

## Tangible Workspace for Intangible Work

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***Abstract.** The creation of intellectual property requires workspaces that structure and provide balance between team and individual work activities. The intellectual property means ability to learn and create new knowledge. The workspaces supporting the knowledge creation process are resources for companies.*

*This paper describes elements of learning and knowledge creation and proposes ways in which the work environment can support it. The elements are derived from existing literature. The aim is to create a classification for the different kind of workspaces needed for different phases of knowledge creation.*

*A model, which helps to evaluate and to classify the elements of work environment, is presented. It offers a framework for organisations to discuss further about their ability to use the work environment as a resource for knowledge creation. The literature-based model guides the empirical measurements towards a multidisciplinary direction and it offers a perspective for further development.*

***Keywords:** work environment, knowledge work, knowledge, tangible, intangible, tacit and explicit, individual, collaborative, extrospace, introspace*

### 1 Introduction

The concept of a “learning organization” appears revolutionary to many, because learning is so often considered a solo activity. Learning environments get a similar reaction. But many kinds of learning are collaborative. Perkins and Salomon (1998) call learning a “fundamentally social activity” that draws people together into communities of practice. People are united by a common enterprise develop and share ways of doing things, talking, sharing beliefs, values and practices. The learning organisation is in more and more significant role in the time of knowledge work, because knowledge work means any creative systematic activity undertaken in order to increase the stock of knowledge of man, culture and society, and the use of this knowledge to devise new applications (Despres and Hiltrop 1995 in Collins 1998). The creation of new knowledge needs social interaction in the exchange of

tacit knowledge, in the formalisation of tacit knowledge to explicit knowledge and in the sharing of the new knowledge created (Nonaka *et al.* 2001).

The physical environment is critical to these more complex learning processes within knowledge society, knowledge work and learning organisations. As Winifred Gallagher (1993) wrote in her book *The Power of Place*: “Throughout history, people of all cultures have assumed that environment influences behaviour. Now modern science is confirming that our actions, thoughts and feelings are indeed shaped not just by our genes and neurochemistry, history and relationships, but also by our surroundings.” Though the context of Tayloristic work tradition still affects to the perception and attitude towards work of knowledge society. Hierarchies are created with formal specialisation and Tayloristic bureaucracy considers the participants as a part of standardised and routine system (Dettwiler 2003). But the knowledge intensive work often demands collectivism and there is a need to work across the borders between individuals, groups and organisations to achieve the results of it (Huuhtanen *et al.* 2000).

This paper aims to discuss about the important issues of knowledge creation in the context of work environment. The research question aims to find out the relevant classification of knowledge workspace. The existing classifications are discussed as well as the theories of knowledge production in the context of adult learning processes. Based on this framework the results of literature review are presented in the simple model. Finally, the challenges for organisations to understand their accommodations as a resource for knowledge creation are summed up in the conclusion. The paper is part of a larger research project in which analysis of space is developed for management to analyse ways that workspace can support knowledge production. The results discussed in this paper support the analysis and interpretation phase of this project. The results offer a model as a typology, which can be used as a framework for analysis of space.

## **2 The research question**

The explorative approach is used in order to form a model to understand the elements of learning process and the requirements the process set to the workspace and environment. In industrial production lane the raw material was processed to be goods. The production lane of the knowledge processes is different: the raw, tacit knowledge is transferred with the help of explicit knowledge to internalised tacit knowledge. The raw material is intangible, tacit knowledge. The articulation and construction of it makes the knowledge explicit. After this transformation the knowledge become tacit again, learning has happened and outcome is internalised tacit knowledge – it is more than learning by heart. Tacit knowledge was first coined out by Polanyi (in Stenmark 2001), and is that which is in the mind of the individual, it is intangible and difficult to describe. By contrast explicit knowledge is tangible. Explicit knowledge is everything that is written down or otherwise encoded within an organisation’s documents, systems and processes. Explicit knowledge is the knowledge know-what when the tacit knowledge is know-how.

The measurable character of explicit knowledge differs from the tacit knowledge, which is often difficult to measure and even manage (Cortada 1999; Nonaka and Takeuchi 1995; Schön 1983.)

The process of knowledge creation can be supported by facilities and workspace arrangements. In traditional production, i.e. primary production and industry, the visual sense and the hands were the most important transmitters of the technology contact. The interface was very concrete and visible. The man-technology interface is the key question also from the point of view of the usability of new technology. Workload and the productivity of work are to a great extent determined by such an interface. The human-technology contact is, however, much more complex and a great deal more abstract in the case of IT. (Rantanen 1996.)

