team meetings with documentation
Sponsorship at middle-management levels	Sponsorship at executive levels

Source: Kerzner (1997); reproduced with the permission of John Wiley & Sons.

one's own outcomes are contingent on the trustworthy or untrustworthy behaviour of the other, and *vulnerability* means that one would experience negative outcomes from the other person's untrustworthy behaviour. Meyerson *et al.* (1996) define vulnerability in terms of the goods or things one values and whose care one partially entrusts to someone else who has some discretion over their behaviour. Because self-sufficiency is rare in a project work context, vulnerability is common. This means that trust includes approved vulnerability to another's possible, but not anticipated, ill will (Baier, 1986).

Most conceptions of how trust develops emphasize that personal trust is a history-dependent process (e.g. Lindsfold, 1978). This means that the personal trust builds incrementally and accumulates. Many conceptions of trust refer to expectations (e.g. Luhmann, 1979; Ring and van de Ven, 1994; Rousseau *et al.*, 1998) that are in turn based on the trustor's perception of the motives and the abilities of the trustee. Ring and van de Ven (1994) argue that expectations are the bases for an explanation of the development of inter-organizational relationships, which in turn are grounded in the motivational and cognitive predispositions of individuals to engage in sense making and bonding processes. Expectations are thus also crucial aspects of trust in a project work context.

Trust is thus a structure of meanings embedded in a team member's worldview. It is rather permanent, but can be destroyed rather quickly when something negative happens in a person's situation that puts an end to expectations concerning the other party's behaviour.

It is likely that if trust is violated then distrust between the parties rather than a continued state of trust ensues, especially if such violations are viewed as deliberate rather than due to circumstances beyond the control of the violating party (Luhmann, 1979). Furthermore, in a crisis situation, incorrect allocations of resources based on trust violations could be fatal for project implementation: the vulnerability aspect of trust is even greater in crisis situations than in routine non-crisis situation.

Lewis and Weigert (1985) suggest that various qualitative mixes of cognitive, emotional and behavioural contents make it possible to categorize different types of trust. They also argue that trust in everyday life is a mixture of feelings and rational thinking. Excluding one or the other leads to pure faith. According to Moorman *et al.* (1993), the practical significance of trust lies in the social attitudes and actions it underwrites. This means that trust takes different forms, depending on what its bases are and how it is communicated and manifested (e.g. Lewicki and Bunker, 1996; Huemer *et al.*, 1998; Rousseau *et al.*, 1998). In other words, trust is formed from different components. Both technically competent performance and fiduciary responsibility in fulfilling contracts are needed in different mixtures of work settings: both components of trust are always present in a successful project implementation (cf. Barney and Hansen, 1994).

Researchers have generally argued that different forms of trust vary considerably in their 'thickness'. For example, the trust associated with close personal relationships has generally been characterized as a 'thick' form of trust that is relatively resilient and durable (e.g. Janoff-Bulman, 1992; Powell, 1996). Other forms of trust, in contrast, have been characterized as 'thin' forms of trust because they are negotiated in a cautious manner and withdrawn easily. Therefore within these forms of trust the expectations are high, but so are the reservations.

Deterrence-based trust (i.e. calculus-based trust)

The most fragile relationships are contained in deterrence-based trust (a 'thin' form of trust) (e.g. Shapiro *et al.*, 1992; Gulati, 1995; Lewicki and Bunker, 1996; Sheppard and Tuchinsky, 1996; Greenberg and Baron, 2003): one violation or inconsistency can destroy the relationship. This is based on the fear of reprisal if the trust is violated: individuals who are in this type of relationship do what they promise because they fear the consequences of not fulfilling their obligations. In other words, deterrence-based trust emphasizes utilitarian considerations that may also lead to believing that a partner will behave in a trustworthy manner.

Potential sanctions, such as loss of reputation and of repeat business, which are perceived to be more costly than any potential benefits of opportunistic behaviour, may cause deterrence-based trust.

Deterrence-based trust will work only to the extent that punishment is possible, consequences are clear and the punishment is actually imposed if the trust is violated. To be sustained, the potential loss of future interaction with the other party must outweigh the potential profit that comes from violating the expectations. Moreover, the potentially harmed party must be willing to introduce harm to the person acting untrustingly.

If one party violates the deterrence-based trust, the other party can either to renegotiate the relationship, to improve the desired outcomes, or seek another relationship. Repairing of deterrence-based trust assumes that both parties prefer to do so relative to best-alternative relationships to meet the same need (Lewicki and Bunker, 1996).

Role-based trust

There is not always time in temporary project teams to engage in the usual forms of trust-building activities. Therefore the people in project teams often deal with each other more as roles than as individuals. Trust manifests itself in impersonal form and on categorical assumptions until personal contacts are made. But, although the role-based trust is a 'thin' form of trust, it is a 'thicker' form of trust than the deterrence-based trust.

Expectations of ill will or good will develop in project teams just as they do in other forms of organizations. However, because the project teams have not enough time for these expectations to be built from zero, they are imported from other settings and applied in project teams in categorical forms. Expectations defined rather in terms of categories are especially probable because people have little time to judge each other (Fiske and Taylor, 1991).

If people in project teams deal with one another more as roles than as individuals, which is probable because the project is often built of strangers interacting to achieve set objectives, then expectations should be more stable and defined in terms of professions than personalities. As Dawes (1994) notes: 'We trust engineers because we trust engineering and believe that engineers are trained to apply valid principles of engineering.' In an engineering project it is assumed that a civil engineer knows things concerning construction, and an electrical engineer knows things concerning electrification (Koskinen and Pihlanto, 2003).

If one party violates the role-based trust, the other party can try to repair it in the same way as described above in the case of deterrence-based trust.

Knowledge-based trust

Most organizational relationships are rooted in knowledge-based trust (a 'thick' form of trust) (e.g. Shapiro *et al.*, 1992; Gulati, 1995; Lewicki and Bunker, 1996). That is, trust is based on the *behavioural predictability* that comes from the history of interaction. It exists when an individual has adequate knowledge about someone to understand her well enough to be able to predict considerably accurately her behaviour. According to Shapiro *et al.* (1992: 369), mutual trust results from predictability, for it produces a 'self-fulfilling prophecy' effect. People often act co-operatively towards those they expect to be co-operative, and this action encourages the receivers of co-operative gestures to reciprocate in kind.

The repair of violated knowledge-based trust is problematic, because the violation presents a direct threat to the victim's self-image and self-esteem. According to Lewicki and Bunker (1996), violation of knowledge-based trust suggests that the victim has been very wrong about the violator (i.e. she does not know that person as well as she previously thought).

Identification-based trust

The 'thickest' form of trust is identification-based (e.g. Lewis and Weigert, 1985; Shapiro *et al.*, 1992; Lewicki and Bunker, 1996; Robbins, 2003). It is achieved when there is an emotional connection between the parties. Identification-based trust allows one party to act as an agent for the other and substitute for that person in interpersonal transactions. Trust exists because the parties understand each other's intentions and appreciate each other's wants and desires. This mutual understanding is developed to the point that each one can effectively act for the other. This form of trust, again, underlines the relevance of feelings in communication between people.

The repair of violated identification-based trust is even more problematic than repair of violated knowledge-based trust. A restoration of trust to its former state is not often possible.

As noted above, project teams often lack the requisite history on which incremental and accumulative trust-building measures can be asserted. There is in many projects neither enough time nor opportunity for the sort of experience necessary for a 'thick' form of trust to emerge. Therefore a 'hedge' may be used in order to reduce the perceived vulnerability of trust by reducing interdependence between the parties involved. Hedges minimize the dangers of misplaced trust, when the goods dealt

with are of high value (Baier, 1986). Hedges imply an attitude that one trusts the other, but only partly. The existence of a hedge allows one to enter a vulnerable activity because the worst-case outcome is covered.

For example, most customers buying new software are very reluctant to trust the company supplying only a single copy of software. Creating a backup of the software as a hedge (a contract regarding after-sales services) enables the customer to trust the supplying company, even though it has had little or no prior experience with it. Hedges imply an orientation that resembles the attitude of wisdom described by Meacham (1983) as a stance of simultaneously believing and doubting, understanding and questioning.

Because it is possible that the project team will not achieve the set objectives, the members entrust their reputations. This means that there exist vulnerabilities in terms of loss of reputations and grounds for expectations of goodwill in terms of the reality of interdependence. However, the realities of project work interdependence can forestall intentional harm to those reputations. Team members know that their specialities are crucial and worthless without links to other team members. They also know of the implicit threat to their own reputations if they do not perform. A well-known saying 'We all are in the same boat' describes the situation well.

As said above, an approach to deterring untrustworthy behaviour is to provide possibilities for interactions. The more the project stakeholders have opportunities for mutual communication, the more they can improve trust. For example, project team members may begin their interactions with a series of social messages (e.g. Pinto and Kharbanda, 1995; Kerzner, 1997). They then increase knowledge-based trust by introducing themselves and providing some personal background before focusing on the work at hand.

By clarifying the roles for each project team member, it is possible to improve trust among the project team. This clarification makes clear that team members are dependent on a variety of expertise. Assigning each member a particular task enables all of them to identify with one another, forging a foundation for identification-based trust. Especially at the outset of the project, dependency is strongly forged when an ambiguous knowledge drives the team, whether it is constructing a new building or developing a new product. The issue of identification is a critical one in all project work environments.

Several authors (e.g. Thamhain and College, 1993; Pinto and Kharbanda, 1995; Kerzner, 1997; Tuckman and Jensen, 1997; Järvenpää *et al.* 1998) have reported that the project teams with the highest levels of trust tend to share three key traits:

- *They meet deadlines.* If an individual promises to get something done on time, it is essential to meet that deadline. Although few incidents of lateness may be overlooked, people who are chronically late in meeting deadlines, rapidly gain a reputation for being untrustworthy (Greenberg and Baron, 2003).
- *They spend time in sharing personal values and goals.* Identification-based trust requires a keen understanding and appreciation of others.
- *They have the hallmark of the trusting team, the right attitude.* Project team members consistently display eagerness, enthusiasm and an intense action orientation in all their communication. According to Järvenpää *et al.* (1998), one pessimist has the potential to undermine an entire project team.

To sum up, trust is critical to successful knowledge management in a project work context. Despite its value, it continues to be a most difficult intangible to create and maintain, especially in large project-based companies. The potential is in its lasting effect on knowledge management once it is properly embedded into the company and maintained within company politics. However, because there is not always time in a project work context to develop 'thick' forms of trust, project teams have to often accept 'thin' forms of trust as a reality that they must manage.

