6 The use of knowledge and communication

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6.1 Introduction

There already exists a long debate about the transformation of knowledge into technical and standardised working procedures. From the 1960s on, this debate was focused on the production sector, where integrated manufactured systems brought major changes to social, organisational and professional routines (Corbett, Rasmussen & Rauner, 1991; Emery & Trist, 1960; Kern & Schumann, 1984). During the 1990s this discussion was revitalised and has generated new approaches to the study of the development of work organisation.[44]

The technical performance of modern information and communication technologies (ICTs) has significantly changed not only the organisational structure of work but also individual work profiles. In this transformation process, the use of knowledge and communication has acquired great significance especially in relation to the acquisition and mobilisation of knowledge.

The intention of this chapter is to show that the influence of knowledge on new forms of work organisation can be described as a mutual relationship. It is not only the case that the content and structure of knowledge change the organisational patterns of working activities; conversely, different changes in work organisation also have a strong influence on the increasing importance of knowledge within the production processes as well as on the social and cultural expectations of different individual and collective actors in working situations. The mutual dependencies of knowledge and work organisation can be examined from several different points of view, *e.g.* 'What role does knowledge play in an economy characterised by ever-accelerating change? How do organisational structures make use of knowledge and how can they integrate new knowledge? Which organisational structures are conducive to innovation? What are the consequences for the use of skills and communication within these different processes?'.

Coming from the concept of the information society (Mattelart, 2001; Webster, 1995) the rise of 'intellectual technology' (Bell, 1973) as the main feature of new developments becomes the analytical starting point. Of course the technical dimension represents only one element in the whole process of creating social 'expert systems' (Giddens, 1990). But the combination of new forms of communication networks, distributed artificial intelligence and agent-oriented systems (Latour, 1996; Malsch, 1998) points towards new perspectives. In the literature these perspectives are described as 'network organisations' (Castells, 1996; Powell, 1996), which are oriented both towards a 'connected' dimension

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and an increasing 'global' dimension. Castells, as the most prominent representative of the network society approach, focuses on the following features that constitute the heart of the information technology paradigm:

'The first characteristic is that information is its raw material: these are technologies to act on information, not just information to act on technology, as was the case in previous technological revolutions. The second feature refers to the pervasiveness of effects of new technologies. Because information is an integral part of all human activities, all processes of our individual and collective existence are directly shaped by the new technological medium. The third characteristic refers to the networking logic of any system or set of relationship using these new information technologies. The morphology of the network seems to be well adapted to increasing complexity of interaction and to unpredictable patterns of development arising from the creative power of such interaction. [...] Fourthly, related to networking but a clearly distinct feature, the information technology paradigm is based on flexibility. Not only are processes reversible, but organisations and institutions can be modified and even fundamentally altered, by rearranging their components. [...] A fifth characteristic of this technological revolution is the growing convergence of specific technologies into a highly integrated system, within which old, separate technological trajectories became literally indistinguishable. [...] But even this differentiation is blurred by the growing integration of business firms in strategic alliances and co-operative projects, as well as by the inscription of software programs into chip hardware.' (Castells, 1996: 61ff).

Castells's description of the technological paradigm makes a significant contribution to the characterisation of the new organisational pattern of modern organisations. In this view, the social hierarchies and the limitations of markets are decreasing whereas at the same time decentralisation, integrated systems, flexible social structures and knowledge-based work gain in importance. The transformation of implicit to explicit knowledge becomes a visible aspect, which takes place between occupational groups within companies. The strong market orientation in the production sector as well as in the service sector stimulates the development learning and innovative organisations in order to meet the new challenges (Nonaka & Takeuchi, 1995; Rammert, 1999). By describing the institutional systematisation of these transformation processes, some authors extend this approach towards a theory of intelligent organisations (Willke, 1998b & 2001).

In order to look at the impact on the opportunities for the acquisition, mobilisation and utilisation of knowledge, we make a distinction in this chapter between the organisational level and the individual level. As the literature shows, the semantic use of the term 'knowledge' is widespread but without a common agreement on its implications, interfaces and empirical issues. The weak and open distinction between the two levels in this chapter therefore reflects the methodological problems within the literature (as well as the need to distinguish between different disciplinary approaches). In the remainder of this chapter, the use of knowledge at the organisational level is discussed with reference to the concept of 'knowledge management', whereas the use of knowledge at the individual level is described by the term 'social capital', which is strongly linked to individual learning processes and the co-ordination of communication structures. Both knowledge management and social capital are terms with long traditions in the different scientific debates. Because of the questions it addresses, this chapter focuses on the thematic aspects of the new quality of knowledge in the working processes as well as on new communication structures.

6.2 Knowledge management

6.2.1 Knowledge management in organisations

'To make your organisation perform, you'll have to build systems that support knowledge - not data' (Manville & Foote, 1996: 1). Although within the management literature the difference between 'information' and 'knowledge' very often seems obvious and clear, there is still a lack a clear epistemological distinction between 'information', 'data' and 'knowledge'.

One of the classical distinctions, which became central for the debate on knowledge management, is the differentiation between implicit and explicit knowledge made by Michael Polanyi (1958). According to Polanyi, implicit knowledge refers to the knowledge a person has which has to do with his or her personal experiences, his or her biography and other learning processes in the sense of individual 'know-how'. Typically the person does not reflect on this specific knowledge. A child cannot explain how to ride a bike; 'we know more than we know how to say' (Polanyi, 1958: 12).

