



Well-being architecture in academic workplace

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Abstract

Academic research work is well known to be flexible in the terms of time and place. However, several studies indicate that postgraduate students and academic professionals experience high levels of stress, due to the nature of their work. In the field of natural sciences, the academic workplace consists of offices as well as laboratories. Laboratories are specialized environments, where expensive instruments and spatial requirements play a significant role. Hence, these spaces are often designed according to technical needs, not according to human demands. However, the spaces should support well-being in all kinds of academic workplace environments, including laboratories.

The purpose of this paper is to study, which architectural solutions could support well-being in academic workplace, where laboratories form a major part of the working environment. The research approach is qualitative in nature and focus on a single case study. The empirical material is collected via interviews with academic researchers, and inductive content analysis is used as a method to analyse the interview material.

The results imply that well-being in academic workplace can be enhanced in a research laboratory environment, for example, by offering working spaces for concentration as well as collaboration. Laboratories can be seen as places for social interaction and collaboration, while offices are places for solitary work. Furthermore, the whole campus should support the varying nature of academic research work by offering different spaces and various activities.

The empirical research data is limited and it is based on a subjective opinion of the interviewees. Therefore, further studies are needed in order to compose a full understanding. However, the study provides a firm foundation for follow-up research. When designing academic workplace environments, elements that enhance well-being of the employees must be considered. The study offers novel insights to the workplace well-being from an architectural point of view in the context of research laboratory environment.

"Physical settings of a workplace have impact on job performance, motivation and even stress level of employees."

Introduction

Well-being at workplace has various aspects. According to Locke (1976, p.1302) job satisfaction consists of different dimensions, such as intrinsic interest and variety of work, chances for success, rewards, supervision and co-workers. Social and physical working conditions are as well one of the dimensions of job satisfaction. Torrisi (2012, p. 803) defines well-being in the work environment as *"a combination of subjective perceptions that are related to the following dimensions: physics, organizational, relational and personal satisfaction."* All these physical and psychological dimensions together comprise employees' experience of well-being at workplace.

The survey by Torrisi (2012, p. 810) indicate that academic productivity correlates significantly with all of the different dimensions of well-being, mainly with the organizational, relational and personal well-being. In order to improve the level of appeal and productivity of academic staff, Torrisi suggests – among other things – that working environment and organizational well-being need to be enhanced, for example, by giving researchers more time for research by reducing their teaching.

Even though physical working conditions are only one aspect of well-being, they are still an important one; Several studies indicate that physical settings of a workplace have impact on job performance, motivation and even stress level of employees. For example, access to nature and availability of daylight has effect on people's energy levels, which in turn has influence on the experience of stress. (Augustin 2009; Stringer & Ostafi 2013).

People under stress have less capacity to accomplish complex tasks and they are less creative, because part of their mental energy is unconsciously focused on the cause of the stress (Augustin 2009). Furthermore, several studies indicate that academic employees experience high levels of stress due to the nature of their work. This continuous stress decreases job satisfaction and may even impair job performance. (Kinman & Jones 2004; Kinman & Wray 2013; Muurlink & Poyatos Matas 2011). Therefore, it is even more important enhance well-being in academic workplace.

Laboratories are highly specialized environments, and the nature of the research work differs significantly from traditional office work. In addition, seemingly minor differences in work practices can mean that workspace requirements are totally different. Hence, in order to understand what kind of spatial solutions could support well-being in academic workplace, one must first understand the unique nature of research work.