Trust is based on understanding, with the help of which people try to understand their partners' behaviour, state of mind and motives. The development of relationships directs the process. When a feeling of trust becomes established, it affects the perceptions of a partner's motives more than does behaviour and so trust has an indirect effect on the efficient transfer of knowledge. The greater the level of trust, the greater the level of openness, and the better the opportunities for knowledge to be transferred.

Trust develops only with time as the result of interpersonal relations. In temporary organizations, which project teams are, the trust of individual project team members is often based on the roles of the other team members and therefore the utilization of tacit knowledge within a project team may be problematic. The shared experiences of project team members, experiences that are derived from previous jointly

implemented projects, improve the possibilities to share all types of knowledge.

Caring attitude

Caring attitude is the aspiration to help others to succeed: 'Someone who shows supportiveness is dedicated to the team's success and wants what's best for the team, works behind the scenes to aid the team, willing to pitch in whenever necessary, always willing to help out, willing to take on more responsibility, very easy to work with, and listens well to others' ideas' (LaFasto and Larson, 2001). A caring attitude, like all other attitudes, is a meaning structure in a team member's worldview. It causes positive behaviour towards other team members.

According to West (2004), a team's caring attitude is a multidimensional concept that includes four types: emotional support, informational support, instrumental support and appraisal support. Someone who provides a shoulder to cry on, encouraging words and is sympathetic of others' pain is said to be a team's *emotional support*. A team member who provides team *informational support* exchanges necessary knowledge about a certain thing to her colleagues. A team member who is actually 'doing the support' provides team *instrumental support*. *Appraisal support* is the help individual team members can provide to make sense of a particular problem (Somech and Drach-Zahavy, 2002).

According to von Krogh (1998), a caring attitude influences knowledge sharing. Care includes four dimensions (see also Mayeroff, 1990):

- *Mutual trust* Trust compensates for lack of knowledge about other people and is necessary in order to ensure that people can help each other – to give and to accept help. Furthermore, knowledge and trust share several properties and characteristics (e.g. Huemer *et al.*, 1998; Koskinen and Pihlanto, 2003, 2007). Knowledge is history-dependent and context-sensitive (von Krogh *et al.*, 1994), or situation-sensitive just like trust. Consequently, neither trust nor knowledge can be universally defined, but must be dealt with according to history, relationship and context. Both knowledge and trust reduce uncertainty and complexity: 'Trust cannot reasonably exist without knowledge, i.e. we might hope or even be ignorant, but we cannot trust' (Huemer *et al.*, 1998: 140).
- *Active empathy* Empathy means that an individual can understand another individual's situation, interests, skill level, history, opportunities and problems. 'Active' describes the situation when an individual proactively seeks to understand another individual.

- *Access to help* Having access to help means that an individual needing help is able to find it immediately.
- *Lenience in judgement* Lenience in judgement is needed especially when members of the project team experiment with new solutions and produce errors. This means that errors are not judged harshly, which could possibly prevent future experimentation.

Von Krogh distinguishes between *high-care relationships* and *low-care relationships* in organizations and points out that 'when care is low among team members, the individual will try to *capture* his knowledge rather than share it voluntarily' (von Krogh, 1998: 139).

Motivation is essential to caring. In project work an individual team member commits herself to the project. Motivation is not an optional element, as if an individual might be said to care but also not be motivated. When motivation breaks down, the caring breaks down, too. Motivation does not simply measure the extent of an individual project team member's caring; it is through motivation that caring for a project acquires substance and its particular character. According to Mayeroff (1990), caring attitude develops in the process of overcoming obstacles and difficulties.

In the opinion of Mayeroff (1990: 11), obligations that derive from motivation are a constituent element in caring, and an individual who acts with a caring attitude does not experience obligations as forced on him. This means that there is a convergence between what an individual feels he is supposed to do and what he wants to do. According to Styhre *et al.* (2002), the concept of 'caring attitude' brings together sense making concepts such as culture and emotions, at the same time as it underlines the relational qualities inherent in a project team's work. Care makes sense at the same time as it reproduces mechanisms for exchanging experiences and know-how. To be caring is to invest time, effort and concern in the surroundings and to be aware of the need for continuous interaction with the other project team members.

Indeed, care is 'a serious attention [need], a feeling of concern and interest' (von Krogh, 1998: 137). When the project team members interact with care, mechanisms for open and non-demanding relationships are established. When people act with care they are aware of the elusive nature of relationships between team members and their abilities. However, high-speed and time-pressured project work does not always give a chance to promote a caring exchange of ideas and suggestions between team members.

To sum up, a project stakeholder is able to show a caring attitude when has conflict resolution knowledge, skill and the ability to:

- Recognize and encourage, but not discourage undesirable, team conflict
- Recognize the type and source of conflict confronting the team and implement an appropriate conflict resolution strategy
- Use an integrative (win-win) strategy.

Or, when he has collaborative problem solving knowledge, skill and the ability to:

- Identify situations requiring participative group problem solving and use the proper degree and type of participation
- Recognize the obstacles to collaborative group problem solving and implement appropriate corrective actions.

Or, when he has communication knowledge, skill, and the ability to:

- Understand communication networks and where possible use decentralized networks to enhance communication
- Communicate openly and supportively and send messages that are behaviour or event oriented (congruent/validating/conjunctive/and owned)
- Listen non-evaluatively and use active listening techniques
- Maximize consonance between non-verbal and verbal messages and recognize and interpret the non-verbal messages of others
- Engage in ritual greetings and small talk, and recognize their importance (cf. Stevens and Campion, 1994).

Physical system and proximity

The physical system is one of the numerous elements of company's capability (Leonard-Barton *et al.*, 1994). According to Thamhain and Nurick (1994), there are significant correlations and interdependencies among environmental factors and team performance: 'the physical environment does not have to be fancy but it must reflect the professional level and needs of those involved.' Self-evidently, a person's situationality affects her behaviour – e.g. performance in teamwork – and the physical system is a part of it. Factors commonly cited as important are:

- Equity in allocating work space and facilities on the basis of needs rather than rank

- Adequate equipment, materials and test sites
- Minimal work space reassignments that interfere with the work flow.

The physical system may be provided to the project by the management as a given fact that cannot be affected. Often facilities, such as offices, workshops and testing shops are in this category. On the other hand, it is often impossible to determine the exact need for equipment, tools and materials before the work has been started, and it is the responsibility of the project leader, together with the team, to specify and acquire these resources during the implementation of the project. Here the ideal role of management is expected to be in providing fast support and flexible funding for these needs. According to Thamhain and Nurick (1994), team members would be unlikely to have a sense of organizational stability, project priority and sufficient resource allocation if management showed little concern for long-range planning and management of the work environment (cf. Rouhiainen, 1997).

The degree of certainty in project work is related to the proximity and understanding that exists among team members and other project stakeholders. Brown and Duguid (1991) stress that the sharing of knowledge is most pronounced in proximate organizations. A common history of interaction between project participants makes it easier for people to monitor each other and, thus, reduces the time required to identify relevant counterparts with whom experiences and knowledge can be exchanged. According to autopoietic epistemology, a history of interaction can give a rise to a common language that can be linked to a specialist area of knowledge or practice. The development of a shared language and other codes of communication and interaction improves the fluidity of knowledge in project relationships. The common environment situation thus offers means of knowledge sharing, social bonds, norms, values and institutions (North, 1990; Meyer and Scott, 1992) that contribute to certainty and trustworthy relationships. These factors can improve the process of knowledge sharing and learning in a project.

In general, organizations can be described as physical structures, which have 'the architectural design and physical placement of furnishing in a building that influence or regulate social interaction' (Davis, 1984). Research (e.g. Souder, 1981; Davis, 1984) suggests that physical structure can influence the type of interaction that occurs within and among people in an organization. Frequent interaction among people tends to produce interpersonal attraction, while also creating the conditions necessary for high task performance (Oldham and Brass, 1979; Moenart and Souder, 1990). According to Peters (1990), individuals most likely

interact with others when the physical characteristics of the building or settings encourage them to do so: 'If people want to share meaning, then they need to talk about their shared experience in close proximity to its occurrence and hammer out a common way to encode it and talk about it' (Weick, 1995: 188). Many companies have recognised the intrinsic value of water coolers, coffee machines, subsidized canteens and common rooms as being instrumental in facilitating interaction between their employees.

Some research has investigated the effect of physical proximity among team members on project outcomes (e.g. Allen, 1977; Keller and Holland, 1983; Keller, 1986). According to Pinto *et al.* (1993), these findings have, however, been somewhat inconclusive in establishing a link between physical distance among project team members and project outcomes. While not directly influencing project outcomes, Allen (1977) and Keller and Holland (1983) have demonstrated that proximity is useful for enhancing interaction among project team members. Pinto *et al.* (1993) argue that although the research has not supported the link between physical distance and actual project outcomes, proximity can be an effective tool in creating supportive team relationships and improved communication flows. For example, practice shows that an open plan-type office is an appropriate room for a project team to work together. Pinto *et al.* (1993) also argue that modern communication technology tools, like electronic mail, are impersonal means of communication and details, confidential issues and the idiosyncracies of messages often hinder their effectiveness. These tools are useful for routine communication but are less effective in situations that are non-routine. In an organic project work environment projects often entail a significant amount of non-routine activities.

Indeed, physical separation produces communication barriers between project team members. Co-operation becomes more difficult if a person is separated from the rest of the team. Instead of engaging in direct communication, those who are separated must choose written communication channels and they will have few connections to the rest of the team members. Those who separate themselves do not participate in informal events; however, over half of informal conversations are related to issues at work (Ruuska, 1999). Project work is by and large co-operation, within the project team as well as between the project team and its environment.

While physical proximity establishes a context for interaction, another factor – accessibility – determines the type and frequency of interactions that occur (Pinto *et al.*, 1993). Accessibility can be defined as an individual's perception of his or her liberty or ability to approach

or communicate with another organizational member. Factors that influence the type and amount of interaction that occurs between organizational members include an individual's schedule, position in an organization and out-of-office commitments. Souder (1981) indicates that the lack of communication, lack of appreciation and distrust which often exist between marketing and R&D is fostered by normal time pressure, work deadlines and some imbalance of power and prestige. Zaltman and Moorman (1989) suggest a causal link between interaction and trust: interaction is easier when the parties are accessible.

There is a crucial difference between *accessing* knowledge and actually *exploiting* it (Cohen and Levinthal, 1990). Hamel (1991), examining the process of interpartner learning in strategic alliances, underlines the distinction between gaining access to a partner's knowledge and the actual internalization of it. For example, a company might gain access to the partner's files on quality management, but without underlying knowledge of how the practices were developed and how they are actually carried out, they are of no value outside the narrow terms of the agreement (Wathne *et al.*, 1996; Daft and Huber, 1987; Huber, 1991).

