

# ORGANISATIONAL MEMORIES IN PROJECT-BASED COMPANIES: AN AUTOPOIETIC VIEW

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## Abstract

This conceptual paper draws attention to the autopoietic knowledge production as a potential explanation for the project-based company's learning and organisational memory. First, the concept of project-based company is described. Second, the epistemological assumptions are highlighted with the purpose to get a better understanding of what is knowledge and how it and organisational memory develop. Third, concept of organisational memory is described in brief. Fourth, the main content of the paper, namely the study on autopoietic knowledge production (i.e. learning) and memory development in project-based companies is described. The paper ends with the conclusion according to which project-based companies' organisational memories are autopoietically produced and reproduced, which brings about that although people may leave companies, the knowledge produced and communicated by these people is not, as argued by many authors, completely lost, but it continues to be active in the organisational memories of these companies.

**Keywords:** Project-based company, Organisational memory, Autopoietic epistemology

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## 1. INTRODUCTION

During the second half of the 20<sup>th</sup> century, there has been a shift from the functional organisations to the project-based organisations (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).

Another recent shift which surfaces as particularly important is an economic and social order in which knowledge, not labour, raw material or capital, is the most important resource for businesses (e.g. Drucker, 1994). In that respect it is not surprising that also companies which base their businesses on project deliveries have found that the classical sources of competitive advantage, e.g. low cost, have made room for knowledge as the key source of such advantages. For example, in many technological project deliveries the quality and sophistication of functions are more important sources of success than the price. Therefore, it is important for individual people and project teams working for these types of companies to be able to acquire and draw upon knowledge developed in other projects.

However, in project-based companies learning and development of organisational memories is often a complex task. 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. Therefore, many authors argue that the knowledge developed during the project implementation is lost when the project team is disbanded and the people go back into their own organisations.

The goal of this conceptual paper is to show that the above mentioned argument is not completely truth. In the pursuit of this goal the following discussion first defines the concept of project-based company. Then the discussion deals with the two epistemological assumptions, namely cognitivist and autopoietic epistemological assumptions. After that follows an illustration of the concept of organisational memory. And then follows the main content of this paper – namely the study on the autopoietic knowledge production and organisational memory development in the context of project-based companies. All in all, the paper tries to show that *the new autopoietic epistemology better explains knowledge production and organisational memory development in project-base companies than does the traditional cognitivist epistemology.*

## 2. PROJECT-BASED COMPANIES

Project-based companies are organisations in which the majority of products are made against bespoke designs for customers. These types of organisations 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 organisations that collaborate to serve third parties. (Turner and Keegan, 1999)

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. Since projects enjoy autonomy, they easily become separated from each other, with the risk of turning the company into a series of disconnected projects. This means that the project-based companies will tend to suffer from certain weaknesses, e.g. bring about company-wide development and learning (Hobday, 2000) and difficulties in linking projects to firm level business processes (Gann and Salter, 2000). Furthermore, individual projects typically comprise a mix of individuals with highly specialized competences, belonging to different functionally differentiated worldviews (Dougherty, 1992)

making it difficult to establish shared understandings, a common knowledge base. (cf. Lindkvist, 2004)

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 will be distributed (Tsoukas, 1996) into a multitude of local settings and to a great extent reside in individual members. In other words, project-based companies are not like functional organisations with a long and stable history of tenured individuals, a standing tradition of cohort groups, and low turnover. Governance in a project-based company context must take into account the organisation's fundamental dependence on its knowledgeable individuals, and its potential weaknesses in dealing with issues of firm integration and development.

Thus, although project basing is often conceived of as a appropriate way of producing customised products (e.g. Lundin and Midler, 1998) research on learning in project-based companies consistently highlights the problems involved in attempting to capture and share knowledge and learning across projects (DeFilippi, 2001; Prencipe and Tell, 2001). Many authors point to the inherent contradiction between organising to meet short term project task objectives and the longer-term development nature of organisational learning processes (Ekstedt et al., 1999; Bresnen et al., 2003). However, learning through projects is one of the main ways by which project-based companies interact with, and are changed by their environment. This means that using knowledge gained from failures or successes that have occurred in projects is vital for the long-term competitiveness of businesses (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.