The nature of the research work

Research work has some distinctive differences compared to office work in general: research has typically very long time scale and the goals of the research are not always well defined. In many cases, research is a solitary work in its major parts, with occasional meeting with a supervisor. Hence, the work practices as well as working hours are highly personalised and depend on individuals' own habits. Because of this, research work is mainly non-routine, and therefore, requires high degrees of concentration. (Lansdale et al. (2011, p. 408)

On the other hand, Dunbar (1995, p. 14) draws attention to social context and importance of collaboration in problem solving. Dunbar found that social interactions with colleagues were important for scientific discoveries: especially the discussions about interpretation of data during laboratory meetings often led to insight and conceptual change of the research. Colleagues tend to challenge each other's interpretation of data, or ask unexpected questions that forced researcher to look the data from a different point of view. Hence, research work seems to require concentration as much as collaboration. (Dunbar 1995)

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Several studies (Kupritz 1998; Lansdale et al. 2011; Parkin et al. 2011) also recognize this delicate relationship between collaboration and privacy in academic workplace. All these studies conclude that well-designed working environment should offer scientists places for quiet, concentrated work as well as places for interaction with colleagues. Open-plan offices were not considered optimal solution for academic workplace, because office work requires often concentration and creative thinking, which can easily be disturbed. However, collaborative places for discussion seem important as well.

The overall character of research work is anticipated to change radically over the next ten years: researchers will spend more time in meetings and offices, and less time in their laboratories. There are several reasons that spur on this change: the development of scientific instruments, outsourcing a routine work and advanced automation systems will increase the amount of data-analysis. Hence, researchers need to manage more complicated entities, and analyse more data than before. Therefore, the time spent in the offices will grow. In addition, researchers need to collaborate with each other, not only locally but also globally, in order to accomplish more complex research problems. (Stringer & Ostafi 2013; Studt 2009; Watch & Kliment 2008)

Under these circumstances, the significance of offices as working environments will naturally increase. Therefore, it is valuable to study which kind of office environments could be optimal for academic research work. After all, academic research work is flexible in terms of time and place, and hence, it can occur anywhere. However, work environment should also be considered wider concept that covers more extensively the whole campus.

Methods

The research is a qualitative case study, where the material is collected via interviews (n=10) with open-ended questions and reflecting on interviewees' answers. The respondents were chosen amongst the current employees of a biomedical research laboratory. This particular biomedical research laboratory unit is on-going process of designing a new laboratory building. One of the reasons to select this biomedical research unit as a case study is the unique opportunity to investigate the on-going design process and a complete transformation of the spaces. Respondents represent following groups of employees: post-doc researchers, research leaders, and technical staff. In addition to this, a laboratory architect was interviewed concerning the construction of the new laboratory building.

Interview material was recorded and transcribed. Inductive content analysis is used as a method to analyse the interview data. This analysis method aims to organize the data into meaningful categories, which are based on the content. Hence, the results of the data analysis have affected on their part the whole research problem. (Tuomi & Sarajärvi 2002)

Hsieh & Shannon (2005) point out that it may be impossible to analyse data without presumptions, because previous knowledge about the subject will affect on the analysis. In addition, this type of approach may be insufficient in order to describe the phenomena completely, if the key categories are inadequate. Credibility of this data analysis is partly validated and confirmed by literature sources. However, in order to receive full understanding of the context, further studies are needed.

Results

Core facilities

One of the major themes, which arose from the interview material, was a concept of core facility. In the case study laboratory, core facilities are the key shared resources. According to the research material, researchers develop core facilities step-by-step. At the beginning cores are often smaller shared facilities, but later they might evolve bigger units, which offer access to specialized instruments and services.

The respondents evaluate, that core facilities can be seen also recruitment assets: the top researchers want to work nearby their often-used instruments and have an access to specialised equipment. Furthermore, research material implies that architectural solutions of the core facilities could enhance the level of appeal of a university, and a bigger research unit is seen more attractive working environment than smaller one: several different disciplines combined together can offer researcher more interdisciplinary atmosphere as well as more specialized core facilities. The interviewees stated that all the functions and services of the university should be designed to support academic research work, in order to give a researcher time to focus on his core competency.

Own bench space and offices

According to the interviewees, researcher requires also a bench space, in addition to core facilities. Bench space is a researcher's own laboratory desk within a laboratory room. Respondents defined own bench space very important facility, because the most delicate parts of the research work often occur here.