Organizational designs influence the inter-team relations or the extent to which informal networks grow. Galbraith (1994) argues that although informal networks within organizations occur naturally and randomly, organizations can be designed in a way that eliminates the randomness in their creation. Paying deliberate attention to the design of large and complex projects can play a significant role in accomplishing this task (Ayas, 1997). The tendency in the majority of organizations is to assign projects to the existing structures and thus create formal, rigid systems for large and complex projects. Yet, along the course of a project the needs and requirements may change and the project may benefit from different emerging structures.

To sum up, an innovative architecture for learning and knowledge sharing may involve a building with different rooms for different phases of project implementation, one with an open plan that fosters intermingling and communication, and with separate rooms for privacy and concentration.

Organizational culture/project culture

Organizational culture is a component of project members' situations, which is also embedded in their worldviews – if they have adopted and understood the culture. Culture contains the basic, taken-for-granted assumptions and deep patterns of meaning shared by organizational participation, and the manifestation of these assumptions (Slocum, 1995).

The failure of many knowledge management systems is often as a result of cultural factors rather than technological oversights, especially in organic project work environments. However, culture, by its very nature, is a nebulous subject with a variety of perspectives and interpretations.

Studies on organizational culture and project culture have been able to shed light on project teams and project-based companies on a whole as epistemological systems. In addition, they have stressed the importance of such human factors as values, meanings, motivations, symbols and beliefs, and paved the way for more elaborate research on knowledge management in a project work context. A culture that is able to harness knowledge as a *transferable asset* that can be used to enhance future projects can, and should, be created. Continuous learning at individual, team and company levels should be embedded within the project-based company's culture (Brown and Duguid, 1991).

The importance of culture has also been emphasized by organizational theorists such as Burns and Stalker (1961), who present a case for organic as opposed to mechanical structures. There are many arguments that suggest that in order to facilitate knowledge sharing, work environments must be simultaneously tight and loose. There appears to be a high dependency on knowledge, with the development and maintenance of an appropriate context within which knowledge sharing can occur. The key distinguishing factor between projects that are successful in managing knowledge and those that are not is the ability of management to create a sense of community in the work place. Highly successful projects behave as focused communities, whereas less successful projects behave more like traditional bureaucratic departments. It is therefore possible to conclude that 'project culture' refers to underlying values and principles that serve as a foundation for project management (Denison, 1990). From a socio-historical aspect the project culture is created in a situation where new concepts of the 'right' and 'wrong' ways of operation are born within mutual experience. The culture stabilizes the project's ways of operation, and at its best supports the initiative and efforts of an individual in her daily work.

Project culture may determine individual behaviour, but it is also concurrently constituted through human behaviour (Swieringa and Wierdsma, 1992). Culture awareness increases the likelihood of learning becoming a natural process in the project. This requires bringing to the forefront the hidden, basic assumptions and beliefs embedded in the project and developing the capability to engage in double-loop learning, using the inquiry processes that Argyris and Schön (1978) suggest. This means that a project design to be effective for learning necessitates

a context where team members can question institutional norms (Ayas and Zeniuk, 2001). Project culture based on motivation to find the truth and inquiry starts at the individual team members' levels as they reflect on their actions and how they contribute to their problems, feel the necessity to change and see their own part in the change process (Senge, 1990).

Because project culture and organizational culture as a whole are such a difficult concept to capture and describe, it is important to identify the basic elements of predominant cultures within them. According to West (1997), the two fundamental dimensions of organizational culture are flexibility versus control, and internal versus external orientation. High flexibility is characterized by 'flatter' organizational structures, decentralized decision-making and low specialization of jobs (cf. the organic project work environment), while high-control cultures tend to be very hierarchical in their structures, with centralized decision making and many specialized jobs with a proliferation of job titles (cf. the mechanical project work environment).

Project managers often engage in transactions with several different cultures simultaneously. They typically work within their own base organization core culture; with the sub-cultures of other departments within the organization (R&D, marketing and sales or manufacturing); or with an external customer's core culture. Each has their own inherent 'ways of doing things around here to succeed' (Suda, 2006: 52). This means, for example, that understanding and speaking the language of the immediate culture is critical for project success. Effectively communicating with the surrounding culture can help to develop plans and strategies that will be recognized and respected by the project, while avoiding practices that violate the beliefs and values of the client organization. Project managers have many opportunities and duties to create and shape a project culture in purposeful ways. Very often the project culture must be in alignment with the organization's lead culture. This is an important part of project team development and a healthy team climate, and sets the stage for ensuring project success.

Internal forces such as the project's structure and management style affect the project culture. Rigid, formal and command-and-control structures, for example, can promote functional efficiency at the expense of collaborative and innovative activities. Moreover, sub-cultures typically exist within the overall structure of a project, and they grow up in different locations, occupations, and the provision of services. Sub-cultures may be very different from the base organization's culture, even within the same organization. External forces often shape project culture and

are very powerful since projects reflect national, trans-national, regional, industry and occupational ideologies. These may take the form of religion, political ideologies and environmental concerns. The substance of a project's culture may reflect many beliefs, only some of which originate within the project.

Since the final product of a project delivery consists of the work of several experts in various fields, the cultures of the basic organization and of the various professional groups meet. Different professions typically have their own cultures and ways of working that are not necessarily in harmony with the rules of the project (Ruuska, 1999). When various cultures are effectively joined, the result is a project organization that is able to mediate the message widely and get everyone working for a common goal. A good project culture therefore requires a directing whole which consists of an organizational culture and a strong professional culture (Figure 6.6). What is in question is a synthesis of cultures: one should not even attempt to unite the various professional cultures but rather seek appropriate modes of co-operation and communication for the project at hand.

In the opinion of Brown and Eisenhardt (1997), culture is important in encouraging team members to share knowledge and, according to them, successful project organizations appear to be good places to work and share knowledge. In these types of atmospheres interpersonal communication tends to be non-problematic. Furthermore, the basic challenge in project organizations may not be the transfer of tacit knowledge into explicit knowledge, but the 'bumping up' of knowledge one level so that it becomes part of the decision making process of the project team and/or project-based company.

Understanding the culture is critical to running a successful project. Culture resides in every fold of a project, influencing the dynamics of how people perform, relate and perceive the project's impact on their

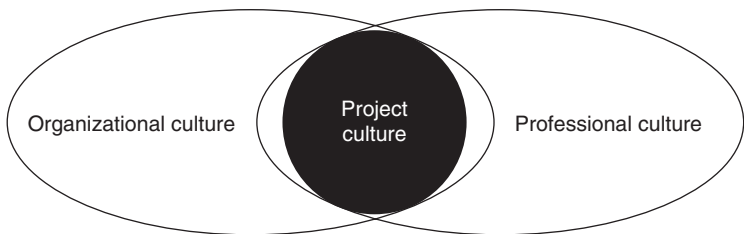


Figure 6.6 Project culture

Source: Ruuska (1999: 49).

lives. However, individuals, project teams and organizations seldom fit one particular type of organizational culture because they represent complex social systems and mixtures of many cultural patterns.

Values

Values are abstract concepts, and they are very general. They refer to various personal goals such as status or power, and to the means of attaining these goals. Values are thought to exert a broad influence on society and over any related activity. They can help to explain behavioural differences among various project teams (Gudykunst, 1988).

The values individual team members follow in their work must be understood by them – i.e. these values must be in their worldviews in the form of meanings. The clearer these meanings are, the better the team members behave in accordance with them.

Values may determine 'how things ought to be in the team'. If the values of different project teams are similar, the behaviour has a potential to be similar (Lachman *et al.*, 1994). Values can be considered in a framework where some are more important than others (Figure 6.7). Values higher in the hierarchy are more enduring and resistant to change, and have more power to control social behaviour.

Organizational values fall into four categories and it is important to avoid confusion between them (Lencioni, 2002):

- *Core values* are deeply ingrained principles that guide a company's actions. They are never compromised for convenience or economic gain and often reflect the values of the company founders.
- *Aspiration-based values* are values to support a new strategy. They are values that the company needs to compete in the future, but currently lacks.

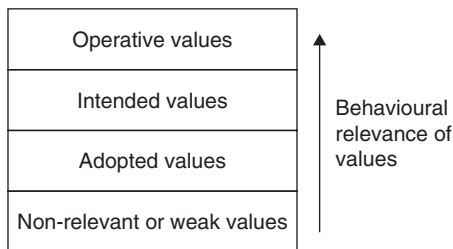


Figure 6.7 Value framework

Source: Ronen (1986); reproduced with the permission of John Wiley & Sons.

- *Permission-to-play values* are the minimum behavioural and social standards required of people in the company.
- *Accidental values* are values that arise spontaneously over time. They reflect the common interests or personalities of personnel. They may be positive, such as inclusion of employees, or negative, such as ingrained mistrust of management.

Core values guide every action and decision that a company makes. They form the fabric underlying every recruitment, selection, appraisal and reward policy. If the core values are poorly implemented, they can lead to mistrust and cynicism about senior management motives (Jashapara, 2004). Core values require constant vigilance to make explicit what a company stands for and to act as a rallying call to guide people's actions. They can reinforce individual commitment and willingness to give energy and loyalty to a company. Individuals may make sacrifices and investments based on company values.

Hofstede (1991) argues that values are unconscious to those who hold them. The team members may not be able to articulate these meanings, but still may behave according to them. Therefore, they cannot be discussed; they can only be understood by others by observing the way people act in various situations. Values influence behaviour through either behavioural channelling or perceptual screening, or both. In contrast to values, the culture is claimed to be an entirety made up of beliefs, needs and cognitive processes. Beliefs reflect how people construct their social reality. They are composed of an object and an associated attribute; thus, they can be discussed.

The value agendas of managers and project leaders of project-based companies can be organized under three broad imperatives – *orienting*, *institutionalizing* and *sustaining* company values (Goodpaster, 1989). The first two deal with placing value considerations in a position of authority alongside considerations of profitability and competitive strategy in the company mindset. The third imperative (sustaining) has to do with passing on the spirit of this effort in two directions: to future leaders of the company and to the wider network of organizations that make up the social system as a whole.

Orienting

Managers and leaders must first *identify* and then, where needed, attempt to *modify* their organizations' (i.e. companies' and projects') shared values. Such a prescription cannot be followed without first performing a kind of 'value inventory'. What is needed is a sounding process sophisticated enough to get behind the natural cautions, defences and

espoused values of people. Managers and leaders must listen to and understand their organizations in ways that reach its character strengths and defects. Such a process is relatively easy in a small organization (e.g. in small project teams) because behaviour is observable daily and communication is direct. But in large companies the task is much more complex, and almost different in kind.