By contrast, explicit knowledge is formal and documented knowledge, an individual knowledge, which is markedly conscious and functional. The transformation from implicit to explicit knowledge can be extremely cumbersome for many people. Many are incapable of making their implicit knowledge explicit and this is described as a specific problem for knowledge management in modern organisations.[45] In particular, Nonaka has dedicated his concerns to the development of a model of 'organisational knowledge creation' (Nonaka, 1994). His central idea is that knowledge-based organisations have to support the transformation of individual implicit knowledge to explicit knowledge. These learning methods should be intensive communication processes like 'rounds of meaningful dialogues' or the use of metaphors, which may give individuals an insight into their implicit knowledge (Nonaka, 1994).

On the basis of a broad classification of knowledge types, Nonaka (Nonaka & Takeuchi, 1995) created a model of knowledge conversion. This type of knowledge generation and conversion is made up of the following stages:
1. socialisation covers the process through which the individual tacit or implicit knowledge is transferred into collective tacit knowledge (or, using the terminology of Collins, from embodied knowledge to embedded knowledge). This involves less expressed or coded forms of knowledge sharing, rather practical examples, common experiences and physical proximity;
2. externalisation refers to the process whereby this collective tacit or implicit knowledge is transformed into collective explicit knowledge (from embedded to encoded knowledge). This phase is essential to make the tacit knowledge owned by a community accessible to everybody. However, this process always results in a loss;
3. combination: this stage of knowledge conversion generates individual explicit knowledge from collective explicit knowledge (from encoded to embrained knowledge).

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45 According to Huws (2003) this issue is sometimes linked with the concept of 'intellectual property' in the context of precarious employment. Workers may be quite capable of making their implicit or tacit knowledge explicit but may choose not to do so in order to avoid passing their intellectual property to the employer and thus making themselves dispensible.

During this phase the already explicitly expressed components of (collective) knowledge are systematically transformed into a new combination, thus producing a new form of knowledge;

4. internalisation is the final stage of knowledge creation, when individual explicit knowledge is transformed into individual tacit knowledge. This needs personal interaction, practice-oriented situations (where the new knowledge is applied) and a high level of involvement.

In relation to the question how to identify empirically the interactions between explicit and implicit (tacit) knowledge, it would be advisable to identify the relative importance of 'learning by interacting', 'learning by practicing' and 'learning by doing' practices in the various business functions, organisations and occupations in comparison with the formal training (education). The later forms of the knowledge creation aim mainly to share and develop explicit knowledge. Even the smooth transfer of explicit knowledge requires it to be combined with the transfer of implicit knowledge (Makó & Nemes, 2003).[46]

This little excursion demonstrates the complexity of creating organisational learning. According to Willke, organisational learning or institutional knowledge can be identified by the personal-independent, anonymous systems of rules of every single organisation. This includes the firm's traditions, the specific organisational culture, the operating procedures that are currently in use, guidelines, descriptions of work processes, specific data banks, and codified knowledge of the production process as well as of projects (Willke, 2001: 16). Thus, every firm creates its own 'community of practice' or its own collective context of experiences, which can be recognised on the basis of individual learning processes. The exchange of information can only succeed if this transformation process is embedded in the ambitious context of mutual learning.

The importance of the 'community of practice' has been intensively discussed using a variety of economic approaches. This new field has developed around two different traditions. The first of these was largely inspired by the seminal works of Simon and others (Simon & March, 1958; Newell & Simon, 1972) in which firms and knowledge are represented in terms of abstract information processing. The second, the implicit knowledge tradition (Polanyi, 1967), is more empirical and emphasises the situated nature of knowledge (Nonaka & Takeuchi, 1995). The originality of Nelson and Winter's analysis (1982), which is one of the major works in knowledge economics, has been to connect these two different traditions by introducing the notion of 'organisational routines' (in their 'evolutionary theory of the firm'). This link is possible because these authors follow several levels of explanation. While their analysis gives a representation of changes that can affect a firm, an industry, or even the whole economy, they also aim for a good understanding of how the members of an organisation develop and co-ordinate their skills. In order to characterise routines, the authors emphasise the implicit dimension of knowledge. But, when they discuss the way routines are used in processes of change, the implicit dimen-

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[46] Special thanks to Carla Dahl-Jørgensen and Hans Torvatn (SINTEF) for their fruitful comments. They also asked for concrete empirical findings related to the implicit and explicit knowledge. As the theoretical description shows, the relationship between explicit and implicit knowledge can be considered as somehow very individual and special for every enterprise. The empirical analysis of the (more effective) organisation of implicit and explicit knowledge will be one of the challenging tasks of WORKS, therefore this chapter focuses mostly on the scientific debate in order to formulate some interesting hypotheses.

sion of knowledge can be ignored, and routines can be conceptualised by reference to Simon's notion of search routines (Simon & March, 1958). The authors can then give a representation of the changes in a particular industry in terms of technological trajectories that exist within a selection environment. Thus the works of these economists model the core of the firm as a set of communities of practice. They try to reconcile the knowledge-based theory of the firm and the transaction cost approach in order to formulate a dual theory of the firm. David (2001) points out the consequences for the firm, particularly in terms of 'trade secrets', having members who also belong to technological networks ('double agents').[47]

As the management literature shows significantly, there remains a theoretical lack of a model for the closed relationship between personal and organisational knowledge.[48] Only when the role of the organisation as 'collective minds' gains the same attention as the role of the individual mind can the idea of an 'intelligent organisation' be fulfilled (Willke, 1998b & 2001). In the sociological debate there is an agreement that the reaction in a dynamic market situation should be the development of 'learning organisations', but generally the discussion of new organisational concepts mainly emphasises the empowerment of employees. These demands – well-known within the 'lean management' concept (Womack, Jones & Roos, 1990) - focus on the creation of new models of professional performance like creativity, responsibility, social skills, networking, *etc.* The 'improvement of the human resources' (Sauer & Döhl, 1997) is often described as a sort of learning process, which should be considered as an appropriate reaction to ongoing market changes.