The temporary nature of a project means that starting and completion dates are specified for the assignments. Assembly line production (i.e. part of a functional organisation) is an example of an activity that is going 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. This is, a project fulfils its goal within time and money limits. The differences between an ordinary functional organisation and a project organisation can be described as depicted in Table 1.

Table 1 Functional vs. project-based organisation

| Functional organisation       | Project-based organisation    |
|-------------------------------|-------------------------------|
| 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                    |

### 3. EPISTEMOLOGICAL ASSUMPTIONS

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

Epistemology is a branch of the grand divisions of philosophy and it deals with the views of interpreting knowledge, i.e. the ways of knowing. With an organisational epistemology we can construct a theory on how and why organisations, like project teams, and project-based companies know. Organisational epistemology deals with some core questions: what is knowledge, how does it develop, and what are the conditions for knowledge to develop (e.g. von Krogh and Roos, 1996).

Differences in the epistemology are manifested by different ways to categorise knowledge. This means, for example, that by uncovering the epistemological roots of a project one can better understand the characteristics of knowledge production needed in that project. "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, p. 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 epistemological distinction that is highlighted in the following is mainly based on the contributions of Maturana and Varela (1980), Varela et al. (1991), Luhmann (1986) and von Krogh and Roos (1995). These authors refer back to cognitive science because it has been the most influential for scientists studying organisational knowledge. The following two sub-sections provide short illustrations of *cognitivist* and *autopoietic* epistemologies.

### **3.1 Cognitivist Epistemology**

The cognitivist epistemology is based on the idea that the mind has the ability to represent reality in the 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 organisations 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 organisation: the more knowledge an individual or an organisation can gather, the closer the presentation is to reality.

Knowledge production (i.e. learning) in the cognitivist epistemology means to improve representations of the world through assimilating new experiences (von Krogh et al., 1996; Varela, 1979). According to Bruner and Anglin (1973), 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 the brain 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 person to another is the ability to represent reality. The truth of knowledge is understood as the degree to which inner representations correspond to the world outside. As new things are learned, this truth will constantly be improved.

### **3.2 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, 2002a). The theory's main thesis is that the components of an autopoietic system are used to produce new components 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 themselves affect the

components of the system. From this it follows that the production of components 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. perturbation) but closed to knowledge from outside the individual.

Indeed, autopoietic epistemology provides a fundamentally different understanding of the input coming from outside a system (i.e. individual team member, project team, project-based company). 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 conveyed from one individual to another, because data have to be interpreted before its becoming knowledge. Moreover, according to autopoietic epistemology, information does not equal knowledge, but it is a process that enables knowledge production (i.e. learning) and communication to take place. von Foerster (1984, p. 193) states that "...information is the process by which knowledge is acquired". This is, books, manuals, memos, computer programs, this paper, etc., are data – not information.

Thus, an autopoietic system 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. This is, the perturbations trigger knowledge production (i.e. learning), but not specify it. The receiver's own worldview 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. This is, *data triggers information* process, which interprets this data with the help of *existing knowledge*, then updating organisational memory. In other words, this triangle of interdependency is the foundation of development of organisational memory.

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 produced is different: knowledge therefore cannot be directly transmitted but only produced with the help of interpretations of messages. (Vicari and Troilo, 1999) This means that the only way to produce new knowledge is to utilise existing knowledge. Within a project team the people cannot directly transfer knowledge, but they can help in the formation of situations where an individual team member can produce new knowledge.

In project business context many things change continually (e.g. new projects, teams, problems, solutions, etc.) at some speed. It is only their timescale or size relative to individual's perception that sometimes tends to mislead him or her into thinking them static. In other words, different perturbations continually trigger individual's interpretations bringing about new knowledge.

