

OTANIEMI CAMPUS – A FINNISH TECHNOLOGY HUB

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1 INTRODUCTION

The knowledge society demands new ways of working compared to industrial times. The collaborative performance is an as important part of productive work than individual work performance (Drucker 1999). Such renewed ways of working are mainly taking place in office buildings, which have remained surprisingly similar in their structure until recently: they are built for individually performed work tasks. The same applies to traditional school buildings; they are also designed for groups of individuals, whose performances are directed by an authority, the teacher. Also University buildings are still defined and designed from a traditional pedagogical perspective, where the major mode of communication is unidirectional – from the teacher to the students. The teachers teach the students through lectures and the students learn by listening to their wisdom. This teaching philosophy is built on a specific view of knowledge and calls for a special type of university buildings. (Granath 2006)

However, a change in the pedagogical paradigm towards a more constructive learning philosophy, where the focus is on students' willingness and ability to search for knowledge through dialogues with each other and their teachers, thereby extending the one way communication of wisdom from teacher to student, requires quite different university premises. The traditional university environment would be quite useless for this new pedagogy. (Granath 2006) The higher education environment as well as the modern office environment is facing a similar kind of challenge: what kind of environment is relevant for new ways to learn and work?

This paper aims to list several perspectives to approach the challenges for the higher educational environment. It also presents one campus as a case in order to provide an example for how to analyse the learning environment and to understand the variety of properties required for learning environments today and in the future. However, the intention is not to indicate causal relationships between environment and learning, but predominantly to describe the learning environment and the possibilities to organise the university campus to support different kind of learning processes. It therefore explores the application of a set of design criteria from lower educational buildings for the campus of Helsinki University of Technology and its surroundings.

2 LEARNING ENVIRONMENT

Learning is an on-going process that is not dependent on place. The rapid progress of information and communication technology has revolutionized the methods of acquiring and producing information and creating new knowledge. Learning is no longer bound to time and place. However place has an impact on the educational process and its results and can at its best support the learning processes – specially the social part of it. Holtman and Ward (2000) have classified the elements worth to consider for knowledge intensive work. The knowledge management needs to balance the rigor of diagnostics, processes, analysis and monitoring with the purposeful design of real and virtual spaces where people can discover what they know, exploit what they know and share and increase what they know. There has to be places and time to think and reflect, watch, listen. Not always doing. The time and space take risks, challenge the system, and push the envelope, cross

boundaries. Places of greater safety in which to experiment, fail, learn from failure and apply the lessons to the next experiment.

The learning environment should be seen as a composition of physical and virtual environment facilitating both interaction and individual privacy in learning processes – the third corner stone is the social environment.

2.1 Physical learning environment

Physical places are needed for learning, discussion, and group work spaces for groups of different sizes, from auditoriums to small group work nooks. It must be possible to use the space reserved for dining flexibly as a group work space and maybe also as an all-day cafe. (Tapaninen 2000) It is a place where one can bond and belong – to increase social capital. Cohen and Prusak (2001) define social capital: "Social capital consists of stock of active connections among people: the trust, mutual understanding, and the shared values and behaviours that bind the members of human networks and communities and make co-operative action possible. According Putnam (1995) and applied by Engeström (2002) social capital can be described as three kinds: linking, bridging and bonding. Linking means connection upwards with government and other powers, bridging means crossing the borders between communities and bonding means network inside the community. Engeström locates social capital functioning at its best in so-called border zones – they are areas for sharing and changing. The complexity of social capital has led to proposals to use the concept trust instead of social capital – it means both trusting people, even strangers and confidence towards institutions. (Ilmonen 2000)

A physical learning environment is needed both to gather and search for information and study. The meaning of the library as the information centre of the university is significant. It can be a centrally located place for information gathering, with many terminals, multimedia workstations, and

connections with foreign information networks. (Tapaninen 2000)

Part of the learning community teachers' workspaces must no longer be isolated in a separate administration wing but located in the middle of the learning spaces or in their immediate vicinity. While participating in learning situations, teachers themselves also learn, experiment, and observe. Several teachers may be present in the same learning situation. (Tapaninen 2000) The workplace solutions like combi office with shared workstations and separate rooms for concentration (Mosbech 2004) might be relevant for modern school environment.