During the 1990s, in particular, the introduction of the 'lean' concept provoked an intensive discussion about the success and failure of market-oriented decentralisation (extreme outsourcing, loss of know-how, internal conflicts, barriers to motivation, *etc.*). Experiences in many sectors and branches show that the empirical evidence of a relationship between organisational support and individual work achievement has still to be demonstrated (Boyer & Durand, 1997). It seems clear that not only from the perspective of the employees but also from the perspective of firms, the open-ended situation of the capitalistic market still continues to produce economic pressure. For this reason the development of integrated or 'intelligent' organisations, and the long-term maintenance of knowledge within firms have become important topics in the public and scientific debates (see Chapter 4).

6.2.2 Changing use of knowledge

Roughly, it may be said that the transition from Fordism to new production principles finds its counterpart in the transition from traditional services to those based on the mastery of abstract knowledge via software systems and communication networks (Boyer & Durand, 1997).

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[47] Many thanks to Christian Bessy (CEE), whose additions of the economic approach have been integrated into the paper. He also mentioned the distributed cognition approach, which seems very interesting for the further discussion of the project.

[48] This aspect is also emphasised in Chapter 4, which pays special attention to the risks in overestimating the codification of knowledge in work processes.

Although there is a lack of empirical work that analyses the transition processes in different cultures, from a technical perspective these processes can be described as the computerisation of society. The process 'through which domains of human activity became substantially dependent upon electronic programmable devices for rapidly storing and manipulating data in order to extract information' (Hakken, 1990: 11) still continues and is expanding into different societal fields. Whereas twenty or thirty years ago this transformation process was studied in 'classical' sectors like metal engineering, automotive or electronic industry, nowadays the technological penetration reaches even the health care sector, the transport system and other societal fields with a high human resource proportion. In this process, knowledge becomes - in addition to the classical factors of capital and labour - an increasingly central factor in the value chain.

In the literature, the distinction between 'information' and 'knowledge' is remarkable insofar as it presents 'knowledge' as that which is necessary to produce valid and useful material and to be able to interpret this material. While 'information' tells the current or past status of some parts of the production system, 'knowledge allows the making of predictions, causal associations, or prescriptive decisions about what to do' (Bohn, 1995: 62; Stehr, 1994). Therefore it is important to understand knowledge itself, as well as the production of knowledge, as an active process. In this sense knowledge is not just the content of a database or a mass of information, but it involves the ability to interpret data (Miles & Robins, 1992).

Another important aspect is considered by Nico Stehr. According to Stehr, the production of knowledge mainly implies the reproduction of knowledge: the ability to gain an overview of particular situations in order to take decisions quickly becomes more important than the deep understanding of coherence (Stehr, 1994). Thus knowledge management means the ability to create decision-making processes as a quick response to market demands.

Especially in the management literature, the importance of knowledge in working processes has shifted from the notion of a formal qualification to a highly individual aspect. Whereas in the past knowledge was treated as a technical indicator for professional skills, in recent years it has increasingly become a 'soft' indicator, which has a subjective, dynamic and process-oriented bias. The utilisation of the flexible, subjective and innovative knowledge of employees has been described as a 'paradigm change' in the production process (North, 1999). Therefore the operational aspect of knowledge remains very difficult to transmit.

These changes are therefore also reflected at the operational level. Knowledge-based management is defined as an integrated concept, which implies a need for psychological, organisational and technical indicators in order to develop effective workflow as well as to guarantee the ongoing innovation process. This organisational approach differs from other approaches mainly in its individual aspects. As a result, the organisational level is increasingly connected with individual and personal attributes like communication skills, social competences and the capacity to resolve problems at different levels. 'Knowledge' within working processes can thus be described both as content and as a procedure. Both are related and have major impacts on the structure of work (Degele, 2000).

Through speed-up processes, the emphasis of knowledge may move from content to processes with less content, but the application of knowledge becomes more dynamic, flexible and recursive. Knowledge is less produced than moderated and the competence for moderation and social co-operation becomes a centrally important qualification. As

the whole management literature points out, moderation and organisation of knowledge are the basic activities needed in order to be efficient with knowledge. The result can be 'knowledge at work' (Palshaugen, 2004).

In summary, we can conclude that the knowledge management has been discussed as a strategic indicator for the development of micro- and macro-economic development. At the organisational level, knowledge management can be embedded into a lean management model as well as into new re-engineering concepts (Nippa & Picot, 1995; Osterloh & Frost, 1996).

6.3 The organisation of communication

The precondition for the network organisation is communication. As described above, support for a transformation to a post-Fordist production model is based on:
1. technological communication systems;
2. organisation of communication structures.

6.3.1 Technological communication systems

One of the central advantages of modern ICTs is that they bridge both time and space, which traditionally have been key barriers to information and knowledge exchange. ICTs enable rapid communication across geographical space and organisational boundaries. It is no longer necessary to combine all competences and resources in the same place. Because of the networked character of these technologies, people from all over the world with different expertise can work together to resolve specific problems (Fulk & De Santis, 1995).