The question is if the process of knowledge creation is supported in a way it should or in a way it has used to support in the times of producing the goods. There is a lack of deeper understanding of the nature of knowledge production processes in the context of workspace as well as lack of experience of working both in physical and virtual work environments. The research question in this paper is: What kind of classifications can be used to illustrate the connection between workspace and the knowledge creation as a primary process?

The answer for the question is based on literature review. Instead of the traditional method of literature review, where each author is considered in turn, the literature by particular issues is assessed. These issues deemed as directly relevant to this paper. The purpose of a literature review is to provide theoretical contents and context for a method of interpretation. The method of interpretation is needed for different methods of analysis of space. According to Mosbech (2004) these methods can include i.e. user profile, analysis of functions in space, analysis about the relationship between organisation and environment. The relationship between learning process and environment has been investigated by the type analysis (Nenonen 2003) and the space profile of it needs a frame for interpretation.

The review is presented in three different parts: First the typical sub-themes for workspaces of knowledge creation process are summarised. Second, the relevant findings from the literature about operational and environmental elements for learning process are combined and third, by mode of cross-table the knowledge workspace typologies are drafted for a model.

### **3 Space for learning**

#### ***3.1 The workspace***

There is no lack of approaches and classifications for work environment. However there is a need to understand multidisciplinary approaches and their different languages to manage work environments (Soja 1997; Weiskopf 2000). The work environment combines many players and processes. Workplace planning or process architecture and design concentrate on the functional and symbolic use

of space (Dettwiler 2003). The sociological framework brings in the context of society and gives input to the social character of knowledge work as is described in the concept of “Third Places” (Oldenburg 1989). According to Lefebvre (1991) there is a difference between objectively defined spaces - “spatial practices” - and more subjectively defined mental, cognitive or ideal spaces - “representations of space”. He believes that the interaction of these two created lived spaces- what he describes as “space of representations”. He concluded that space is never empty and always embodies diverse meanings for the actors who share it. Space may be physical and geographical, but space is also a metaphor for people’s range of intention and understanding - things seen but also things thought.

Roberts *et al.* (2001) use four metaphors for workspace: natural space, behavioural space, space of artefacts and emotional space. The natural space seems to be the paradigm for the efficient management of organisational space - it means the measurement of the performance of operational real estate assets and the significance of explicit and rational ideas (McGregor and Then 1998). The second metaphor, behavioural space is more a behavioural modifier. The space gives aspiration for people and can serve as a tool for the managers to manipulate people’s behaviour. The idea that management of organisational space can lead to defined behavioural outcomes - particularly employee productivity - provides powerful support to the ambition of managers to align the use of space with wider business objectives (Roberts *et al.* 2001). The third metaphor, the space of artefacts envisages that organisational space is socially constructed through the use of diverse physical artefacts and social interactions within the workplace (Turner 1971). The metaphor of emotional space explores the responses of the psyche to organisational space (Roberts *et al.* 2001). The “spirit of space or place” is often discussed within this metaphor.

Duffy (1997) describes four major organizational types of work environments in offices as hives, cells, dens and clubs. Hives are compared to beehives occupied by workers bees. Cell presents the isolation present in cellular offices. Den are busy and interactive places where it is easy to work informally in teams, club present the new transactional office. In the real world the workspace of companies tend to represent a mixture of all four between two dimensions: both low - high autonomy and interaction underlay this typology of workspaces.

Holtham and Ward (2000) classify the knowledge workers surroundings in general besides the office environment. They use the two dimensions of collaborative-individual knowledge work together with illustrations of particular locations in open-minded – single-minded space. For example the most open-minded space of all is the free fresh air and it has throughout the history been capable of stimulating creative thoughts. The opposite happens in an enclosed prison cell; in general this form of sensor deprivation is probably not conducive to creativity. Busy, crowded, executives may well cite stressful airport departure lounge – a model of open-mindedness – as a place where they can readily carry out individual knowledge work. The cellular office may be frequently used as a place

for small-team meetings and hence score relatively highly as a collaborative work location. According to several studies conducted by Holtham and Ward (2000) they present: “There is a range of key factors that has significant implications for the relative success of spaces in supporting knowledge creation.”