The interview material implies that academic research work, in the field of biomedicine, is first and foremost experiments. In a daily work, most of the experiments fail; Researcher strives to find something new and unexplored, and in order to do so, he needs to do something that has never done before. For this kind of experiments researcher needs *own bench space*. However, the own bench space can be located in a shared laboratory, where other researchers have their own bench spaces as well. Actually, the common laboratory space can be important social meeting place, where researchers engage conversation with their colleagues. Figure 1 illustrates the different situations.



Figure 1. On the left the benches are located in separate rooms, and in comparison, on the right benches are located in the same room. Locating benches in the same space allows more various organizations of laboratory furniture and enables, for example, shared use of instrument maintenance. (Yläoutinen et al. 2014)

In addition to this, respondents stated that academic research work requires an *office space*. According to interviewees, office work seems to be the solitary part of the research work: researcher desires a quiet place for concentration, analysing the results and writing publications. Therefore, the current open-plan office trend seems to be in contradiction of this. However, research material implies that in the future the teamwork and collaboration with other researchers is expected to increase. Hence, office spaces should offer also suitable places for group work.

To summarize, *core facilities* are centralized shared resources, which offer expensive and specialized instruments as well as services to scientific investigators. In comparison, *own bench space* is a researchers own area, where he can run experiments and keep his personal instruments and liquids.

"The common laboratory space can be important social meeting place, where researchers engage conversation with their colleagues."

In addition, *office space* is required. Office space should offer adequate privacy for silent working as well as teamwork spaces. Altogether the spatial requirements are balancing between shared and private.

Connections

The interviewees stated that the current facilities of the case study laboratory are decentralized and located in several buildings within the campus. However, the new facilities, which are currently in design process, are centralized and all the functions and facilities are located within the same building. The respondents evaluate that the new facilities will be more suitable for scientific research work than the current facilities. Moreover, the respondents believe that the compact building will enhance the interaction between researchers. According to the interviewed laboratory architect, in the architectural design of the new building enhances the spaces in *between* the laboratories and offices. The goal is that these in-between spaces could support serendipitous encounters and enhance interaction.

Connections within the building were other theme arisen from the research material. All the interviewees agreed that centralized facilities are more efficient than decentralized ones. Researcher may walk between his own laboratory bench and office several times a day, and hence, these facilities are practical to locate near each other. Nevertheless, there was polarization in opinions between interviewees. Part of the respondents preferred the own laboratory bench to be located near offices, while others stated that offices could be separated from own bench space. Figure 3 illustrates these two options to locate different functions. According to the laboratory architect, separating offices from laboratories is a more cost effective solution, since the functions could be organized by technical and logistic needs of a building. Interviewees agreed, however, that core facilities serve better when they are located centrally in the same part of the building.

In addition, interviewees stated that a compact building increases interaction between different people. Short distances between spaces, shared facilities and common break areas force people to use same routes within the building, and hence, force people to meet other people. *"I'm looking forward the transfer to the new building. If people are forced to use common facilities, such as restaurants, it eventually bring about conversations at the dining table, and after that follow other good things."* (Director of the unit)

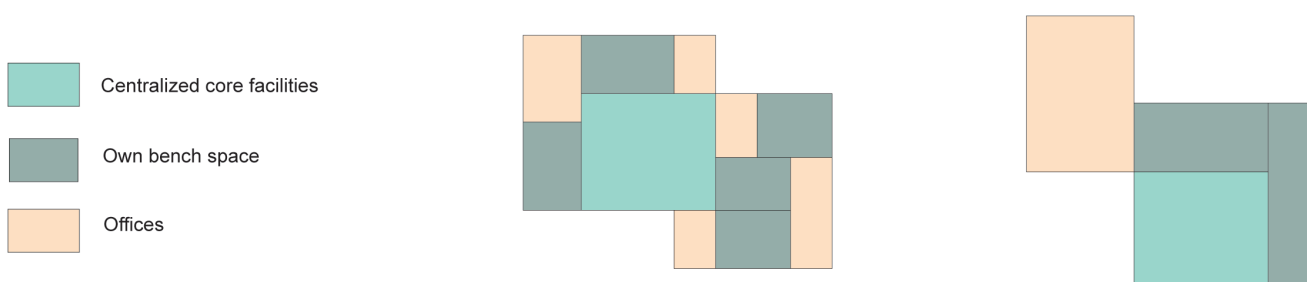


Figure 3. Two different options to locate core facilities, own bench space and offices within a research laboratory building. (Yläoutinen et al. 2014)