This ability to overcome geographical limitations together with the rapidity of transmission can be seen as the major ways in which modern ICTs can facilitate further acceleration of the innovation process. The communication and storage capacity of network technologies enables the creation of innovation as well as the production of knowledge. In this respect, it seems very important that modern ICTs support the exchange of both codified and tacit knowledge. The codification of knowledge on the one hand reduces transaction costs and on the other hand makes it possible to establish information bases and electronic networks for enterprises.

Modern ICTs are the first global technology with the potential for international codification and transferability of intercultural communication. 'Knowledge is from this perspective a non-rival good. It can be shared by many people without diminishing in any way the amount available to one of them' (Soete, 1996: 16). The egalitarian as well as the democratic aspect of ICTs are emphasised especially by Castells, who predicts an improvement in participative culture not only in the highly industrialised societies but also in the countries of the developing world (Castells, 1996). As the digital divide debate shows, however, the egalitarian and participative aspects of communication structures do not depend only on technical access to ICT (Katz & Aspden, 1998; Martin, 2003), but to a considerable degree also on social, cultural and political factors. Without taking this important issue into account, the new possibilities of worldwide communication, the models of networking and the creation of new social and cultural perspectives through ICTs cannot be considered seriously.

At the firm level, ICTs contribute to the creation of new knowledge which can accelerate different learning and innovation processes. They radically transform both intra- and inter-firm communication which is of particular importance in the daily operation of intensively co-operating company networks. ICTs can also radically transform communication between firms and their clients. The possibility of direct communication with clients (who are becoming one of the most important sources of knowledge) opens up new paths to company level learning.

As well as technical access to modern ICTs, specific skills and routines are needed to use the technologies, which are also strongly connected with the capability to generate non-formalised communication. From this perspective, the emphasis is on their potential to reinforce human interaction and interactive learning and ways that companies can support and mobilise tacit knowledge (Ernst & Lundvall, 1997).

6.3.2 Organisation of communication structure

In the literature there is agreement that ICTs are becoming critical ingredients of work processes, because they largely determine innovation capability and provide the infrastructure for flexibility and adaptability throughout the management of the production process. According to Castells, four dimensions are important in order to improve the creation of value or the production of knowledge within firms.[49] 'The first dimension refers to the actual tasks performed in a given work process. The second dimension concerns the relationship between a given organisation and its environment, including other organisations. The third dimension considers the relationship between managers and employees in a given organisation or network. I call the first dimension value-making, the second dimension relation-making, and the third dimension decision-making' (Castells, 1996: 243).

Faced with the increasing complexity at all organisational levels, the importance of communication for bridging the gap between individual knowledge and organisations is clear.

Lam (2000) brings together the types of knowledge and organisations, creating a matrix that distinguishes between four models of organisational learning[50] (shown in Table 6.1).

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[49] Chapter 7 deals extensively with the increasing skill requirements associated with the expansion of ICT. There the additional 'supportive' role of ICT, the speeding-up processes of innovation cycles and the knowledge-intensive character have demanded more adaptability, learning competences and flexibility from workers of all educational levels.

[50] Christian Bessy (CEE) has drawn attention to the outstanding role of Lam (2000) in this discussion. Indeed, with regard to knowledge creation and storage in firms her works are directly derived from that perspective. By focusing on learning processes she analyses how the members of different organisations develop and co-ordinate their skills and what role the institutional context plays in these cognitive processes.

Table 6.1   Types of knowledge and co-ordination of knowledge

		Knowledge agent (autonomy and control)	
		Individual	Organisation
Standardisation of	High	Professional bureaucracy	Machine bureaucracy
knowledge and work	Low	Operating adhocracy	J-form organisation

Source: Lam, 2000: 494

The assumption here is that the Fordist production model is based on professional bureaucracy and mechanical bureaucracy.

1. *professional bureaucracy and embrained knowledge* represents a form of organisation whose capability derives from the formal 'embrained' knowledge of its highly educated professionals/experts. 'Although the professional bureaucracy accords a high degree of autonomy to individual professionals, its structure is primarily 'bureaucratic': co-ordination is achieved by design and by standards that pre-determine what is to be done' (Mintzberg, 1979: 351). The source of standardisation originates outside the organisation. External educational institutions and professional bodies play an important role in defining the standards and boundaries of the knowledge in use (Lam, 2000: 494);

2. *machine bureaucracy and encoded knowledge* relies basically on explicit or formalised ('encoded') knowledge. The key organisational principle in this type of organisation is the well-known triad of scientific management: specialisation, standardisation and control. The core aims of this type of bureaucracy are stability and efficiency. This model of organisation resembles the Weberien 'ideal type of the bureaucracy'. 'The knowledge agents of the machine bureaucracy are not the individuals directly engaged in operations but the formal managerial hierarchy responsible for formulating the written rules, procedures and performance standards. There is a clear dichotomy between the 'application' and 'generation of knowledge' ... Knowledge within a machine bureaucracy is highly fragmented and only becomes integrated at the top level of the hierarchy ... and the structure is designed to deal with routine problems, but unable to cope with novelty or change' (Lam, 2000: 495-496).