The reality of widening the work environment from physical to virtual space is present in the time of information and communication technology (ICT) revolution. According to Wauters and Harrison (2003), the Space Environmental Model classifies the virtual and physical workplace. Both can be private, privileged or public. Public place is predominantly suited for informal interaction and touchdown work for relatively short periods of time i.e. cafes, hotel lobbies, airport terminals, chat rooms and information sources. Privileged space supports collaborative project team and meeting spaces as well as providing space for concentrated individual work, i.e. clubs, airport lounges, collaborative virtual environments, project extraneous, videoconferences. Private space also contains both individual and collaborative work settings but with greater emphasis on privacy and confidentiality, with defined space boundaries and security, i.e. serviced offices, incubator space, home working, and corporate intranets.

Nonaka and Takeuchi (1995) describe work environment as a space where knowledge is shared in a knowledge cycle. The space for knowledge creation is called as “ba”. Ba can be defined as a “place” or “field” or a shared space – it can be physical, virtual or mental space, or combination of them. In ba knowledge is created, shared, and utilised. Nonaka *et al.* (2001) describe that “ba” is the context shared by those who interact with each other, a process through which the context itself evolves through a self-transcending process of knowledge creation. Ba provides the energy, quality, and place for individual knowledge conversions and for moving along the knowledge spiral between tacit knowledge and explicit knowledge.

These workspace classifications and concepts as such can be detected to two aspects: tangible and social (Table 1). Tangible aspects include measured qualities and experienced qualities of workspace. Social aspects include the individual and co-operational qualities of workspace.

**Table 1.** Summary of sub themes of workspace

| Tangible aspect   | Social aspect  |
|---|--|
| <ul style="list-style-type: none"> <li>– Measured qualities and experienced qualities of organisation space dimensions (Roberts <i>et al.</i> 2001)</li> <li>– Low autonomy and high autonomy dimensions (Duffy 1997)</li> <li>– Tangible and intangible dimensions (Nonaka and Takeuchi 1995, Nonaka and Konno 1998, Nonaka <i>et al.</i> 2001)</li> </ul> | <ul style="list-style-type: none"> <li>– Individual and collaborative dimensions (Duffy 1997, Holtham and Ward 2000, Wauters and Harrison 2003)</li> <li>– Close-minded space and open-minded space dimensions (Holtham and Ward 2000)</li> <li>– Public and private dimensions (Wauters and Harrison 2003)</li> </ul> |

These aspects are relevant to keep in mind when forming the model for knowledge workplace. Before this several approaches to process of knowledge creation are described.

### **3.2 Elements of knowledge creation**

The theories of learning are many and it is difficult to choose the relevant ones. Nonaka and Konno (1998) have used the knowledge learning cycle to illustrate the interaction between tacit and explicit knowledge. The knowledge learning cycle can be called also as a SECI-process (Socialisation, Externalisation, Combination, Internalisation). The knowledge learning cycle is based on a double spiral movement between (a) tacit and explicit knowledge and (b) individual-group- divisional and corporate-wide levels. Socialisation (from individual tacit knowledge to group tacit knowledge) is a process of creating common tacit knowledge through shared experiences. A “field” of interaction, where individuals share experiences and space at the same time can be built for socialisation, thereby creating common unarticulated beliefs or embodied skills. Externalisation (from tacit knowledge to explicit knowledge) is a process of articulating tacit knowledge into such explicit knowledge as concepts and/or diagrams, using often metaphors, analogies, and/or sketches. A dialogue intended to create concepts from tacit knowledge triggers this mode. Combination (from separate explicit knowledge to systemic explicit knowledge) is a process of assembling new and existing explicit knowledge into a systemic knowledge, such as a set of specifications for a prototype of a new product. Often, a newly created concept should be combined with existing knowledge to transform it into something tangible. Internalisation (from explicit knowledge to tacit knowledge) is a process of embodying explicit knowledge into tacit, operational knowledge such as know-how. Explicit knowledge documented into text, sound, or video formats facilitate the internalisation process. Therefore, manuals, a quintessential example of explicit knowledge, are widely used for internalisation. These four modes of knowledge take place in a continuous knowledge learning cycle. (Nonaka and Takeuchi 1995; Nonaka and Konno 1998; Tuomi 1999.)

The model of seven learning processes (van Houten 1995) focuses on the process from external knowledge to internal knowledge adding the sphere outside the individual to the sphere inside the individual. The analyses include also the difficulties in different phases of the learning process.