Institutionalizing

Once managers and leaders have identified characteristic values and value conflicts – and have clarified the direction they want to take in whole or in part – the process of institutionalization becomes paramount. Possible acts could be, for example, decisive actions, a statement of standards with regular audits and appropriate incentives.

Since ‘actions speak louder than words’, a major factor in the process of institutionalizing company/project values is leadership activity that has both wide visibility and clear ethical content. Such actions serve as large-scale demonstrations to the rank and file of the seriousness and importance that management attaches to needed values.

Every company and project addresses values somewhat differently. Nevertheless, certain elements will be common to the process of institutionalization in any company and/or project. A statement of norms, along with a monitoring process, is one of those common elements.

Sustaining

To sustain values is to communicate them to the all project stakeholders as well as to the wider social system. The objective is to reach a ‘fit’ between the mindsets of the people working in the company and its projects. Without some degree of ‘value fit’ or congruence, the company mindset simply cannot survive or replicate itself.

Thus, project values have considerable potency as they tend to link the social, cognitive and behavioural dimensions of a company. The social aspects characterise the history of experiences and understandings of teams within the company. The cognitive aspects draw on the history and experiences of individuals within these teams, and the behavioural aspects show how these values affect individual actions and interactions (Ashkanasy *et al.*, 2000).

Norms

Norms are expectations of appropriate and inappropriate behaviour. These may be norms about dress code or issues such as expectations surrounding performance and handling conflict. Norms attach approval

or disapproval to holding certain beliefs and attitudes and acting in particular ways. They can vary along two dimensions (O'Reilly, 1989):

- Intensity of approval or disapproval attached to an expectation
- Degree of consistency with which a norm is shared.

At a team member level, norms are a part of the worldview, and are therefore more or less individually understood. A project team's norms are like an individual's fingerprints – each is unique. Yet there are still four common classes of norms that appear in most teams (Goodman *et al.*, 1987):

- Probably the most common class of norms is *performance norms*. Project teams typically provide their members with explicit cues on how hard they should work, how to get the job done, their level of output, appropriate levels of effort, and the like (Blau, 1995). These norms are extremely powerful in affecting an individual team member's performance – they are capable of significantly modifying a performance prediction that was based solely on the team member's ability and level of personal motivation.
- A second category encompasses *appearance norms*. These include things such as appropriate dress, loyalty to the project team or company, when to look busy and when it is acceptable to leave early. Some companies have formal dress codes. However, even in their absence, norms frequently develop to dictate the kind of clothing that should be worn to work. Similarly, presenting the appearance of loyalty is important, especially among professional employees and those in the executive ranks. So it is often considered inappropriate to be openly looking for another job.
- Another category concerns *social arrangement norms*. These come from informal work groups and primarily regulate social interactions within the team. Whom team members eat lunch with, share friendship on and off the job, social games, and the like are influenced by these norms.
- A final category relates to *allocation of resources norms*. The norms can originate in the team or in the company and cover things like pay, assignment of difficult tasks and allocation of new tools and equipment.

Beliefs, attitudes and assumptions

Beliefs are the manifestation of a culture embedded in the project members' worldviews. Beliefs concern what people think to be true. For

example, some project leaders may believe that adaptive learning (i.e. single-loop learning) is more likely to lead to greater companywide performance whereas other project leaders may believe it is generative learning (i.e. double-loop learning) that will achieve their goal. Sometimes values and beliefs may be hard to distinguish, especially where the belief and value, such as learning styles, are closely related. Values could be considered as enduring beliefs where certain actions are considered socially more appropriate than others (Rokeach, 1973).

The attitudes of people connect their beliefs and values with feelings (Brown, 1998) in their worldviews. They are a learned predisposition to act in a favourable or unfavourable manner in a given circumstance and situation, and involve evaluations based on individuals' feelings. According to Jashapara (2004), attitudes are more enduring than opinions and have an impact on an individual's motivation. They can result in prejudices and stereotypes, such as the negative attitudes towards projects' 'after- action reviews'. All these complicated processes are realized in the worldviews of project team members in terms of dynamics between different kinds of meanings.

Basic assumptions are the taken-for-granted solutions to particular problems (Brown, 1998). They are the 'theories-in-use (Argyris and Schön, 1978) that perpetuate organizational routines and single-loop learning. Assumptions are unconsciously held, making them difficult to confront or make explicit. They are highly complex interpretations based on individuals' beliefs, values and emotions. One typology of basic assumptions considers five dimensions (Schein, 1985):

- Whether an organization dominates the external environment or is dominated by it
- Whether truth and reality are received dogma, rules and procedures, a consequence of debate, or 'what works'
- Whether people are inherently lazy or self-motivated
- Whether 'doing' and work are more primary than 'being and valuing employees' private lives'
- Whether human interaction is based on individualism or collectivism.

In the opinion of Flannes and Levin (2001), many project team members join a new project team with a certain amount of 'baggage' located in their worldview. Such baggage can be feelings, attitudes, beliefs, assumptions, or expectations that have a negative tone and are the result of previous negative personal or professional experiences of the team member. In essence, the baggage becomes an impediment to the team

member's active, positive engagement with the work of the current team. The residual feelings that make up a person's baggage become a 'chip on the shoulder' that can hinder the team member's learning and knowledge sharing. Sources of baggage are located in people's worldviews and include:

- Previous or ongoing organizational problems, such as reductions in the work force
- Industry changes
- Health issues
- Career stalling
- Personal problems.

Creating an effective knowledge sharing culture in a project work context

Just as the organization transmits its values and beliefs to its members, the project leader also creates a 'team culture' by transmitting values and beliefs to the team members – into their worldviews. This process is aimed at developing project goals, objectives and team norms (e.g. how decisions are made, conflicts resolved, trust built, etc.).

The project manager can help the project team to develop and reach performance levels in a number of ways. One is to protect the team, particularly in situations in which there is a dominant base organizational culture that may interfere with accomplishing the project's mission. Another way by which a project manager can help build team effectiveness is by understanding and directly communicating the base organization beliefs and values to the project team. Providing the team with insights about potential conflicting values can help team members develop strategies to overcome potential problems.

For example, when a project leader leads a project team with the help of an exceedingly high-competence core culture in a situation in which the base organization's core culture is an extremely collaborative culture, the project team's competitive behaviour is very likely in direct opposition to the behaviours endorsed by the base organization. While the project leader can foster individual achievement and accomplishment, these values are incongruent with the base organization's values of co-operation and collaboration. The project team may run into the risk of confrontation and resistance against the base organization if they are not involved in critical project decisions. It is the project manager's responsibility to promote a better working relationship with the base organization; he

must ensure that the project team understands the nature and strengths of the base organization culture and help them to develop a healthy balance between these two distinct cultures – the organizational and team culture. This is not an easy task, because every team member must understand the issue at hand, and this happens only after the ‘right’ meanings have been formed in their worldviews. The current contents of everybody’s worldview and situationality may hinder and shape this process of forming meanings.

The key elements to help the project team to reach a high performance are an understanding of organizational matters and how each member of the team approaches tasks, how they relate to one another, their particular management and leadership styles and how they perceive the ‘way of success’. It is also useful for the project manager to know something about the team members’ backgrounds – i.e. the content of their worldviews and situationalities.

Indeed, differences in the assumptions and beliefs of each core culture and ‘how we do things around here to succeed’, have profound implications for the success of projects. Appreciating the values and beliefs of the base organization can help the project manager to understand how to adapt his behaviour and develop more effective approaches to make the project successful.

One of the ways to understand knowledge sharing cultures is to deploy a SECI knowledge creation model (Nonaka and Takeuchi, 1995) and the concept of ‘Ba’ (Nonaka and Konno, 1998) (Figure 6.8). According to the theory of existentialism, Ba is a context, which harbours meaning. Thus, Ba can be considered as a shared space that serves as a foundation for knowledge creation. According to Nonaka and Konno (1998), Ba can be thought of as a shared space for emerging relationships. This space can be physical (e.g. office, dispersed business space), virtual (e.g., email, teleconference), mental (e.g. shared experiences, ideas, ideals) or any combination of them. Ba provides a platform for advancing individual and/or collective knowledge. Nonaka and Takeuchi suggest that the process of knowledge creation is a spiral, moving from tacit knowledge to explicit knowledge and back to tacit knowledge. In other words, knowledge is created in the interaction of explicit and tacit knowledge. The harvesting of tacit knowledge from the individual and transforming it to explicit knowledge renders that knowledge is available to a much wider range of individuals. For example, an idea of a new product or project implementation method is formulated in the worldview of an individual but the social interaction of the individual with others is often the stimulus for this creativity. Nonaka and Takeuchi state that social

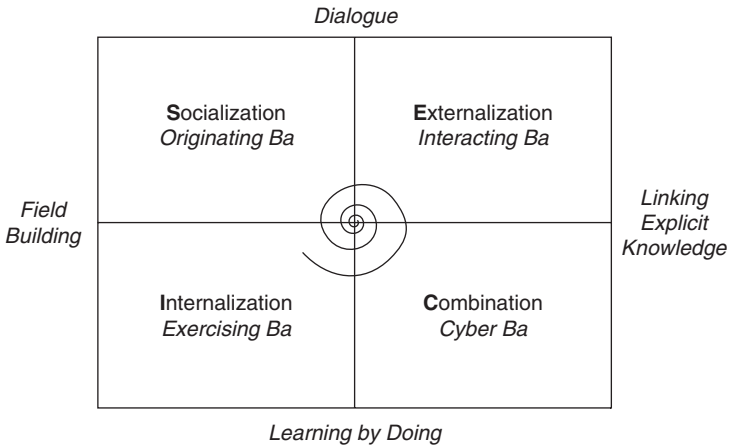


Figure 6.8 The SECI model

interaction creates a forum for nurturing, transforming and legitimizing new knowledge. It is a premise that projects and project-based companies should amplify this process by enabling social interaction to take place, by providing the mechanism and support for these processes to occur.

The matrix in Figure 6.8 details the processes that take place when knowledge flows from individuals to others:

- *Socialization* involves sharing tacit knowledge between individuals. Tacit knowledge is considered as more than 'know-how' and can include intuitions, hunches and insights. It is deeply embedded in a person's values and beliefs. The space that contributes to socialization is 'Originating Ba' where individuals share feelings, emotions, experiences and other contents of their worldviews. The values that support the transfer of this tacit knowledge are motivation, trust and care.
- *Externalization* involves the articulation of tacit knowledge into explicit knowledge. This conversion normally occurs through dialogue and the use of figurative language, metaphors, stories and creative inference. The space required to facilitate this knowledge conversion is 'Interacting Ba'. The main characteristic of this artefact is dialogue, where individuals share certain parts of their worldviews and reflect and analyse their own understandings.
- *Combination* involves conversion of explicit knowledge into more complex explicit forms. This may arise from capturing, collecting,

sorting, editing and integrating new explicit knowledge. Such conversions are promoted through 'Cyber Ba'. These cyber spaces encourage the documentation of knowledge and the use of database and groupware tools.