Post-Fordist production models can be achieved through the development of operating ad-hocracies or 'J-form' organisations:

3. *operating adhocracy and embodied knowledge:* this shape of organisation represents little standardisation of either labour process or knowledge and is often called organic organisation. It requires mobilisation of both formal and practical-tacit knowledge from its members. The latter types of knowledge are generated through learning by doing and learning by interacting. This way of organising activities and knowledge is characteristic of such activities as software development, new media studies, knowledge-intensive business service firms, *etc.* 'The individual's performance is assessed in terms of market outcomes: the ultimate judges of their expertise are their clients, and not the professional bodies' (Starbuck, 1992). This way there is a strong incentive to engage in 'extended occupational learning and the accumulation of tacit skills beyond the pursuit of formal knowledge ... Operating adhocracies are fluid and fast moving

organisations and the speed of learning and unlearning is critical for their survival in a complex and dynamic environment ... is the most innovative and yet it is the least stable form of organisation' (Lam, 2000: 497);

4. *'J-form' organisation and embedded knowledge:* this form of organisation represents an ideal setting for 'cumulative innovation'. In this type of business organisation, the strength of the firm derives from the knowledge accumulated in the expertise of the working team, the operating routines of employees and their shared norms and values (organisational culture). The designation 'J-form' or 'J-firm' refers to the 'Japanese type organisation' (Aoki, 1988; Nonaka & Takeuchi, 1995). As Lam (2000: 497) writes: 'Co-ordination is achieved via horizontal co-ordination and mutual adjustment. This is reinforced by shared values embedded in the organisational culture ... 'hypertext organisation' (Nonaka & Takeuchi, 1995), an analogy borrowed from computer science to illustrate the dynamic interaction between different layers of the organisation and the freedom of its members to switch among different context, ... facilitates the interaction between tacit and explicit knowledge, and that this ultimately determines the capability of the organisation to create new knowledge.' In spite of the capacity of J-form organisations to generate new knowledge, this form of organisation is well suited to the creation of cumulative innovation (as opposed to radical innovation).

From a systemic perspective these models can be useful for describing the relationship between knowledge and organisations. Especially for the analytical distance and empirical interrelation between cultural modes of production and modes of economic development these models seem to root distinctions in a theoretical basis. However, these models have less potential for guiding empirical and theoretical research projects focused on the analysis of new social structures in the working context. In order to gain more information about change processes in working structures we need a theoretical perspective rooted in the approach that societies are organised around human processes structured by historically determined relationships of production, experience and power (Castells, 1996). Such processes have mostly been analysed at the individual level of the working structures.

Some hypotheses that may be relevant for the WORKS project

1. Coming from the tradition of the industrial society, the characterisation of knowledge-based societies is grounded on new production patterns taking place within global value chains. The (technical) possibility of the digitisation and codification of all types of products as well as the decentralisation of working processes has led to a new concept of knowledge. This knowledge relies on specific technological and cognitive conditions, which are strongly connected with a reorganisation of working structures.
2. The knowledge-based concepts mainly rely on acquaintance with, elaboration, distribution and moderation of immaterial data, databases and information. The computer can be considered as the symbolic tool for these activities. This means that specific competence needs are required (formal qualification, social skills, networking capabilities, *etc.*).
3. The distinction between knowledge management and social capital has been influenced strongly by the idea of knowledge as a 'new organisational concept'. One hypothesis is that the knowledge-based concept as a management concept focuses mainly on the individual level. This means that the continuous improvement of individual

skills (social skills, increasing qualification, flexibility, *etc.*) should be adapted to market demands. The role of 'learning organisations' as the counterpart of this process remains somewhat unclear and open.

4. Networking, decentralisation, internal and external flexibility and new career trajectories can be considered as reactions to new market demands. Therefore 'knowledge management' as an organisational concept has become an important issue in the restructuring processes of work. These changes have created new social and political insecurities.

6.4 Tools of communication and co-ordination: networks, social capital and communities of practice[51]

The analysis of various types of knowledge and learning processes, especially collective or organisational forms of knowledge development and transfer, together with the speed up of the global value chain (Huws, 2006b: 10-11) draw attention to the central role of networking and co-ordination/communication. Since the 1970s, an abundant literature has emerged in the social sciences focusing on various characteristics of networking. In analysing this large literature, this section aims to make a typology of networking in order to arrive at a better understanding of communication and co-ordination mechanisms of knowledge and the related learning processes in the new forms of work organisation. In addition, we make a distinction between the forms and mechanisms of communication and co-ordination.

Differences in technologies, organisational design, cultures or the expectations of social actors may produce communication problems even in cases where firms are interested in co-operating with each other. However, solving the communication problems in organisations in the context of a rapid restructuring of global value chains using leading edge communications technologies cannot overcome the problems related to the appropriate co-ordination mechanisms in the knowledge/learning economy. Whilst communication represents the cognitive form of regulation, co-ordination-based regulation is related to incentive alignment in order to solve co-operation problems within and between organisations (or networks).

Table 6.2 Forms of network: a stylised classification

Dimension	Dichotomy	
Time*	Early phase of networking	Matured phase of networking
Intensity**	Weak ties	Strong ties
Symbolic consistency*	Community centred	Performance-orientated

* Lesser, 2000; ** Granovetter, 1982

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[51] We would like to acknowledge the contributions made to this literature review by Emőke Palócz and Katalin Melles who are both involved in the work of the Hungarian National Research team (ISB).

Table 6.2 summarises a stylised classification of forms of network. In this diagram, the time dimension indicates the importance of the life cycle of network formation. In the early period of network formation, weak ties serve as important sources for the creation of new networks and for generating enough information for the selection of partners for future co-operation (information benefit), while in a later period strong ties - with trust-based relationships resulting from long common work experiences - serve as a basis for longstanding co-operation (solidarity benefit). Previous research experiences draw our attention to the advantages of weak ties in collecting as much information as possible and through this in developing as large a network as possible. This type of network formation is a source of learning and innovation for new 'start-up' firms. At this stage they are mainly looking for the 'information benefit' of networking and knowledge sharing instead of solidarity based 'partnerships'. Depending on the momentary importance of the given benefit, they will choose one or another network configuration. At a later stage, future aims assume a greater role. In this case, the primary aim is to develop a close network on the basis of repeated exchange relations among the partners, and consequently, this type of network formation can be described as trust-based solidarity. This approach illustrates well the importance of the links between social capital formation, knowledge creation and sharing in the life cycle of a network.