The spaces should be furnished with comfortable and pleasant furniture that enables versatile use. Traditional furniture for schools has consisted of a combination of a desk and bench. However, this concept is poorly suited for the modern way of working at school. Office-type furniture with table groups that can be combined and varied in many ways is better suited for the work environment. (Tapaninen 2000) The informal work environments increase the circulation of tacit knowledge. (Nenonen 2005) The learning space may also resemble a living room, with rocking chairs, couches, and plants. The whole of the building technology – lighting, air conditioning and waste management have its impact for healthy environment (Seppänen 2004) and it must create a positive example of an environment based on sustainable development. (Tapaninen 2000)

2.2 Virtual learning environment

The virtual learning environment can be a space, a centre, equipped with the latest technologies. Educational facilities, through information and communications technology can create virtual learning communities. (Tapaninen 2000) The virtual work facilitated by information technology is considered both as a possibility to break the physical borders, offering and widening social networks and as a threat that could isolate people from social

face-to face interaction. (Holtham and Ward 2000) Nevertheless, virtual learning environments can provide relevant and rewarding experiences. Meanwhile, many emerging technologies and networks can be used to enrich and provide greater interactivity within the virtual learning environment. Advances in technology ensure that almost all traditional classroom equipment can be emulated in the virtual learning environment. (Benesova *et al.* 2002)

In terms of academic results, virtual learning environments can represent a more successful learning environment and have proven to be motivating contexts for learning. In these virtual environments the learning experience can be flexible, more accessible and inclusive. Not only are these environments often a more economically viable option, but they also allow specialist tuition and knowledge to cross geographical boundaries. (Benesova *et al.* 2002)

The future of virtual learning environments possesses many innovative and exciting possibilities. New networks can allow students more opportunities way beyond those offered by the World Wide Web in its current state. But careful planning and innovation will be required to ensure that the potential for the scope of delivery is reached. The importance of mobility should also be considered so that learning can take place in the most appropriate context. If issues of cost and programming were resolved students would be given access to the range of additional hardware and software required. However, one of the main disadvantages of the virtual learning environment is the lack of face-to-face interaction and direct social contact among the students and teachers which conventional educational contexts provide. It is because of these factors, and the lack of evidence of how they will impact on student personal and social development, that virtual learning environment may not entirely replace traditional classrooms and teacher –student contacts. (Benesova *et al.* 2002)

From the technical perspective the need to provide technical systems and their installations for virtual learning environments often causes a disordered bundle of cords and sockets. Yet, newer buildings already adopt floor structure commonly used in office buildings: on top of the suspended slab is a separate light installation floor under which all the electric networks and cords run. (Tapaninen 2000)

2.3 Social learning environment

The social learning environment provides places to meet, to associate with each other, and to experience things together. The academic community is a complex network of human relations, work plans, schedules, and daily activities, for which the building constitutes a physical environment with its own material flows and internal requirements. The educational building itself can direct and determine the behaviour taking place in the environment – it places restrictions as well as it offers opportunities to support the core activities. (Tapaninen 2000)

Further social development, the build up and extension of professional networks, essentially all activities directed to increase the social capital or trust often rely on direct face-to-face communication. It remains to be seen, in how far the maturing virtual learning environment will be able to replace these direct contacts.

2.4 Quality criteria for learning environments

In Finland a catalogue of criteria for the evaluation of School designs has been developed. Nuikkinen (2005) describes the principal criteria for safe and healthy school building and its relation to the quality of the basic education. The overall eight criteria are summarised in Table 1.