To summarise, unlike the cognitivist epistemology, autopoietic epistemology does not claim that the world is a pre-given, but cognition is a creative function. Thus, knowledge is a component of the autopoietic, i.e. self-productive process. Differences between the cognitivist and autopoietic epistemologies are depicted in Table 2.

Table 2. Cognitivist vs. autopoietic epistemology (Modified from von Krogh et al., 1996).

| Cognitivist epistemology                             | Autopoietic epistemology   |
|--|--|
| Knowledge is a representation of a pre-given reality | Knowledge is creational and based on distinction making in observation |
| Knowledge is universal and objective                 | Knowledge is history dependent and context sensitive                   |
| Knowledge is transferable                            | Knowledge is not directly transferable                                 |

According to the discussion above, we choose autopoietic epistemology to be the basis of our understanding of knowledge, knowledge production, and organisational memories in project-based companies. The choice is based on the idea to find a new observational scheme for the understanding of organisational memory development.

#### 4. ORGANISATIONAL MEMORY

Although it has generally been recognised that organisational memory consists of mental and structural artefacts that have consequential effects on performance, the concepts of organisational memories have remained fragmented, and have not been synthesized into a coherent theory. Researchers disagree on the specific form of organisational memory and on what level it might reside in the organisation. Opinions range from Argyris and Schön (1978, p. 11), who argued that organisational memory is only a metaphor, i.e. "...organizations do not literally remember...", to Huber (1996, p. 150), who argues organisational memory being important in the organisational learning process "...to demonstrate or use learning, that which has been learned must be stored in memory and then brought forth from memory; both the demonstrability and utility of learning depend on the effectiveness of the organisation's memory...". Numerous other opinions fall some place between these rather divergent perspectives.

Here, because we accept the possibility that past events are brought to bear on present events, we postulate the existence of an organisational memory that enables the co-existence of the past and present (cf. Walsh and Ungson, 1991). We argue that organisational memory relates the dialectics of planning, communicating, decision-making and knowledge management in organisations. For example, Argyris and Schön (1978, p. 11) claim "... for organizational learning to occur, learning agents' discoveries, inventions, and evaluations must be imbedded in organizational memory". Weick (1979) argues that organisations must accept and live with their memories because memory is an important co-producer of the personality of a firm. Organisational culture is similar to firm's personality in that it provides an organisational memory that minimises the need to start over whenever personnel changes occur (Walsh and Ungson, 1991). Furthermore, Schatz (1991) generalises these observations by suggesting that organisational memory provides knowledge that enables an organisation to function effectively.

Walsh and Ungson (1991) undertook an extensive study on the organisational memory. On the basis that the organisations process data, they concluded that organisations must also have memories, though not necessarily of a type that matches individual's or computer's memory. Furthermore, they categorised organisational knowledge and learning in terms of the different types of memory. They went on to model organisational memory as six "storage bins": individuals, culture, transformations, structures, ecologies and external archives. This was eclectic, capable of grasping most of the ways in which many other authors (e.g. Nelson and Winter, 1982; Barney, 1986) have previously thought about organisational memory.

According to autopoietic epistemology, the communication between project stakeholders takes place through the operation referred to as *recursivity* (Luhmann, 1995). Having a recursive view of project-based companies implies dealing with question how organisational memory develops. Recursivity takes place when knowledge and skills needed in project implementations are offset against a company's present modes of action (i.e. norms, standards, routines) which again enable new knowledge and skills to occur. This means that a project-based company's organisational memory is developed by projects which, in turn, influence future projects. In other words, recursivity refers to the communication between projects and the context for these projects. This means that the modes of action of a project-based company are created through the implementation of projects. They form again contexts within which new projects are implemented. Moreover, these

modes of action constitute constraints because they put limits on the project implementations, but, however, they also represent opportunity for new ways to act.