In relation to symbolic consistency, it is necessary to make distinction between community-based *versus* performance-based network formation. The community-based network and its role in creating co-operation among otherwise individually competing economic actors is based on close and strong ties, the development of which is a time consuming process (Sabel, 1993; Makó & Simonyi, 1992; Makó & Kuczi, 1997). The performance-based network has gained crucial importance with the development of knowledge/learning economy. This phenomenon is well illustrated by the examples of Silicon Valley, Route 128, *etc.* The following quotation illustrates well the genesis of performance-orientated network formation: 'The main networks of social capital in Silicon Valley are not dense network of civic engagement, but focused interactions among (...) the great universities, US government policies, venture capital firms, law firms, business networks, stock options, and the labour market' (Lesser, 2000: 12).

Networks provide important channels for communication and co-ordination and, as we argued earlier, the formation of a given network depends on the time during which the constituting actors co-operate, the primary aim of the network formation, the symbolic consistency of the network, *etc.* In order to manage different types of network efficiently, it is necessary that the actors participating in the network create, maintain and develop some kind of social capital. There is a plethora of definitions of social capital in the social sciences. From among them the most convenient for the purpose of analysing both the process of knowledge and network creation seems to be that of Adler and Kwon (2000: 93) who say that 'social capital is a resource for individual and collective actors created by the configuration and content of the network of their more or less durable social relations'.

The notion 'capital' may be misleading, therefore it is worth drawing attention to the similarities and differences of social capital in comparison with other forms of capital. The similarities can be summarised in the following way:
1. 'social capital is a resource into which other resources are put with the expectation of future, albeit uncertain, returns;
2. social capital is 'appropriable' (Coleman, 1988) and 'convertible' (Bourdieu, 1985);

3. like physical capital and human capital but unlike financial capital, social capital needs maintenance. Social bonds have to be periodically renewed and reconfirmed, or else they lose efficacy;

4. 'like human capital but unlike physical capital, social capital does not have a predictable rate of depreciation, and that is for two reasons. First, while it may depreciate with non-use, as suggested in the previous paragraph, it does not depreciate with use. Like human capital and some forms of public goods such as knowledge, it normally grow and develops with use: trust demonstrated today will be reciprocated and amplified tomorrow. Second, while social capital is sometimes rendered obsolete by contextual change (see Sandefur & Laumann, 1998, for examples), the rate at which this happens is most typically unpredictable, so that even conservative accounting principles connot estimate a depreciation rate' (Adler & Kwon, 2000: 93-94).

Although Adler and Kwon argue that there are similarities between social capital and other forms of capital, important differences can also be identified:

1. 'social capital of aggregate actors is a collective good, in that it is not the property of those who benefit from it' (Coleman, 1988);

2. 'unlike all other forms of capital, social capital is located not in the actors but in their relations with other actors' (Adler & Kwon, 2000: 94).

Concerning social capital, two dimensions seem important: first 'structural preconditions' (*i.e.* stressing that social capital or collectively shared knowledge are embedded in the structure of network relations), 'interpersonal dynamics' (*i.e.* network creation through product and service provision) and a 'common language and subculture'. Second, it is necessary to draw attention both to the positive and negative aspects of the role played by social capital in the practice of different business functions. Unfortunately, in the mainstream literature on social capital, authors only stress the beneficiary impacts of this kind of capital and do not analyse the possible risks that may arise from using it. With regard to this, our own empirical research results broadly support the results of Adler and Kwon which are summarised in Table 6.3.

Table 6.3   The benefits and risks of social capital

	Benefits	Risks
For the focal actors	* Information access * Power * Solidarity	* Costs of creating and maintaining relationship * Trade-off between power benefits and information benefits * Overembedding due to excessive external ties * Excessive claims * Restriction of freedom * Lower creativity and innovation * Downward levelling of norms
Externalities for the broader aggregate	* Information diffusion * Task accomplishment adds to social welfare * Civic community/organisation citizenship behaviour	* Excessive brokering * Negative externalities of successful task accomplishment for broader aggregate * Fragmentation of broader whole due to excessive identification with focal group * Collusion by focal actors against broader aggregate interests * Restricted access by outsiders to focal groups' knowledge and resources

Source: Adler & Kwon, 2000: 104

The other driver of social capital creation is the speedup of networking, that is new forms of work organisation increasingly have an interorganisational character (due to several factors we have no space to develop, such as increasing competition, the growing importance of innovation activities, *etc.*). In this respect we have to draw attention to the important resources existing outside an organisation which are necessary for it to produce its end products or provide its services. Organising resource utilisation in this way (*e.g.* through constant exchange and sharing of information) becomes ever more crucial, as does the ability of producers or service providers for building social capital across these networks of actors. Thus, social capital and collective knowledge are embedded in the structure of relationships, in the interpersonal dynamics within these relationships and in the context of network formation.[52] In what follows we focus on these three dimensions.

Some authors draw attention to the limited interpretative value of such dichotomies as 'weak *versus* strong' ties in networking, and suggest that a multidimensional approach should be used instead. In social capital creation, we have to distinguish the following dimensions:
1. structural preconditions;
2. interpersonal dynamics within the relationships;
3. common context and understanding.