- *Internalization* relies converting explicit knowledge into tacit knowledge. This usually occurs through experience (learning-by-doing and learning-by-using) and training. The spaces that encourage such conversions are 'Exercising Ba', characterised by reflection through learning, training and mentoring.

Nonaka and Takeuchi draw the conclusion that while there are specific instances for the socialization, combination and internalization processes there is little research or knowledge about the process of externalization. Additionally, the process of socialization is often ignored because, being a transaction with no documentation, it is difficult to quantify or analyse.

Furthermore, Nonaka and Takeuchi (1995) detail specific circumstances that must exist in order to propagate knowledge creation in the individual: *intention*, *autonomy* and *fluctuation*.

Intention is concerned with how individuals approach the world and try to make sense of their environment – i.e. situation. These authors quote Husserl (1968), who determined that consciousness – i.e. awareness – was in existence only when an individual relates to an object that he is conscious of, or directs his attention towards. It arises, endures and disappears with the subject's commitment to an object. For the creation of new knowledge, an individual's awareness of the object in question must be very intimate.

Knowledge comes about as a result of an individual's interpretation of data, which happens in his worldview. According to autopoietic epistemology, this understanding can be attained only when the data are evaluated in the light of individual's previous knowledge and values – i.e. the lens through which the individual views the data will ultimately affect the knowledge generated. According to the HCM, this evaluation happens in relation to understanding, which is located in a person's worldview in the form of meanings. The intention embedded in the worldview not only creates the possibility of forming a meaning, but also limits its form. Our paradigms or worldviews limit both our view and our perceptions. If truth is to be the goal of a project's created knowledge, then the project must nurture a neutral atmosphere that welcomes truly free thought. This leads on to Nonaka and Takeuchi's second dimension: autonomy.

Increases in *autonomy* in an organization allow individuals to bring their own paradigms or worldviews to bear on the problem at hand. This is an important issue in an organic project work environment. It also allows the individual to ascend Maslow's hierarchy of needs to self-actualization, or attaining a sense of purpose.

An excellent stimulus to a new working method is viewing a problem in a fresh light. Circulating the problem to a wide number of people and assimilating each view on it can bring this about. It is also possible to artificially stimulate the creative process by introducing a random event. Papanek (1972) suggests a procedure called 'cognitive dissociation'. The problem at hand is viewed in the light of a selection of random concepts, which are drawn from a dictionary. Usually these concepts originate more or less 'automatically' from the team members' worldviews. These random interventions (i.e. perturbations or triggers) and connections stimulate the person to think of the problem in the light of the new concept. If the product of this conflict is useful to the individual then the process has successfully introduced stimulus; if not, the process can be repeated and/or the outcome combined with another random selection.

Fluctuation has the similar effect of throwing a wild card into the pack. If individuals have to question their values, for whatever reason, they may gain new insight into a particular problem from the modified viewpoint they now command. Winograd and Flores (1986) emphasize the role of periodic 'breakdowns' in human perception. Breakdowns refer to the interruption of an individual's habitual, comfortable state of being. When faced with a breakdown, individuals have an opportunity to reconsider their fundamental thinking and perceptions, which can be of benefit to a problem.

Implications for project leaders

Projects often have a profound impact on the organization that receives a project delivery. Such deliveries usually transform all or parts of the receiving organization, and by their nature create changes to the individual departments. Projects often involve the design and development of new physical products or services that may contain complex technical elements. The problem most common to projects is, unfortunately, to concentrate and emphasize the technical content at the expense of understanding its impact on the people and the organization. An important characteristic of project work is the extent to which the people who will use the product are invited to participate in the work. Very often the

work is done by a specialist without the co-operation, participation, or commitment of the end-users.

Project leaders, as we have seen, must be able to interact with various sub-cultural elements within their organization and that of the customer. Leaders who are aware of cultural differences can avoid or minimize unproductive conflicts and misunderstandings. Differences may arise for various reasons – such as values, assumptions and beliefs – and arise from problems of communicating across cultures. The nature of communication in R&D is very different from the language spoken in marketing, for example; it is important for the manager to make a concerted effort to speak and listen in ways that take these differences into account. Attributing project barriers to another co-worker's inflexibility or stubbornness may polarize differences, escalate conflict and make it very difficult, or next to impossible, to complete the project.

Projects have a higher probability of succeeding when they:

- Start with the premise that organizations are living social systems
- Assess, identify, work with and align with the organization's core culture
- Are designed on the front end from a system-focused perspective and implemented in a manner congruent with that design
- Are clearly tied to the organization's strategy
- Are aligned with strategy, culture and management
- Understand that all organizations have a lead core culture and sub-cultures and that the project culture must function in the service of them
- Take seriously the individual differences among the team members – i.e. their individual and therefore unique worldviews and situations, which reflect on and limit all aspects of their behaviour.

To sum up, the concepts of project and organizational cultures can help to understand how projects really work. Culture – as team members understand it – can be thought of as the 'personality' of the project that defines the way it is implemented. Culture is therefore the key ingredient of a project's success. The cultures of each project and organization tend to have distinctive properties that make them unique.

Summary

There are many issues – both human and organizational – that must be taken into account when dealing with knowledge sharing. The merits behind it are often laudable, but the difficulties are significant and,

therefore, should not be under-estimated. The factors described in this chapter, present some useful guidelines for project-based companies as they begin to investigate methods for enhancing the effective knowledge sharing. We can make three key suggestions:

- There is a need to make a deliberate effort to *identify the expected contributions* from all project stakeholders. Ambiguous statements that support knowledge sharing, but do not specify the types of knowledge, amounts of knowledge, or other structural mechanisms are not as helpful as a straightforward policy that identifies the knowledge sharing people, the knowledge they will provide and the nature and frequency with which knowledge sharing will progress.
- Many project-based companies, faced with the need to engage in sustained knowledge sharing practices, find themselves without the means to *collaborate most effectively*. There are a number of reasons for this lack, but the primary cause can be traced to interpersonal reasons. As noted in this chapter, the very act of sharing knowledge across professional and organizational boundaries may fly in the face of established leadership styles and cultural norms. It is necessary to analyse objectively the behavioural capacity for free knowledge sharing and, in the event that clear obstructions exist, begin to develop a programme whereby cultural or behavioural objections can be identified and eliminated.
- *Clearly established goals* by which project stakeholders have incentives to share knowledge can induce cross-functional co-operation. This means that a clear motive, identified with a sense of overall goals, drives co-ordinated effort among disparate specialists. The value of clear and established goals lies in their ability to create a shared vision for the project, but also one that cannot be achieved by one member of the team alone. Hence, goals serve as both the vision for the project and a motive for knowledge sharing.

Project-based companies can use a variety of methods to encourage a knowledge sharing culture. Some of these form straightforward reward strategies, whereas others represent the sophisticated manipulation of the way in which people work in order to create the desired working environment:

- Knowledge is seen as a *personal intellectual asset* (e.g. Carter and Scarbrough, 2001) embedded in a person's worldview as different kinds of meanings. Therefore, people do not want to give it away unless there

are benefits in doing so. The reciprocal act of receiving something in response to giving something else is central to the concept of knowledge sharing (e.g. Ellis, 2001). This could be a formal reward from the organization in recognition for an individual sharing his knowledge, or less tangible rewards such as motivational praise or new knowledge returned from a colleague. Using recognition as a reward is often considered as one of the most powerful motivators by knowledge workers (e.g. Storey and Quintas, 2001).

- The development of a *shared vision* provides the focus and energy for knowledge sharing. It encourages and energizes people to uncover the organization's (i.e. project's and/or project-based company's) view of the future, and should provide meanings and value for everyone (e.g. Pan and Scarbrough, 1998).
- *Trust* is a key element for knowledge sharing, as employees may not be willing to share their work-related knowledge if they believe that hoarding knowledge will assist in furthering their careers, or if they feel ill-treated at work (e.g. Storey and Quintas, 2001). Furthermore, if employees feel that their employment relationship is not fair, if they feel that work-related promises or commitments have not been kept and if they do not trust their employer or leader to keep promises or commitments in the future, then they are less likely to feel disposed to share knowledge at work (e.g. Patch *et al.*, 2000). Ellis (2001) argues that it is difficult to discuss knowledge sharing or knowledge management without trust, as most people will not risk sharing what they know without it. It is fundamental to developing a culture of openness and collective ownership that underpins successful learning environments and encourages knowledge acquisition and sharing (Smith, 2001). Arguably, trust develops through frequent and meaningful interaction, where individuals learn to feel comfortable and open in sharing their individual insights and concerns. This demands an atmosphere where ideas and assumptions can be challenged without fear or risk of repercussion, and where diversity of opinion is valued over commonality or compliance.
- Successful *teamwork* is crucially important for knowledge sharing (e.g. Huang, 1997). Rather than require each person to contribute individually, the company can assign them to small knowledge management teams and give them collective responsibility for knowledge sharing. If they are asked to meet a few times a year and contribute three pieces of knowledge every time they meet, they will start sharing what they know and even develop new knowledge (e.g. Ellis, 2001). As pointed out by Ingram and Desombre (1999), team working can be

characterised by friendliness or camaraderie. For some respondents the authors surveyed, this friendliness is an important part of their job satisfaction and has been extended outside of normal working hours.

In this chapter we have identified two main factors that influence knowledge sharing within project-based companies: *experience* and *openness*, and the latter one is dependent on *richness of communication* and *trust* (Figure 6.9).