Van Houten (1995) describes learning with seven learning processes, which are to perceive, to relate, to digest, to individualise, to practise, to grow faculties and to create something new. This process includes the dimension between external knowledge and internal knowledge. Besides the process itself this model classifies the obstacles, which affect the learning process. Table 2 summarises both learning processes.

**Table 2.** Summary of learning process and its obstacles according to Nonaka et al. 2001 and van Houten 1995

| Learning process |                            | The forms of behaviour in learning process - the typical obstacles   |
|------------------|----------------------------|--|
| SOCIALISATION    | 1. TO PERCEIVE             | Critical attitude: Prevention of pure impression<br>Strong expectations: Negative attitude or unrealistic expectations for future reinforced in the group<br>Resistance or desire of authority<br>The seek of authority  |
|                  | 2. TO RELATE               | Narrow-minded attitude or arrogant attitude<br>Cold atmosphere easily experienced in order to ignore joining, searching for isolation<br>Status orientation in observation   |
| EXTERNALISATION  | 3. TO DIGEST               | The fear of new things and lack of self-confidence<br>Fear of embarrassment and belief in authority<br>Fear of losing the identity   |
| COMBINATION      | 4. TO INDIVIDUALISE        | The permanent uncertainty is inconvenient - the ego is unable to live with it and avoid it. The regular self-confrontation<br>"Leader" - religious, scientific, or personal authority - leaning on imitation instead of groups own ability to function.<br>The resistance of chaos is weak |
|                  | 5. TO PRACTISE             | The laziness<br>The hidden barriers<br>The unreceptive attitude towards repeating  |
| INTERNALISATION  | 6. TO GROW FACULTIES       | The strong routines<br>The impatience<br>The sense of security<br>The principles of right and wrong, pragmatic attitude  |
|                  | 7. TO CREATE SOMETHING NEW | The perfectionism, a lack of self-confidence,<br>The fear of mistakes<br>Will for predictable activities<br>The need for control, unwillingness to take risks  |

The elements of learning processes can be seen as a production lane for knowledge. The process orientation of learning and creation of new knowledge force workspace planning to provide “catering for diversity of work patterns - space and place must cater for changing behaviour: who we want to be, what roles we want to play and with whom we want to be at a particular time. These are the attributes of new behaviours that organisation must learn to support.” (Bradley and Woodling 2000).

The decision of using only these two learning theories is based to the fact that both models are linked to the processes of adult learning. This adds their relevancy to be used in organisational learning context. The challenge is to investigate how space can support different phases of learning process and take into account two dimensions: the tangible and intangible character of knowledge as well as the individual and social character of it. Can these qualities be applied to the workspace?

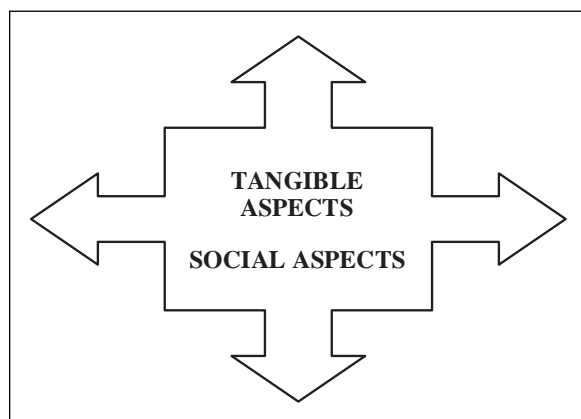
### 3.3 *The model*

The theoretical context from literature review enables meaningful synthesis and in order to summarise the classifications of workspace the use of two aspects is relevant: tangible and social aspects. These are the typical sub-themes for workspaces for knowledge creation process at first.

Secondly the literature review indicates two processes of learning. They are combined with environmental elements of workspace. This is presented in Table 3.

Third, by mode of cross-table the knowledge workspace typologies are drafted for a one model. The aspects of the workplace classification were tangible and social (Figure 1).

The learning or knowledge creation process can be expressed with Figure 2.