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[52] Special thanks to our colleague Marcel Hoogenboom (University of Twente), who formulated some doubts in this context. The question however remains for him whether these descriptions are possible at all. Generally the types of networks found in the knowledge-based society are complicated and unstable, and often consists of participants that do *not* share a common set of norms and values.

It is widely accepted in the recent literature on knowledge and social capital that the development of communities of practice is a key structural precondition for social capital creation. We often speak about the need to bring such informal groups of employees into the organisation who do not only share knowledge and experiences but are also related to each other by shared motivation and interests. The 'community of practice' - which represents a structural aspect of social capital formation as well as a new form of work organisation - is an important enabler of building social capital (Lesser, 2000: 13-14). It can help to develop social capital in the following way:

1. the community serves as an intra-network clearinghouse by identifying those with relevant knowledge and helping individuals within the community make connections with one other. This is particularly valuable as the organisation grows and goes virtual and individuals find it increasingly difficult to know who knows what;

2. the community acts as a reference mechanism, quickly enabling individuals to evaluate the knowledge of other members without having to contact each individual within the network;

3. communities of practice can help connect individuals from outside the network with those who are already identified as community members. This function can be critical, especially for new employees who are looking to identify individuals who hold the firm specific knowledge needed for them to be successful in their new roles;

4. by being able to bring people together to develop and share knowledge, the community creates the conditions whereby individuals can test the trustworthiness and the commitment of other community members. Through this process, the community builds its new form of informal currency, with norms and values that are commonly held, and provides conditions of payment that are generally accepted. It is through these repeated interactions that individuals can develop empathy for the situations of others and can develop the rapport with other individuals in the community (Lesser, 2000).

Communities of practice help shape the actual terminology used by group members in everyday work communication. In addition, they generate and share the knowledge objects or artefacts that are used by community members. Equally as important, communities generate stories that communicate the norms and values of the community and of the organisation as a whole. 'These stories enable new members to take cues from more experienced personnel and allow the development of a community memory that perpetuates itself long after the original community members have departed' (Lesser, 2000: 13-14.).

The tension between the conflicting aims of management both to develop well-functioning communities of practice and to diversify (and divide) their work force does present a real source of conflict. However this managerial strategy is as old as the history of business organisation. This is the practice of continuous reproduction of 'core' and 'peripheral' employment and working conditions in the workplaces both in the perspective of single organisations and of the network. However, it would be interesting to identify the continuity between this existing management strategy and the emergence of a new one in the knowledge-based economy. The new managerial methods (for example the support of the systematic renewal of knowledge) are as important for many categories of core worker as they are, for instance, for web developers in the new media sector, in the same way as the widely publicised special incentive packages are important. The use of

new managerial roles (*e.g.* that of 'knowledge broker') is becoming crucial in the changing management strategies that are developed to regulate knowledge use, knowledge sharing and development in the project-type form of work organisations, especially in its 'agency model' version (Makó & Csizmadia, 2006).

The final social product of this briefly presented process is social capital reflected in the shared norms and values of all members of the community, which may facilitate access to the tacit dimension of knowledge.

The interpersonal dynamics of the relationships of social capital are related to the trust-based regulation of human behaviour. Without a shared history of common experiences and interactions or, in other words, without participating in a 'collective learning process' we cannot speak about trust relations based on reciprocity. In this respect, it is worth drawing attention to the analytical importance of the dimension of social time in any organisational adaptation process and especially in the case of building trust. This feature of trust is referred to, for example, by the term 'studied trust' (Sabel, 1993).[53]

Finally, in connection with social capital creation, we have to stress the importance of a common understanding of the tasks, assumptions, hypotheses and language used by the participants in a given network. Once again, similarly to the 'learned' or 'studied' character of trust, the time perspective is also very important for understanding the individual and organisational investments that are necessary to develop shared understanding, the precondition of social capital formation.

Among such sources of social capital such as 'networks', 'norms', 'beliefs', 'rules' and 'trust' relations, we intend to add some ideas to the interpretation and identification of trust relations. In particular, we stress the heterogeneous character of the category 'trust' because of the frequently mentioned importance of trust relations in sharing and developing non-coded and diffused knowledge, especially in project-based firms. We suggest making a distinction between *'category or role driven trust'* and *'person focused or dyadic trust'*. In the case of role or category driven trust, the actors participating in the network can deal with one another more as 'role performers' than as 'individuals'. Expectations are consequently more standardised and stable and defined more in terms of tasks than in terms of personalities. However, it is more difficult to identify and measure empirically 'person focused' trust relations. In this case it is necessary to map and measure the density and internal dynamics of the network.

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[53] This is the least visible tool of social integration, but at the same time it is also a factor of social control that makes its effect felt in the long run. It is usually said to have three components. One is technical competence or professional skill: we trust somebody if he or she is capable of carrying out what is planned. The second component is so-called moral competence, *e.g.* the assumption of responsibility for the community, toleration of another's values and interests, and action in accordance with mutually observed and respected norms (*e.g.* those represented by communities of practice). Besides developing technical knowledge or competence in the self-regulating social subsystems, securing moral competence (*e.g.* to create a solidarity based network) appears to be a more difficult task, though it is precisely trust based on moral competence that can forge co-operation and create stability in reducing mutual losses caused by sharp individual competition and tensions arising from the diversity of social and organisational relations. Time is the third dimension of trust-based relations: participants of interrelationships may test the trustworthiness and commitment of other community members only through shared and repeated experiences. In this interpretation, trust-based regulation of human behaviour is not interest-free but is based on long-term interest relations.