The first factor of knowledge sharing in a project work context is the project's and or project-based company's ability to *internalize knowledge*. According to autopoietic epistemology, project teams that already have an important stock of task-related knowledge (i.e. experience) are often in a better position to successfully complete their projects than the project teams that have low initial levels of task related knowledge. Thus,

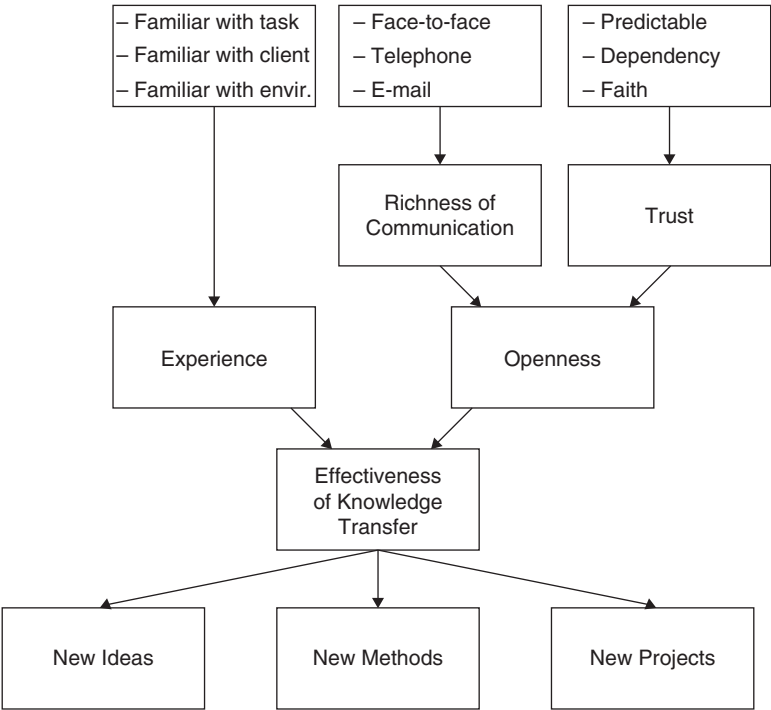


Figure 6.9 Effectiveness of knowledge transfer in a project work context

relatedness of prior knowledge to the knowledge being sought seems to be an important factor in the effectiveness of knowledge sharing between project stakeholders.

The second factor of knowledge sharing in a project work context is stakeholders' *openness* in terms of willingness to share knowledge and people interaction. Stata (1989) defines openness as people's willingness to put all their cards on the table, eliminate hidden agendas, make their motives, feelings and biases known and invite other opinions and points of view. Hamel (1991) discusses the concept of 'transparency' – the 'knowability' or openness of each partner. He explains that it is a determining factor in the potential for learning, and argues that the openness and accessibility of the partners is due partly to their attitude towards outsiders.

The first factor influencing openness is the *channel of interaction*. As mentioned above, the people working on projects share experiences with each other in various ways, such as e-mail, telephone and face-to-face. Misinterpretation and/or having the other actor hide his intentions is less likely in face-to-face interaction than in less close forms of social relations (Wathne *et al.*, 1996). The reason is that even when interacting face to face, the actors apprehend each other by means of 'categorisation'. Individuals' typification schemes are susceptible to others' interference, and they will enter into an ongoing 'negotiation', being more vulnerable the less remote the forms of interaction. Hence, the interaction channel has important implications for the perceived openness among projects pursuing co-operative work practices (cf. Wathne *et al.*, 1996).

Trust, another factor influencing openness, has been emphasized as one of the most important elements in knowledge sharing. As mentioned earlier, trust at all levels (i.e. individual, project team and company levels) will only develop over time as a consequence of *interaction*.

Predictability and dependability are both based on the reliability of previous evidence. However, the future brings novel situations and circumstances for which past or present experience is not necessarily an accurate guide. Over time, relationships may be faced with new stresses and forces that could not have been anticipated and to which no past encounters reasonably correspond. To capture the essence of trust that is not securely rooted in past experience, Rempel *et al.* (1985) use the term 'faith'. Given that a successful relationship is not guaranteed, continuing commitment to, and belief in the relationship requires some degree of faith. Predictability, and especially dependability, should therefore be related to faith, although faith does not fully subsume those factors (cf. Wathne *et al.*, 1996).

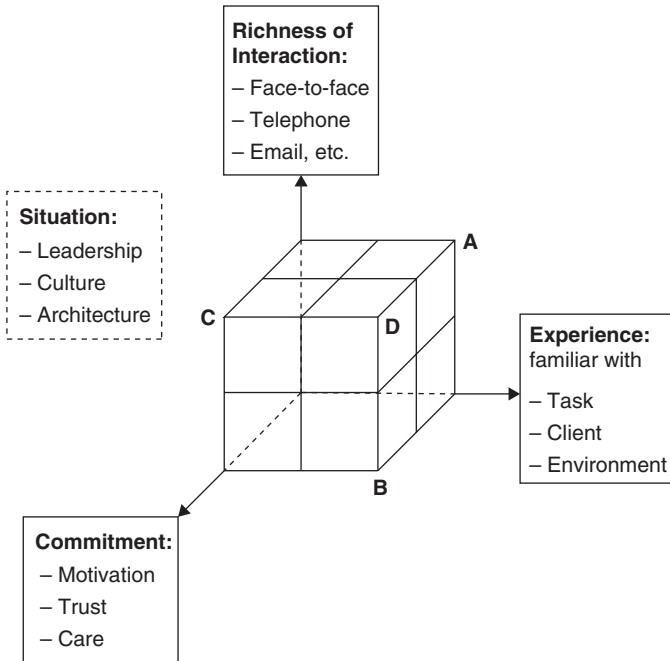


Figure 6.10 Conceptual model for estimation of knowledge transfer in a project work context

With the help of the discussion in this chapter and the factors described in it, it is possible to form a three-dimensional space by which one can estimate the effectiveness of a knowledge sharing in a project work context (Figure 6.10). Various factors within a project can be positioned in the space in order to determine the grade of knowledge sharing within a project. In the following there are four examples of different situations on knowledge sharing in a project:

- *Example 1* (Figure 6.10, the project team at point A). The project has a lot of relevant experience, and face-to-face communications opportunities within the team and with the other stakeholders are good, but the team members' commitment to the goal of the project is weak. Knowledge sharing within the project does not take place effectively.
- *Example 2* (Figure 6.10, the project team at point B). The project in this case has a lot of relevant experience and the team's commitment to the goal of the project is strong. However, the team members are

widely separated from each other and from the other stakeholders and therefore the possibilities for rich interaction is low. Knowledge transfer does not take place effectively.

- *Example 3* (Figure 6.10, the project at point C). The project team is well committed to the goal of the project and it has ample opportunities for communication with each other and with the other stakeholders. However, the team lacks relevant experience. The project may have difficulties meeting its goal.
- *Example 4* (Figure 6.10, the project at point D). In this case the team has a lot of relevant experience and has good opportunities to communicate with other people within the project and with the other stakeholders. In addition, the team is well committed to the goal of the project. Knowledge sharing within the project takes place maximally.

Situational elements form the background for the factors described above – in other words, they describe the situation in which knowledge sharing takes place. The model should be considered as relative rather than as absolute in its nature. This means that it can best be used in project-based companies in which there is a need to compare the effectiveness of knowledge sharing between different projects.

Reinforcing knowledge sharing is a vital part of the success of project-based companies (e.g. Bresnen *et al.*, 2005). However, achieving this is often difficult, as many projects are interdisciplinary and face the problem of integrating cross-functional contributions and perspectives (e.g. Hansen, 1999). This means that, despite the single disciplinary context, the success in sharing knowledge and learning is dependent upon developing a shared system of meanings. In other words, to leverage the available ‘social capital’ among individuals within the company, cognitive and relational aspects are vitally important (Nahapiet and Ghoshal, 1998). This also means that sharing knowledge across professional and organizational boundaries is vital for creating a situation in which effective project implementation can proceed. The basis of knowledge sharing lies in the promise to increase provision of better knowledge for project management.

7

Strategic Knowledge and Intellectual Capital Management in Project-Based Companies

The resource-based view of the company

The key question in strategic management is how companies can achieve and sustain their competitive advantage. One response to this question is to suggest that it is the company's resources that lead to competitive advantage, arising from a 'resource-based theory of the firm' (Wernerfelt, 1984; Barney, 1991). Resources are the tangible and intangible assets a company uses to choose and implement its strategy (Barney, 2001).

The resource-based view of the company describes its competitive advantage by utilization of its internal resources. A seminal paper in this area (Barney, 1991) suggests seven characteristics of resources by which competitive advantage can be achieved:

- Resources are distributed heterogeneously across firms
- Resources have a 'stickiness' and cannot be transferred from firm to firm without a cost
- Resources are rare – not widely held
- Resources are valuable – they promote efficiency and effectiveness
- Resources are not imitable and cannot be replicated easily by competitors
- Resources are not substitutable – other resources cannot fulfil the same functions
- Resources are not transferable and cannot be bought in resource markets.

In the strategic management literature it has been suggested that a wide variety of resources that have the above conditions will lead to sustainable competitive advantage. These include information technology,

strategic planning, human resource management (HRM), top management skills, trust and organizational culture (Priem and Butler, 2001). One of the highly influential concepts arising from the resource-based view is the notion of 'core competence', which has been briefly described earlier in this book (Prahalad and Hamel, 1990).

An outcome of the resource-based view of the company is the development of a 'knowledge-based view' of the company that assumes that knowledge (know-how and know-what) is the company's most important resource (Grant, 1996; Spender, 1996). This view revisits many of the principles of individual knowledge (Ryle, 1949; Polanyi, 1966), organizational learning (Huber, 1991), conversion of one form of knowledge to another (Nonaka, 1991) and organizational routines (Levitt and March, 1988) as potential sources of competitive advantage. Learning and knowledge sharing are, thus, seen as vital to this perspective and there is recognition of the difficulty of sharing tacit knowledge that may be primary to competitive advantage. The principal role of the company is to integrate the knowledge resident in individuals into their goods and services (Grant, 1991). The primary task of management is thus to co-ordinate the process of knowledge integration. One potential aid in this process is to treat the company as a dynamic socio-technical and self-regulating system (Spender, 1996) (cf. Jashapara, 2004).

Strategic knowledge management

Project business decisions come in all shapes and sizes – small and large. The small are usually called 'tactical' or 'operational', and the large ones 'strategic'. Operational decisions are typically many and small, with sufficient prior data on which to build a knowledge base. Knowledge-based systems for tactical decision making can be automated, taking human understanding out of the expert loop at the boundaries: making a progress scoring of a project is a common example.

Strategic decisions are typically infrequent, each of large value with little formal prior data on similar decisions on which to build understanding, and requiring business judgement and the balancing of qualitative trade-offs: making a business acquisition is a common example.

There are at least four potential problems in the strategic decision making process:

- Obtaining relevant data
- Re-using existing knowledge and avoiding the Not Invented Here (NIH) syndrome

- Making good decisions quickly – i.e. not making bad decisions quickly nor avoiding making any decisions at all
- Having made a decision, turning the decision into action.

However, the knowledge management literature dealing with strategy issues is relatively young, and the forms of strategy proposed can be characterized as a dialogue between the forces of efficiency (i.e. the mechanical project work environment) and innovation (i.e. the organic project work environment) (Mintzberg, 1991).