Table 1 Criteria for safe and healthy school buildings according to Nuikkinen (2005)

Criteria for school	Design proposal
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buildings	
Flexible environment	Connective Multifunctional Alternative ways to use building Easy to move
Encourages learning	Motivating environment Promotes sustainability Provides model of working environment
Multidimensional centre for multiple usage	Takes into account needs of surrounding community Multipurpose building for all For all ages
Challenging	Environmental message is in importance of co-operation, not in bureaucratic institution and artefacts
Supports interaction	How people meet each other Traffic junctions and meeting places
School for everyone	Accessibility Individual privacy Openness – no need for control – safety
Aesthetical	Body and sense experience Self regulation Comfortable, healthy
Supports the identity	Message about organisation, expected behaviour

The catalogue has lot of significance for learning environments for children and in basic education.

While the classification scheme has successfully been used in the basic educational sector, no experiences exist within the field of

higher educational school buildings. It is therefore challenging to apply it and investigate the nature of work environment for higher education. The following case description explores the application of the eight criteria for higher educational school buildings and the campus environment of Helsinki University of Technology.

3 CASE OTANIEMI

Location

Otaniemi is located in the Helsinki metropolitan area in Espoo. It is the leading technology hub in the Nordic countries, with a unique mix of top-level research organisations, higher educational institutions and technology businesses. Otaniemi is a community of over 25,000 people consisting of about 15,000 students of the Helsinki University of Technology and 10,000 technology professionals. 6000 of them working for research organisations, while the latter 4000 are employed by technology businesses. Helsinki University of Technology itself is divided into 12 departments and several instituts. (Otaniemi 2006)

Otaniemi area has firmly established itself as an international technology centre and an integral part of Finland's innovation framework. The "Otaniemi Model", which emphasises diversity and collaboration, has served as the inspiration for numerous technology centres both in Finland and abroad. In particular, the close relationship between research and business draws a constant flow of international visitors.

Otaniemi has become an acknowledged location for high-technology companies and organisations. In total, the area is home to over 300 companies, with 60 to 80 new businesses founded and over 500 new business ideas invented each year. There are about 200 patents received each year, and over 1,000 academic degrees are completed at the Helsinki University of Technology. Additionally, Dipoli, across the street from the

University's main building, is one of the leading international congress centres in Finland.

For start-up companies, Otaniemi offers a valued environment, a strong ecosystem of other companies in a similar phase, and a wide array of business development services. An increasing number of large companies and research organizations, both Finnish and international, are establishing themselves in Otaniemi. These companies value Otaniemi's solid infrastructure, innovative and entrepreneurial spirit, and the availability of a wide base of potential new employees.

History

The campus area of the Helsinki University of Technology (TKK) and VTT Technical Research Centre of Finland (formerly: the Technical Research Centre of Finland) has an interesting history: For the 1952 Olympic Games in Helsinki the athletes were housed in newly constructed buildings in Otaniemi. These buildings still constitute a substantial part of today's students' village. Just recently new additions have been made again, in order to host the 2005 World Championships in Athletics. Also these houses were later turned into students apartments. Nowadays 3000 students live in the village.

Shortly after the students moved, Helsinki University of Technology and VTT relocated and Otaniemi received its landmark with Alvar Aalto's main building.

Users

Otaniemi of today, which has grown around TKK and VTT, is the heart of Finnish science and technology. The area is architecturally unique, boasting buildings designed by leading architects including the mentioned Alvar Aalto, but also Heikki and Kaija Sirén, and Reima and Raili Pietilä. The corporate headquarters of companies such as Nokia, Kone and Fortum are within walking distance from Otaniemi, and other major technology

companies such as HP, Microsoft and TietoEnator are in close proximity. The Espoo-Vantaa Institute of Technology (EVTEK) and Laurea Polytechnic are also located nearby.

Startup companies are supported by Technopolis Ventures, which also manages the business incubator services of the area. The technology centre Innopoli commercialises the research and knowledge-intensive ideas of Otaniemi and functions as a business generator. In total, there are approximately 230 companies operating in Innopoli and Otaniemi Science Park.