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

Indeed, organisational memory plays a significant role also in the context of a project work. 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 organisational memory. Project team members draw on both 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. Huber, 1999; Love et al., 2005)

In fact, the concept of archiving and using learning histories is already an old one in project-based companies. For example, in many project-based companies it is considered good practice to create documents of what is learned in a project. However, according to Conklin (2001), even in those companies in which this practice is a 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 (Conklin, 2001). 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 it.

These two examples in capturing organisational memory seems to give an impression that project-based companies cannot create a useful memory store just by capturing lots of data, but they must somehow organise it in ways that create a coherent whole. These examples also give an idea that the creation and use of organisational memory cannot be a by-product, an extra bit of work hanging on the side of the organisation'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). From this it follows that the project-based companies should find ways of preserving the asset of knowledge they have to look within the practices of everyday teamwork. This suggests, in turn, that in this paper *the concept of 'organisational memory' means job and skill related knowledge - which can be technical, professional, or managerial - embedded in memories of people working for projects and project-based companies.*

## **5. AUTOPOIETIC KNOWLEDGE PRODUCTION AND MEMORY DEVELOPMENT IN PROJECT-BASED COMPANIES**

According to Luhmann (1986), both individual people and organisations (e.g. project teams and/or project-based companies) use *meaning* as their basic form of knowledge production and memory development, i.e. all kinds of knowledge an individual acquires and understands, is represented in the form of meanings. However, people use their *consciousness*, and organisations (i.e. project teams and project-based companies) utilise *communication* as the basic mode of meaning-based knowledge production.

## 5.1 Consciousness

Psychical-mental activities constitute, in the form of recurring processes, 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 meaning emerges in the consciousness as this content becomes referred to the object located in the situation in such a manner that a person understands what the object implies (Pihlanto, 2000, 2002). This means that an individual can understand an object only in terms of meaning. The network of all meanings accumulated in the consciousness is called the *worldview* of an individual. The worldview is recurrently redefined as new meanings (i.e. from perturbations which trigger information processes) emerge on the basis of new contents from 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 is 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 perturbations from the situation, e.g. observes and produce new knowledge. Meanings are often forgotten, fading into the unconsciousness and perhaps retrieved into the consciousness anew.

What an individual project team member brings to the knowledge production situation has an important influence on what he or she can learn from another individual. This means that an individual's personal worldview profoundly influences the way by which he or she experiences the situation at hand. "...although it is the individual who learns, this individual is one who has a language, a culture, and a history..." (Usher 1989, p. 32). Thus, a project team member's personal worldview affects, for example, how he or she commits to the task at hand, and what he or she can in the first place understand about the knowledge communicated. People always learn in relation to their worldviews or what they have learned before.

Thus, a project team member's existing worldview determines how a piece of data (i.e. perturbation) is interpreted. The information process may be influenced by his or her position within the project, previous experiences and other project team members and environment. To establish uniformity of shared interpretation, there needs to be uniformity in worldviews among the people of a project team. This is easier when new triggering perturbations are framed in a consistent and familiar manner (cf. Koskinen, 2004: mechanical project management environment). If new perturbation is 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 (cf. Koskinen, 2004: organic project management environment).

## 5.2 Communication

According to autopoietic epistemology, the knowledge communication means indirect transfer of knowledge between the worldviews of individuals (Pihlanto, 2000, 2002; Koskinen and Pihlanto, 2006). This transfer occurs under regulation of parties' personal situations in highly personally oriented ways. These personal worldviews are derived from the individuals' previous experiences, i.e. they are acquired from the social and cultural environments or situations, and they are partly forged by the individuals' own awareness and efforts. They contain pre-suppositions and assumptions that the people have developed in the past. These worldviews are not something about which these people can readily give a comprehensive account. Parts of the contents of worldviews are even totally unconscious, but they still can influence behaviour.