When Zack (1999) discusses the process involved in developing a knowledge strategy, he describes an organization's knowledge in terms of core, advanced and innovative knowledge. *Core* knowledge is the minimal knowledge required to stay in the game. *Advanced* knowledge enables a company to be viable relative to its competitors. It may have similar scope and quality of knowledge to its competitors, but a specific knowledge that places it in a niche market situation differentiates this knowledge as being of an advanced nature. *Innovative* knowledge allows the company to lead its industry segment and significantly differentiate itself from competitors. When core knowledge matches the competition, the company becomes a viable competitor. However, when one company has advanced knowledge relative to its competitor, it places that competitor in a laggard position. When a company has innovative knowledge relative to its competitor, then the competitor is at risk because, as well as having a differentiated competitive advantage, the leading company may well have advanced innovative practices that lower cost and thus provide cost advantage (cf. Walker *et al.*, 2005).

Hence, according to Ahmed *et al.* (2002), project-based companies, in their attempts to implant knowledge management into their projects and organizations as a whole, can follow many possible routes. These authors, examining the performance outcomes of companies following knowledge programmes, suggest that there exist three main generic strategies and one emerging generic strategy. The main strategies are: reactive, mechanistic and organic. The emergent form is the adaptive knowledge management strategy:

- The *reactive* knowledge management approach is characterized by an overall narrow technical and efficiency-led focus. The knowledge strategy can be stated to be atypically reactive to outside forces.
- The defining difference between the *mechanistic* and *organic* approaches appears to be much more subtle. The key detectable difference is that organic knowledge management tends to be

people-driven, placing heavy emphasis on such things as communities of practice and support systems, and rewards and incentives to induce sharing. The mechanistic approach, on the other hand, although it possesses many of the characteristics of the organic approach, is driven by a much stronger emphasis on information technology, and as a whole the approach is 'top-down'-driven and heavily prescriptive and structured in outlook.

- The emerging *adaptive* format is rare, and appears to encompass organic features while containing vastly more open structures and permeable boundaries in its operations and activities. These features lend themselves to endowing a greater internal openness for experimentation, leading to enhanced adaptability.

Depending on the type of project-based company and industry, different strategic approaches can thus be utilized in adopting a knowledge management strategy (Haggie and Kingston, 2003). Hansen *et al.* (1999) propose codification and personalization strategies as alternative ways by which companies can develop their knowledge management strategies. They suggest, for example, that the companies producing customized solutions to unique problems – as do many technological project deliveries – should use the information technology to help people to communicate. The key question in strategic management is information technology to help people to communicate. However, actual problem solving should often take place with the help of personal interaction (see Figure 7.1).

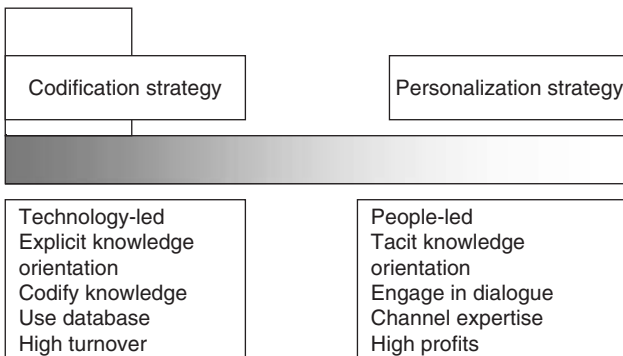


Figure 7.1 Codification and personalization strategies

Source: Adapted from Jashapara (2004); reproduced with the permission of Pearson Education Ltd.

Codification strategies are heavily based on technology and use large databases to codify and store knowledge. The rationale of a codification strategy is to achieve 'scale in knowledge reuse' (Jashapara, 2004). After completion of a project, companies will retrieve key pieces of knowledge from the assignment and create 'knowledge objects' to store valuable knowledge such as key solutions to problems. This knowledge is stored in a 'knowledge repository' so that other projects and individuals in the company can use the same material for their own projects. There is little room for creativity and innovation in this approach and people are likely to be discouraged; only the tried and tested methods of problem solutions are promoted. This is what projects operating in mechanical project work environments utilize: a solid knowledge management approach based on previous knowledge without the potential risks of innovation. In this case, codification strategies are clearly aligned with the company's business strategy focused on efficiency, cost savings and cost leadership.

Personalization strategies are less about technology and more about people. Project-based companies which function in organic project work environments are more interested in developing people through brainstorming exercises and face-to-face communication and gaining deeper insights into problems. They place considerable emphasis on knowledge sharing, either by face-to-face interaction, or over the phone, by e-mail or via videoconferences (Hansen *et al.*, 1999). The focus is on networking within the company and through dialogue developing creative solutions for unique problems. Knowledge sharing, mentoring and the use of creative and analytical skills are keys to this approach. In this sense, a personalization is in alignment with the business strategy focused on differentiation through innovative solutions.

Codification strategies rely on large investments in knowledge repositories and proprietary search engines and use incentives to encourage people to codify and store their knowledge in these databases. Personalization strategies, in contrast, require low levels of technology such as expert databases but high levels of reward for knowledge sharing and dialogue with their colleagues. According to many writers (e.g. Mintzberg, 1991; Hansen *et al.*, 1999) companies that try to pursue both strategies simultaneously tend to fail, as with the problems of 'cleavage' in business strategy where the forces of efficiency and innovation confront each other in the boardroom and can paralyse the company if there are major divisions in competitive response (cf. Jashapara, 2004).

Stewart (1997) identifies three items that he considers are particularly worth the effort:

- A 'corporate Yellow Pages' (or 'knowledge map'), also advocated by Davenport and Prusak (1998), that facilitates connecting inquirers with the relevant sources of specialist knowledge. The larger and more diverse the company, the more valuable such a system becomes. It is much easier to identify the people who hold certain knowledge than it is to attempt to codify the knowledge that they hold, and tacit-tacit interaction is still a perfectly valid mechanism for knowledge sharing.
- A system of identifying 'lessons learned' from past projects, so they are available for consideration in similar future projects. Although knowledge work is substantially customized work, there are normally sufficient elements of similarity to benefit from such documented lessons learned.
- A system to facilitate recording and communication of knowledge about a company's customers and competitors.

Several researchers (e.g. Apostolou and Mentzas, 2003; Chourides *et al.*, 2003; Liebowitz and Megbolugbe, 2003) and practitioners who have developed knowledge management strategies have stressed three major components of a knowledge strategy: people, process/culture and technology. For example, according to Chourides *et al.* (2003), for knowledge management to be successful individuals must be persuaded to contribute to its formulation and implementation. In the opinion of Liebowitz (1999), the mantra in the knowledge management field is that 80 per cent of knowledge management is people and process/culture, and the other 20 per cent is technology. The technology is used as an enabler for sharing knowledge (the intranet, 'Yellow Pages', etc.), but the tough part of knowledge management is the people, process and culture aspects.

These authors contend that the difficulties are exacerbated if incentives are inadequate, inconsistent or poorly aligned with the company's resource constraints, competencies and/or contingencies. Such problems of *goal incongruence* can be conceptualized as an agency problem (Jensen and Meckling, 1976) where unclear goals and incentives can inhibit knowledge sharing. In this context the conflict is between the strategic benefits accruing to the organization as a whole from knowledge transfer, and the operational costs associated with knowledge capture that are borne by the individual projects (cf. Hall and Sapsed, 2005).

Really successful project-based companies are able to address competitive challenges not because they excel at one thing, but because they effectively integrate all the parts of the process into a strategic whole. Project-based companies and/or projects demand at least three things to create a good performance:

- A comprehensive complement of talented individuals (individual competence)
- An ability to work as a perfectly aligned unit (team competence)
- An emphasis on the right individuals for the right projects (strategic competence).

This means that companies must understand not just a few but all of the key elements of knowledge creation and exploitation strategy, and must master many of them. They must also carefully align these elements (people, culture, process and technology) to maximize their complementarity with one another and with the project work environment. Indeed, strategic integration in a project-based company (e.g. Fuchs *et al.*, 2000) demands comprehensiveness, alignment, focus and communication:

- *Comprehensiveness* Integration begins with a clear notion of what needs to be integrated. This demands a comprehensive understanding of all the knowledge elements the company must use to compete effectively. Success in knowledge management is not just about thinking, posturing and talking about what to do, or even taking action. It demands both: the complement of thought with action.
- *Alignment* Success in knowledge management is not arrived at by piecemeal and ad hoc implementation of a random set of mechanisms or processes. It is brought about by putting in place pieces that reinforce each other – in other words, pieces that work through synergy and linkages, which when aligned together magnify the power of the punch. What is most important is not just knowledge management's individual parts but, rather, how they aggregate and align to address the challenges and opportunities in the external environment.
- *Focus* Alignment occurs not just from identification of the mix of processes to emphasize, but also from selecting the critical ones to emphasize above others. This is so because at any one time it is possible for a company to invest resources in only a few processes and themes. Trying to follow them all results in a 'thin' spread and is a recipe for failure.

- *Communication* To make knowledge management work, managers must put everyone in the big picture. Companies can do this by communicating frequently, clearly and with force of intent. Communication can, and should, have many different reinforcing channels, such as policy documents, speeches, newsletters, bulletin boards and symbolic rituals. Usually, however, strategic priorities are best communicated when words are followed by reinforcing actions captured in the form of hard decisions and policies, and by instituting sharing-led reward and accountability systems.

Thus, for knowledge management to work, it must be aligned and integrated with the strategic goals of the company. If it is disjunct with the business and strategic goals, then knowledge management will be doomed to fail (Liebowitz, 2005). The knowledge management plan must also be well conceived and designed, and should be congruent with the company's organizational culture.

De Long (2000) has identified four ways in which culture can influence the behaviours central to strategic knowledge production, sharing and use:

- Culture shapes assumptions about what knowledge is and which knowledge is worth valuable.
- Culture defines the relationship between individual and organizational knowledge, determining who is expected to control specific knowledge, as well as who must share it and who can own it.
- Culture creates the context for social interaction that determines how knowledge will be used in particular situations.
- Culture shapes the processes by which new knowledge, with its accompanying uncertainties, is produced, and shared within organization. Understanding the influence of knowledge in this regard is the first critical step in developing a strategy and specific interventions to align the company's culture with the knowledge management strategy.

Sveiby (2001), in turn, indicates nine important knowledge strategy questions:

- How can we improve the transfer of competence between people in our organization?
- How can our employees improve the competence of customers, suppliers and other stakeholders?