Otaniemi is therefore a prime example of how physical proximity and interconnectedness foster collaboration and innovation between organisations.

This is also recognised by others: The EU Commission has nominated Otaniemi twice as one of the most innovative regions in Europe. With its wide spectrum and strong collaboration, Otaniemi as a technology hub is expected to explore new opportunities to promote, initiate successful companies and innovative products and services in order to drive the economy of Finland and northern Europe further.

Helsinki University of Technology

The focal point of the university centre is the auditorium building with two large halls (also intended for congresses). Its staircase-like ascending rows of windows suggest from the outside an amphitheatre. All tuition rooms are in adjacent buildings grouped about small internal courts, and here are also found the smaller lecture-rooms, laboratories and professors' rooms. The centre is divided into three principal departments: general, geodetic and architectural. The chief materials are dark red brick, black granite and copper.

The library closes off at an oblique angle the third side of the park/court established by the main buildings of the Institute of Technology, begun twenty-two years previously. As a major

reference library, the main problem was to provide good working conditions for the students over a three-storey basement for the library stacks. These spaces and the small lending collection are housed in a faceted volume on the side, away from the main buildings. In the rectilinear tail of the building, offices and seminar rooms are provided.

Closeness to nature has been preserved well in Otaniemi, partly due to protected areas; especially the coast lines have not been touched. They provide an excellent environment for plants and birds; on the other hand, they fail to connect the residential areas to the sea, but function rather as a separating and visually restricting wall.

Table 1 Applied criteria for higher education campus area Otaniemi

Criteria for school buildings	Designed environment
Flexible environment	<p>Campus location</p> <p>University buildings, Research Centre buildings, Incubator buildings, library and facilities</p> <p>Variety in use: from individual space to collaborative space</p>
Encourages learning	<p>High tech solution in older and modern parts of campus area</p> <p>Wireless connections</p> <p>Green values in facilities services</p> <p>Goals to corporate social responsibility</p> <p>Old and new workplace solutions in workplaces</p>
Multidimensional centre for multiple usage	<p>Unique setting for education, research and practice</p>
Challenging	<p>Innovative region</p>

Supports interaction	Centre of the campus in library and main building – historical part
School for everyone	<p>Education, research and practice premises and places for living – student village in the campus area</p> <p>Accessibility</p>
Aesthetical	<p>Alvar Aalto architecture</p> <p>Materials</p> <p>Nature</p>
Supports the identity	Identity of student, next step for researcher – modern research centres – incubators on the “outskirts” of the campus area, border zones

It can be said that the criteria developed by Nuikkinen can be used to analyse the higher educational premises too. The emphasis of the analysis however lies more on a macro level. Also the role of student is different to that in basic education and the core business of the higher educational institution, education and research, differs too. Nevertheless, the higher education is using its premises as a strong message for the society and the business world – it is the investment for the future.

4 CONCLUSIONS

The quality of school buildings in different educational levels is high in Finland. However, the question is not only about the quality of the building, but about the variety of environments it is providing for learning. The triad of physical, virtual and social learning environments together form the setting for modern learning.

The learning and teaching processes are in change towards more constructive learning philosophy. This is a similar discussion to the one on knowledge intensive work and its processes. New ways to learn and work require new kinds of environments. The common factor is the need for both individual and collaborative work and learning environments as well as formal and informal work processes.

The significance of collaboration and social elements of environments are discussed both theoretically in the quality criteria of school buildings by Nuikkinen (2005) and in the explorative description of Otaniemi Campus. An innovative region can be achieved by combining different sectors of society: education, research and practice. Such a network model adds value for all partners. The campus area then not an enclave for university education and research, but it becomes a think tank for business, innovation and life long learning.

The criteria for quality learning environments can be applied for different educational levels; however the actors and the rules of the learning processes differ. At the same time the learning environment is always also a working environment. In view of a future knowledge society, a need arises to generate future working environments which support the knowledge working styles. Transferred back to the educational sector this means, we have to generate learning environments which support future learning styles.

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