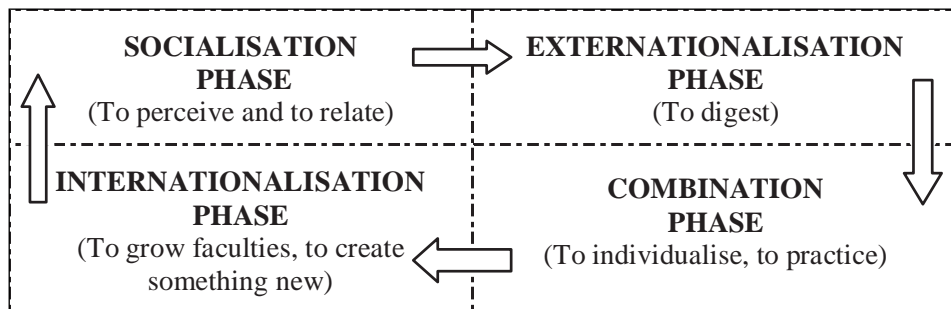


*Figure 1. The aspects of workspaces*



**Table 3.** Summary of the learning process and environmental elements supporting learning

| Elements of learning process |                         |   | Enviromental elements supporting learning  |
|------------------------------|-------------------------|---|--|
| SOCIALI-SATION               | TO PERCEIVE             | Tacit knowledge exchange                      | The space reflects the purpose of the space and the identity of organisation and its social structure as in emotional space.<br><br>The space is experienced, it has high autonomy, it is based on intangible factors and it presents collaborative, open-minded and public qualities as in Dens.  |
|                              | TO RELATE               |   |  |
| EXTERNALISATION              | TO DIGEST               | Forming tacit knowledge to explicit knowledge | The space supports and indicates organisational structures and work processes in the space as well as the space can be measured, it has low autonomy and the use of tangible factors is common as in behavioural space.<br><br>The space provides usable and well-defined signs and well-defined instructions for the use of space. The clear structure in space helps adaptation and concentration to the task as in hives. |
| COMBINATION                  | TO INDIVIDUALISE        | Explicit knowledge exchange                   | The space supports the repetition and routines in its use. Space is more individual, single-minded, private as in cells.<br><br>The space can be measured, it has low autonomy and the use of tangible factors is common and the space reflects the repetition and routines in its use as in natural space.  |
|                              | TO PRACTISE             |   |  |
| INTERNALISATION              | TO GROW FACULTIES       | Forming explicit knowledge to tacit knowledge | The space supports the share of knowledge and innovations. The space provides elements, which encourage identity and self-respect of work community and its individuals as in space of artefacts.<br><br>The space is experienced, it has high autonomy, it is based on intangible factors and it presents collaborative, open-minded and public qualities. The space empowers reflection and relaxation as in clubs.        |
|                              | TO CREATE SOMETHING NEW |   |  |



**Figure 2.** The combined learning /knowledge creation process of Nonaka and Takeuchi 1995 and van Houten 1995

The dimension for tangible aspects can be defined as intangible - tangible knowledge work. The dimension of social aspect can be illustrated with the dimension of open and closed. There is still a need to include the character of co-operative and individual into the model as well as create a linkage to the space. The proposal for the new dimension is between extospace (meaning open and co-operative space) and introspace (meaning closed and individual space). The extospace is collaborative, open-minded and public space, which is in connection to the world outside, open and easy to achieve, providing places for people to meet, come and go, connecting people to collaboration and encouraging group identity. The introspace is a breathing space. It provides the concentration and privacy, it is suitable for task-based activities and it encourages the individual identity. This is presented in Table 4.

The four types of spaces - connective, structural, formal and reflective space as a supporter for different phases of knowledge creation is relevant. The approach includes contemplation of strong and weak qualities of each type. The workspace for knowledge creation is not either - or, it is more both - and. Every phase of knowledge creation does not need its own space but the challenge is to combine them and collect the proper elements for the use of organisations knowledge creation processes.

There is a challenge to apply the theoretical, but hopefully also creative, model to practical realisation. The archetypes of different spaces can be approached for instance by observing:

- Entrance hall as a connective space.
- Project work area or formal meeting room as a structural space.
- Individual office or workstation as a formal space.
- Coffee area or informal meeting space as reflective space.