Communication cannot be said to have occurred until the receiver has understood something, even if not what was intended (Mingers, 2002). This means that the very nature of communication remains undefined until it has been interpreted by the other. For example, according to Boisot (1983), knowledge is produced with the help of language with an efficiency that will vary depending on the characteristics of the communication channels used for such production. The process of codifying a message for knowledge production involves a loss of meaning that can only be recovered in situations where the receiver (i.e. another autopoietic system) associates the same cluster of meaning with the symbols chosen, as does the sender. Therefore the codifying message, which may give rise to uncertain or ambiguous interpretations, requires either the simultaneous activation of several channels of communication, in order to minimise the loss of meaning 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.

Thus, any communication generates meaning, whether intended or not. An autopoietic system – a project team member, project team or project-based company – determines what for it is relevant data, how it may be embodied, and how it may be interpreted. In doing this it draws its own distinction as to what belongs to the system and what does not.

On the basis of the discussion above we draw the conclusion that a crucial part of organisational memories of project companies resides within the individual team members who enter and exit projects. This means that knowledge of individual team members is critical to project teams' and/or project companies' abilities to solve problems and produce new knowledge.

### **5.3 Knowledge Production and Memory Development**

According to Hofstadter (1979), different levels (e.g. organisational levels) collapse, which makes it possible to understand the phenomenon of self-reference. These levels should be interpreted at the same time as separated and tangled, hierarchized and non-hierarchized. According to Hofstadter, in this way we can understand 'strange loops', which threaten the stability of hierarchy and may even lead to its destruction. Every objective takes the place of the other in a process of 'oscillation' that cannot be stopped (cf. Bakken and Hernes, 2002b).

A model of a knowledge production process that is widely used in the management literature is the Lewinian experiential learning model (Kolb, 1984). This model has appeared in a variety of different 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-generalisation cycle. In accordance with this model and the above mentioned concept 'strange loops' we can suggest that each of the four aspects of the knowledge production model can be developed into knowledge production styles of three different levels of the project work context – namely into individual team member, project team, and project-based company levels (Figures 1a, 1b, and 1c). This means that the way an individual project team member autopoietically produces new knowledge (Figure 1a) is similar to the way a project team autopoietically produces new knowledge (Figure 1b), which is similar to the way a project-based company autopoietically produces new knowledge (Figure 1c). In sum, the knowledge production and organisational memory development takes place on different organisational levels similarly, but however, not identically.

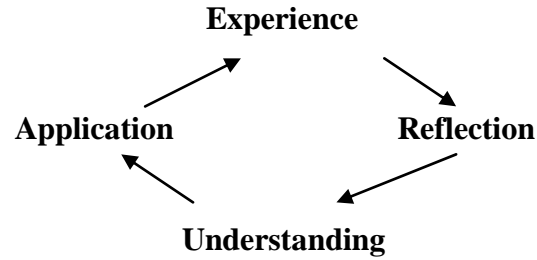


Figure 1a: Individual's autopoietic knowledge production

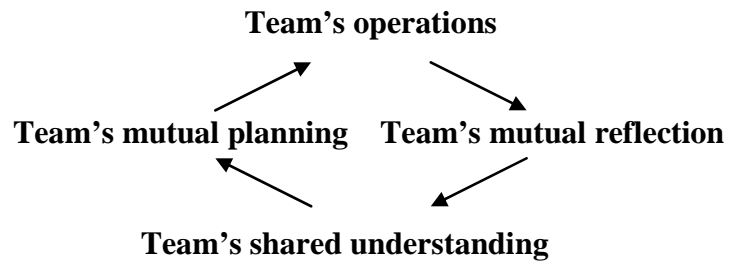


Figure 1b: Project team's autopoietic knowledge production

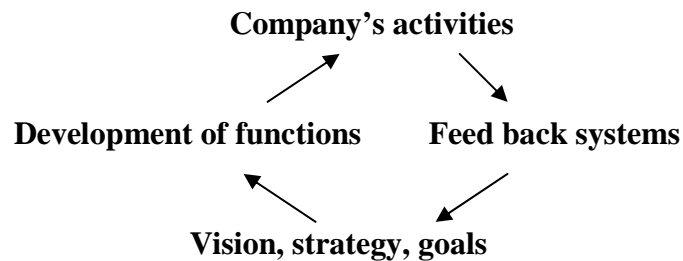


Figure 1c: Project-based company's autopoietic knowledge production

In addition to this, a recent ethno-methodology framework of organisational knowledge production (i.e. learning) and memory development is based on the juxtaposition between the exploration and exploitation (Bontis et al., 2002; Crossan et al., 1999). Renewal is based on organisations exploring