- How can our customers, suppliers and other stakeholders improve the competence of the employees?
- How can we improve the conversion of individually held competence to systems, tools and templates?
- How can we improve individual competence by using systems, tools and templates?
- How can we enable conversations among our customers, suppliers and stakeholders so that they improve their competence?
- How can competence from the customers, suppliers and other stakeholders improve our systems, tools, processes and products?
- How can our systems, tools processes and products improve the competence of the customers, suppliers and other stakeholders?
- How can our systems, tools, processes and products be effectively integrated?

Since knowledge management has a long-term vision and deals with intangible assets, some managers may be reluctant to invest resources in this area. However, management support (both company and project) is critical in paving the way for knowledge management in project-based companies. According to Liebowitz (2005), organizations are now integrating knowledge management as part of their human capital strategy: for the project-based company it is crucially important to do the same. Moreover, the competitiveness of project-based companies in all types of industries depends on two sets of competencies (Chandler, 1990). Strategic competencies are required to monitor internal operations and adjust strategies to a changing environment. Functional competencies, in turn, organized in projects, are required to produce project deliveries.

The process of building a knowing and learning project-based company is a dynamic, relentless and iterative one. It demands continual effort by many managers to generate and exploit knowledge capabilities in an ever-changing world. As the business environment fluctuates, the company must evolve. Managers of highly successful project-based companies constantly reinforce and revitalize the company's strategic intent by ensuring that the pieces dovetail to form the big picture. Knowledge programmes succeed not so much because they have some brilliant and complex magical potion, but because they harmoniously blend and combine knowledge activities and processes (cf. Ahmed *et al.*, 2002).

For a variety of logical reasons, more and more project-based companies are thus moving toward strategic partnerships in bidding and implementing projects of a wide range. The impact of this impetus toward inter-organizational knowledge sharing will be profound.

Strategic intellectual capital management

Intellectual capital also provides a basis for creating a sustainable competitive advantage for project-based companies. According to many authors (e.g. Drucker, 1993a; Brooking, 1997; Stewart, 1997), intellectual capital has much greater value than any tangible assets such as buildings, machinery and land, all of which provided the companies with a competitive advantage in the past. This is not to say that the traditional production factors of land and buildings are not important, only that they have changed in position and priority. According to Drucker (1993a), as long as there is knowledge, the other production factors are easy to obtain. Thus, the most important challenge for the project-based company is to find a methodology, a discipline, or a process with which knowledge can be made productive. This is the role that the learning and knowledge sharing initiatives, described earlier in this book, have come to fill. Intellectual capital is therefore nowadays the project-based companies' most valuable resource.

One of the tools for assessing the intellectual capital of a project-based company is a report of its hidden values. This 'balance sheet', which complements the regular financial balance sheet, helps management of the company to define and visualise its hidden values such as tacit knowledge and organizational culture. In other words, an intellectual capital balance sheet enables management and other stakeholders of a company to obtain an integrated, comprehensive view of all the company's assets, to learn about its potential for future growth, to make a more reliable assessment of them and to navigate the company towards the realization of its goals and vision (cf. Pasher and Horsky, 2005). Naturally, these assessments are rather arbitrary since, basically, intellectual capital resides in the worldviews of organization members. Talents, skills, tacit knowledge, etc. are all meaning structures in the worldviews of people, who may not themselves be totally aware of them.

The *Skandia Navigator* (Edvinson and Malone, 1997) provides a balanced and holistic picture of both financial capital and intellectual capital. According to this Navigator, there are four areas of focus with regard to intellectual capital: customer, human, process and renewal and development. These areas are used as the basis for assessing the intellectual capital within a competitive environment (Figure 7.2).

The Navigator for measuring intellectual capital uses the 'house' as a metaphor for the organization. Financial focus constitutes the 'roof' of the house, and reflects the organization's history and achievements of the past, which do not necessarily enlighten the company in terms

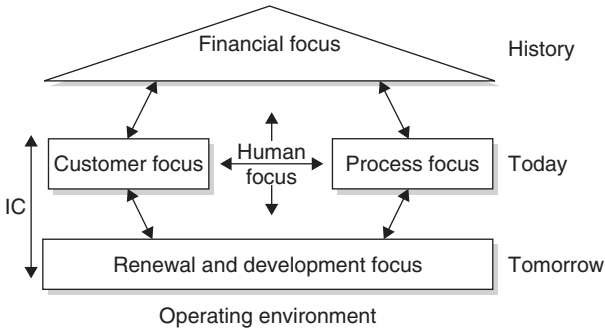


Figure 7.2 The Skandia Navigator

of future achievements. The supporting ‘columns’ are process and customer focuses, and they are the areas upon which the present operations of the company are based. Renewal and development focus, which is found in the ‘centre’ of the house, interacts with all the different focal points. Human focus, which is also found in the ‘centre’ of the house, interacts with all the different focuses. The human focus is the heart of the company – i.e. the capabilities, expertise and wisdom of its people. It is the role of the organization to assist, guide, and support its people towards realization of their vision and strategic goals:

- *Human focus* Human focus includes all the individual competencies, the knowledge, skill set, wisdom, expertise and abilities of the employees and managers to realize their organizational tasks and goals. This focus also includes the values, the culture and the philosophy of the company. Human focus is the property of the individuals, and not of the company, and therefore must be capable of capturing the dynamics of an intelligent company in a changing competitive environment.
- *Process focus* Capitalizing on the flow of knowledge requires structural intellectual assets – i.e. information systems, hardware, software, databases, laboratories, patents, trademarks, organizational structure and management focus – and everything else within an organizational capability that sustains and amplifies the output of human capital. One of the important challenges of companies is turning human capital into *process capital*. Human capital is a limited asset and is related to the company’s ability to become attractive to the people it needs. Process capital is the capital that remains in the organization after the

people go home. Unlike human capital, process capital can be owned, and thereby traded.

- *Customer focus* Customer capital is embedded in the relationship with the company's customers, and enables the full utilization of their knowledge. The once-common idea that customers are essentially one-time targets, who can be forgotten once the sale is made, is irrelevant today: today, most project-based companies realize the importance of providing customers with 'total customer service'. Customer capital includes customer loyalty, knowledge, satisfaction, branding, etc. Market share is a part of this category: the number of clients a company has is in the new economy the most prominent measure in estimating its market-value.
- *Renewal and development focus* This is probably the most important category for exhibiting the company's competences. More and more in a competitive market, companies, products and services are rapidly duplicated. The ability of the company to innovate and develop new knowledge in each of its core competences is a central feature of future growth, and is therefore an excellent measure for evaluating the company. Renewal and development assets include investments in R&D, patents, trademarks, new product development, usage of advanced technological tools and the like.

Summary

The underlying assumption within knowledge and intellectual capital management is that action arising from knowledge management practices will result in some form of competitive advantage. Project-based companies need some form of knowledge and intellectual capital management strategies to achieve these advantages. Two dominant pillars of knowledge and intellectual capital management are technology and human resource considerations. In this book, the focus has been on the latter; this chapter has briefly described the concepts of strategic knowledge management and intellectual capital management in project-based companies. Some of the key claims and suggestions include the following:

- The currently dominant view of business strategy – resource-based theory or a resource-based view of companies – is based on the concept of economic rent and the view of the company as a *collection of competencies*. This view of strategy has a coherence and integrative role that places it well ahead of other mechanisms of strategic decision

making. According to this view, a project-based company's competitive advantage derives from its ability to assemble and exploit an appropriate combination of knowledge- and intellectual capital-based resources. Sustainable competitive advantage is achieved by continuously developing existing and creating new knowledge resources and competencies – as new and better project implementation methods – in response to rapidly changing market conditions.

- The *scope* of knowledge management and intellectual capital management is large and affects almost all of the company's functions. Advanced project-based companies expect to achieve improvements in some characteristics that will lead to sustained company viability. These characteristics range from maximizing individual intellectual capital, on the one hand, to infrastructure elements such as company knowledge bases and organizational memories, on the other.
- It is necessary for the management of project-based companies to focus on specific activities and factors that can support existing policies and the needs of the companies. Experience indicates that this works well, and that it is feasible later to gradually expand the scope into new areas to serve additional needs. It is also important to *align the knowledge management activities* with the *intellectual capital results* that have been targeted.
- Knowledge management and intellectual capital management processes are the most important activities of most project-based companies. These activities represent the companies' future potential. However, they can contribute to the companies' successes and viabilities only if they are *renewed continually* and *used effectively*, or their value is realized in other ways.

8

Epilogue

The success of project-based companies is governed by their abilities to manage knowledge assets that can improve the efficiency and effectiveness of project management. Knowledge management is today an integral feature of project-based companies that exploit their knowledge resources – human resources in particular – to generate superior performance. From this it follows that project-based companies, and the individual projects within them, are seen as knowledge-intensive units, which can be approached in terms of the quality and quantity of knowledge. We have utilized autopoietic epistemology and the HCM in order to gain a better understanding of knowledge, as well as knowledge production and sharing in a project work context.

In our view, knowledge is basically tied to an individual: before a project team member can receive knowledge or transfer it to other team members, she must understand it. This understanding happens only after a corresponding meaning or meanings have been formed in the consciousness of the team member. In other words, all the knowledge a team member is able to utilize must exist in the form of meanings in her consciousness. From there, a person can transfer it to other persons and store it in different kinds of stores – written or electronic.

In practice, it is important to make a distinction between explicit and tacit knowledge. The former is tangible, being clearly stated and consisting of details which can be recorded and stored in databases. Tacit knowledge is located in human consciousness. It is often unstated, based on individual experience and, therefore, difficult to record and store. Invariably, both forms of knowledge begin as individual knowledge in human consciousness but the aim is to transform them into organizational knowledge in order to improve both projects and project-based companies' performances.

There is unfortunately no general and valid recipe or tool for knowledge management in project-based companies. It all depends on the company and the people involved. Some companies have ensured that people mix and talk together. Without the willingness to learn and share knowledge, even if the knowledge exists, few will know where it resides and even fewer will be able to use it.

In any case, knowledge is the intellectual wealth of both individuals and companies. Therefore, there is a need to handle this knowledge properly so as not to reinvent the wheel on every new project, and not repeat past mistakes. When people move from project to project and work in different teams, valuable experience gained can (at least partly) be lost if not shared properly. Therefore, it is possible to conclude that in any type of project-based company individual and company-based learning will be a significant success factor. This means that the learning and adoption of new solutions must be fostered at all levels of a project-based company's activity.

There are numerous factors that either advance or weaken knowledge management possibilities in project-based companies. Therefore, the management of knowledge in these companies, and the projects within them, represents a challenge that most project-based companies are only now beginning to acknowledge. In this book we have sought to offer an illustration of the challenge, and some pointers towards its solution.

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