**Table 4.** The classification of spaces for knowledge production with strengths and weaknesses

|                        |   |  |                      |
|------------------------|---|--|----------------------|
| <b>EXTROSPACE</b>      |   |  |                      |
| <b>INTANGIBLE WORK</b> | <b>Socialisation phase<br/>CONNECTIVE SPACE</b>   | <b>Externationalisation phase<br/>STRUCTURAL SPACE</b>   | <b>TANGIBLE WORK</b> |
|                        | <p>The space is welcoming and the atmosphere is warm. The space reflects the purpose of the space and the identity of organisation and its social structure. The boarders are low. The ownership belongs to all people. It is interactive space.</p> <p>But it is very restless, left easily without care and doesn't really belong to anyone. It can be noisy and even chaotic. It is full of arrivals but no one ever stays</p> | <p>The space supports and indicates organisational structures and work processes in the space<br/>The space provides usable and well-defined signs and well-defined instructions for the use of space. The clear structure in space helps adaptation and concentration to the task. The boarders are clear and well defined. The rules of the use of the space are transparent the functionality is high.</p> <p>But as a task-orientated space it is all the time in motion like an effective machine without a rest and break.</p> |                      |
|                        | <b>Internationalisation phase<br/>REFLECTIVE SPACE</b>  | <b>Combination phase<br/>FORMAL SPACE</b>  |                      |
|                        | <p>The space supports the share of knowledge and innovations. The space provides elements, which encourage identity and self-respect of work community and its individuals.<br/>The space empowers reflection and relaxation. The boarders are flexible.</p> <p>But the space is so comfortable that it is hard to take apart. It is even too lazy and cosy.</p>  | <p>The space supports the repetition and routines in its use. Space is more individual, single- minded, private.<br/>The space supports the role of one individual. The space reflects the repetition and routines in its use. The boarders are high and closed offering privacy, silence and concentration.</p> <p>But it is a space for isolation and separation. It is not easy to achieve and the use of it is based on norms and rules which are nor transparent.</p>   |                      |
| <b>INTROSPACE</b>      |   |  |                      |

Further some practical application can be found from Mosbech's (2004) findings where the linear organisations with the attitude "knowledge is the property of the employee" (= not shared) tends to have cellular offices and/or permanent workstations. On the other hand character of workplace as meeting place is more typical for network-organisations with the increasing focus on both knowledge and clients.

It is important to understand that the use of different kind of knowledge is essential for an organisation. The assumption is if the workspace supported more the explicit knowledge in the past. One part of the environment has transferred for virtual context. The physical environment might have even more significance in the source of tacit knowledge circulation than before because the virtual environment seems to be as an increasing source for explicit knowledge circulation.

A number of key points are summarised based on the investigation and modelling:

- The definition and understanding knowledge work is important for typology of knowledge workspace.
- The understanding of knowledge creation process is important for typology of knowledge workspace.
- The measurement of intangible, soft variants is a challenge.
- The typology summarised illustrates the intangible characters of knowledge workspace with the respect for process of knowledge creation.

#### **4 Conclusions**

The new paradigm of knowledge work needs both multidisciplinary and innovative approach to achieve a more robust measurement and analysis. The challenge is to define, clarify and conceptualise intangible phenomena and its variants and combine them in an effective way to tangible measurements of space. Before these steps can be made there is a need of multidisciplinary and innovative theoretical framework as well. This paper has tried to create one model to classify the issues around knowledge workspace. The linkage between workspace literature and theories of learning has been an interesting adventure.

The theoretical model is constructed for different phases for knowledge creation. Different kind of knowledge creation processes can be compared with different kind of plays, which need different stages. This metaphor of stage could conclude the idea of this paper. Every organisation has many plays going on the stages at the same time. The balance between both the different kind of stages and different kind of plays (work processes) varies in every organisation. The idea is to use the model described in order to get the most relevant collection of stages for the organisations essential knowledge creation processes.

The reliability and the validity of the model developed in this paper based on the literature review can be questioned. The framework described in this paper will be worked further in the close connection with empirical data. The framework will not make workspace development perfect, but it can certainly make organisations

more insightful, perhaps wise, and they may share more knowledge how to use the workspaces as a resource for both intangible and tangible work of knowledge society.

There are at least three important major issues to investigate further in the future:

At first the proposed typology for workspace combines two aspects and four dimensions: introspace, extrospace, tangible work and intangible work. This typology can help organisations to make visible both work processes and spatial needs. The typology can be relevant both for the change process in the organisation and in planning phase of new facilities.

Secondly the proposed typology is offering possibilities to approach the intangible elements, which are often very hard to describe. The scientific models for phenomena, which can be experienced but cannot be described in scientifically respected manners, are a challenge in the new ways of work. The challenge is even increasing in understanding the mostly intangible virtual space as a part of workspace.

Thirdly the proposed typology includes an ambition to describe both strengths and weakness of different workspaces. This issue should be investigated deeper in order to give guidelines for inspection of work environment and development of it. The knowledge workplace is a tailor-made solution in the close connection with the organisation, its work processes and culture – it cannot be taken out from the shelf.

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