and the production of new knowledge at the same time while exploiting the knowledge they already have. Furthermore, this framework considers knowledge production at three levels: namely at the individual, team, and organisational levels. There is thus a nesting of autopoietic systems – interaction occurs within projects, and these projects are also nested within a project-based company. In this situation there is a reciprocal interaction: projects generate the structures of the company, but equally the company provides conditions and constraints for projects. This means that knowledge production and memory development takes place at various levels, i.e. autopoiesis at various organisational levels of project-based companies. However, the autopoietic knowledge production and memory development does not take place on various organisational levels in general, but similarly across levels, i.e. it happens similarly by an individual team member, a single project team, and a project-based company. (See Figure 2)

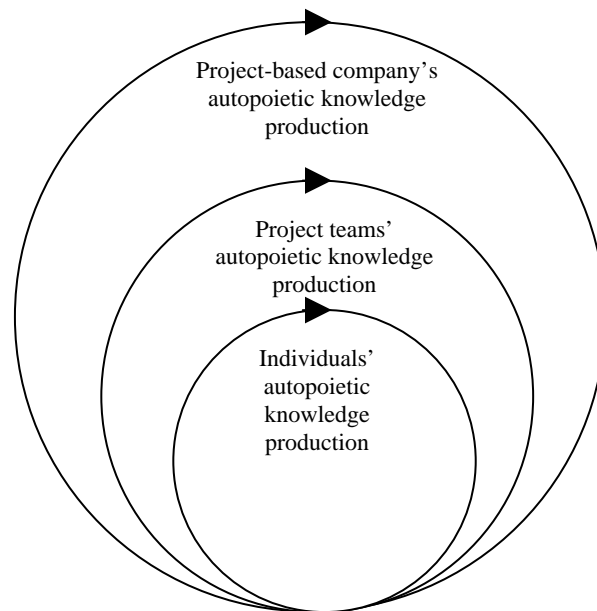


Figure 2: Three knowledge production levels (Adopted from the idea of Ahmed et al., 2002)

Thus, according to autopoietic epistemology, knowledge production which takes place at various organisational levels utilises existing knowledge (i.e. memories) in the production of new knowledge. This means that the memories only serve knowledge production (i.e. information processes), they are not themselves intelligence (Spender, 1996b).

To put together, as said above, a perspective of recursivity provides a form of distinction between past, present and future (Bakken and Hernes, 2002b). This means that it is not possible to see project-based company's organisational memory development as a series of present state of affairs in which there is a clear break between past, present, and future. Instead of that the 'present' is formed out of the meeting between a past and a future. This means that the previous projects have left their traces on the current and future projects. However, the problem is that these 'traces', cannot be given absolute influence on the current or future projects. Nevertheless, without traces from the past the project-based company cannot exist over time as it would not be able to reproduce itself. Autopoietic epistemology demands that there is an element of reproduction, which is that of the project-based company. This means that projects, once having implemented, disappear unless they take place within a company that acts as a 'carrier' over time. It is the reproduction of organisational memory that the project-based company is autopoietic.