For the empirical investigation of this kind of trust relation, we suggest that the following dimensions of trust creation should be measured:

1. the professional reputation of the persons concerned (*i.e.* we trust a person because his or her personal performance is tested by the other members of networks and by people outside the network too);
2. the person's moral reputation (*i.e.* we have enough tested experiences that the person with whom we are developing relations is eager to understand our special needs and does not exploit unilaterally our weakness to strengthen his/her immediate position in the network. In other words, this dimension of trust relations indicates the importance of mutuality or reciprocity of interest relations between network members);
3. social time, or the time that is necessary for the members of the network/project/ cluster/industrial district, *etc.* to monitor and test continuously each other's reputations, both professional and moral;
4. in relation to the social time dimension of trust relations, we stress the learning character of trust. Trust is not an automatic outcome of the professional and moral reputation, but it requires continuous monitoring and testing by network members. Stressing the importance of the learning process in creating trust-based relations some authors even use terms like 'studied trust' to indicate its importance (Sabel, 1993: 1133-1170).

In order to develop a concept of knowledge it seems important to identify strategic social places of production and distribution of knowledge as a first step. As a second step, routines and professional skills should be observed as well as their links and institutional patterns, ranging from local structures to global regimes. This is by no means trivial because one is looking for new knowledge-based professions and branches, is developing new categories against the background of societal developments and last but not least is looking for large-scale technological changes. This scheme nearly implies a whole research program.

Already now, and especially in the future, individual and collective ability (the ontological dimension of knowledge development) to create new knowledge, to share existing knowledge and to apply them to new situations is crucial. Knowledge in organisations is typically categorised as being either explicit (relatively easy to acquire, transfer and maintain its value) or tacit (difficult to code and document without losing from its value which is the so-called 'epistemological dimension' of the knowledge).

Table 6.4 Types of knowledge

| Epistemological dimension | Ontological dimension | |
	Individual	Collective
Explicit	Embrained	Encoded
Tacit	Embodied	Embedded

Source: Lam, 2000: 491

This combination of explicit-tacit and individual-collective dimensions of knowledge (first mentioned by Collins, 1993; cited by Lam, 1998) results in the four types of knowledge presented in Table 6.4:

1. embrained knowledge (individual-explicit) is formal, abstract, theoretical, standardised, easily acquirable and transferable; it can be used and applied in various heterogeneous situation and can be incorporated through formal education and training (learning by studying);
2. embodied knowledge (tacit-individual) is based on the practical experiences of the individual; it can be used in specific contexts and is emergent, fluid and individually-bounded. Embodied knowledge can only be acquired in practice, through personal experience (learning by doing);
3. encoded knowledge (collective-explicit) is codified in signs and symbols and stored in blueprints and recipes using written rules and procedures. It has a collective and public character and is transferable almost independently from the knowing subject to a wider audience;
4. embedded knowledge (collective-tacit) resides in organisational practices, routines and shared norms. It is heavily context-dependent and deeply rooted in specific work practices and socio-organisational structures. It can be transferred through relation specific informal channels where communication, co-ordination and organisational identity play crucial role. It is often referred to as social skill or social knowledge.

In this section, we have stressed the interrelations between the different types of knowledge and the varieties of learning processes. In addition, this analysis aims to identify the tools of communication and co-ordination that play a growing role in the emerging knowledge/learning economy. In this relation, the characteristics of networking and such social institutions as 'social capital' and 'communities of practice' have been identified and evaluated in connection with the complex practices of knowledge use and learning.

In presenting the learning processes, we intended to focus on the forms of learning that help people to acquire, develop and transfer the tacit and social skills of the various actors co-operating in the work organisation. Finally, in relation to the tools of communication and co-ordination, our intention has been to classify the great variety of networking which depends largely on the context or on contingencies. In emphasising the growing role of co-ordination in knowledge creation and sharing and in the related learning processes, we have focused on the regulatory role of social capital and communities of practice. In this analysis we have aimed to highlight the various forms and content of trust relations and the social time necessary to create them (studied trust).

6.5   Some hypotheses related to the WORKS project

6.5.1   Relations between the practice of knowledge use and labour relations regulations

Combinations and degrees of knowledge/skill used in the business functions/sector (*e.g.* explicit *versus* implicit knowledge) may influence the bargaining position of employees with employers/managers in the organisation investigated. Individual or collective representatives of the occupational groups who are using non-coded or tacit knowledge may

strengthen their power position in the bargaining over working and employment conditions. For this 'core' group of employees the use of official actors (*e.g.* trade unions) and institutions (*e.g.* collective bargaining) may be less attractive in comparison with informal bargaining and consent. The group of employees who have such key positions in the use and development of tacit knowledge may prefer the individualisation of their negotiations with their employers.

6.5.2   Relations between the forms of co-ordination of tasks and the types of knowledge processed and used

In the case of a project-based work organisation or a network-type co-operation which aims to use, share and develop products and services based on non-coded or formalised knowledge and requires the deep involvement of the customer (clients, suppliers, *etc.*) we may presuppose the creation of new co-ordination roles. For example, the importance of special roles such as knowledge brokers and project leaders is increasing in the case of products or services which are based on diffused knowledge.

6.5.3   How to measure the role and importance of 'trust regulations' as a special mechanism in the use and mobilisation of both coded and non coded knowledge

In our view, the various dimensions of trust relations should be identified through reference-testing of the members of the network surveyed in the organisational or occupational case studies in relation to their professional and moral reputations. In addition, it is necessary to describe the testing mechanisms used by the network members to monitor these reputations over time. Finally, we have to note that the operationalisation of these hypotheses will be rather different in the case of the quantitative and qualitative research tools used.