## 6. MANIFESTATION OF KNOWLEDGE PRODUCTION AND DEVELOPMENT OF ORGANISATIONAL MEMORIES

Project-based companies' organisational memories are maintained through autopoiesis, i.e. recurrent patterns of interaction. For example, by passing stories through communication networks, knowledge is maintained for long periods of time even as organisational 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 and culture, i.e. organisational memory. Therefore, *a project-based company may preserve knowledge of the past even when project teams are disbanded and the team members go back into their own departments or to other projects.*

The companies' organisational arrangements, which contribute to individuals' knowledge productions, are a practice of sharing an evolving knowledge within the companies' staff and of maintaining companies' organisational memories. Benefits of these arrangements are that they reduce the likelihood of mistaken assumptions about generalisability of the new knowledge (cf. Huber, 1999). This means that the individuals relate with one another in order to produce shared understanding, i.e. they are entangled in collectively produced "webs of meaning" (Geertz, 1973) that enables the efficient use of individual knowledge and skills. This, in turn, means that the reproduction of common understanding is supported by a mutual exchange of ideas and opinions between individual project team members.

However, autopoiesis can also be a factor that limits knowledge production and reproduction of organisational memories. This means that a project-based company governed by autopoietic knowledge production, is likely to develop shared understanding and organisational memory in so far as consistent behaviour is achieved and justified. However, the resulting shared understanding may not be superior, or even adequate, origins of effective behaviour in achieving competitive advantage or greater knowledge. Maturana and Bunnell (1998) have argued that acceptance of a vision, or purpose that is strongly adhered to and becomes a prime modifier of behaviour, actually leads to less intelligent behaviour. Therefore, the autopoietic systems (i.e. individual team members, project teams, and project-based companies) continuously demand new and different perturbations (e.g. new and different projects) to be able produce and reproduce new knowledge and develop organisational memories.

## 7. CONCLUSIONS

The current theories about knowledge production and organisational memory development in project-based companies are largely based on the idea of codability and transferability of knowledge between the people and across the borders. This type of thinking is based on the traditional cognitivist epistemology that means that knowledge represents external reality. The new autopoietic approach suggests transition from these theories to the theory of knowledge production as a creational matter, which type of thinking can potentially provide a new explanation for project-based company's organisational memory.

Our claims in this paper have been as follows:

First, according to autopoietic epistemology, the new knowledge come from making distinctions based upon existing knowledge, which is itself constructed from knowledge of previous experiences – and so on recursively. Therefore, knowledge production in a project-based company means that an individual team member, a project team and a project-based company itself produce knowledge consistent with currently shared knowledge. In other words, a project-based company's accumulation of organisational memory at various organisational levels is an expression of change in knowledge that always maintains compatibility between the autopoietic system (i.e. individual

team member, project team or company) and its environment. Therefore, in order to increase the project-based company's ability to produce new knowledge, it becomes necessary to create perturbations. This means, in turn, that the project-based company's knowledge production addresses how it is able to create these perturbations, (e.g. new and different projects), and thereby produce knowledge around them.

Secondly, many authors argue that the knowledge produced during the project implementations is lost when the project team is disbanded and the people go back into their own organisations. However, we claim that this is not fully truth. This is because - according to autopoietic epistemology - what people know is influenced by what they knew, and what people will know depends on what people know. This is, "...everything said is said from a tradition" (Varela 1979, p. 268). And moreover, the organisational interpretations are made possible through the sharing of individuals' interpretations, which means that these interpretations (e.g. new knowledge) transcend the individual level interpretations. This knowledge manifests itself as different repositories like individuals' know-how, stories, knowledge of whom to ask, etc. Therefore, we can conclude that a project-based company preserves knowledge of the past even when project team members go back into their own departments or to other projects. However, not all knowledge produced during project implementations is preserved into companies' organisational memories.

Thirdly, organisational memories of project-based companies are autopoietically produced and reproduced. This paves the way for conceptualising the project-based company in a manner how an individual project team member produces new knowledge is similar to the way a project team produces new knowledge, which is similar to the way a project-based company produces new knowledge.

Finally, finding viable ways, in which project-based companies can ensure that knowledge is produced and communicated across project boundaries and up and down the organisational 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' organisational knowledge and memory, individualised and socialised.

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