Additional spaces

According to interviewees, flexibility of spaces is another important aspect in academic workplace: technologies and working methods may transform in fast pace. This may increase or decrease the need of certain spaces as well as the number of researchers and technical staff. Hence, spaces are often used in a different way than intended. A laboratory analytic describes: *"The number of the people working in this unit is doubled within last two years. When I began to work here, these spaces were suitable. Nowadays, we need to share*

workplaces, especially within offices, because there are not enough room for everyone." In addition to this, interview material implies that some researchers may need highly customized bench space: for example, tasks that need high accuracy, a researcher needs extremely stable surface to work on. Therefore, the flexibility of spaces, as well as flexibility of organization, enables employees of the research laboratory the best possible circumstances to work.

According to a post-doc researcher *"academic workplace is not just a workplace"*. Instead, researchers are widely engaged with their work, and therefore, they spend a major part of their day within the campus. Respondents evaluate that the whole campus should support the research work by offering suitable spaces for work as well as for free time activities. Moreover, bright spaces and comfortable break rooms invite people to spent time in these spaces, and therefore, these people are more likely to interact with each other.

In addition, research material implies that outdoor environment should offer places for social interaction as well as relaxation. According to a post-doc researcher, outdoor areas as well as coffee rooms and restaurants are natural places for social interaction between different people. All interviewees considered that these types of places are extremely important: shared facilities offer settings for serendipitous encounters, which increases interaction and may even lead to interdisciplinary collaboration. All these elements together comprise the physical work setting for researchers, and in their own part, increase well-being in academic workplace.

"Academic workplace is not just a workplace."

Conclusions

The interview material implies that research work requires various different – and often expensive – facilities. In order to conduct state-of-the-art research, researcher may need a core facility, own bench space, office space, and spaces for social interaction and free time activities as well as relaxation.

Core facilities offer high quality services and state-of-the-art equipment for researchers to conduct their research. Research material implies that core facilities actually offer researchers more time to focus on their core competency and thus, have more time for research. Torrisi (2012) claims that when researcher has more time to conduct the actual research, it enhances working environment and organizational well-being. Moreover, when people can focus fully on their tasks, they experience less stress, which increases also well-being. (Augustin 2009) Therefore, core facilities can be seen a one solution to enhance the well-being in biomedical research laboratory environment.

Shared spaces, such as core facilities and own laboratory bench in a common laboratory area, could support also the social context of the scientific research. Dunbar (1995) claims that discussions with colleagues often led a researcher to the scientific discovery. Similarly, research material implies that common laboratory space can be important place for social interactions.

According to Parkin et al. (2006; 2011) physical working environment have a significant impact on the interaction and communication between employees: people, who work further apart, are less likely to talk to each other than those, who work nearby. This finding supports also the research material that compact building seems to increase interaction.

However, respondents evaluate that offices are not places for interaction in the context of academic workplace. As stated before, researchers require spaces for silent, solitary work. In addition to this, separate teamwork spaces are needed. The research of Parkin et al. (2011) imply similar results: employees, who had allocated desks in individual rooms as well as additional access to social, shared work settings, were highly satisfied to their working environment. According to the survey, this kind of combi-office environment supports creative and concentrated work, as well as team-working and different kinds of meetings. (Parkin et al. 2011)

Open-plan offices may be effective workplace solutions in some environment. However, the nature of the research requires long periods of time and high level of concentration (Lansdale et al. 2011). In academic workplace, social interaction between employees happens more naturally in laboratory environment or informal spaces, such as cafeterias.

However, the importance of offices as working environment seems to increase in the future (Stringer & Ostafi 2013; Studt 2009; Watch & Kliment 2008). If the research work is moving from laboratories into offices, the natural places for social interaction may disappear. Hence, offices should offer places for social interaction as well. Further studies should investigate potential solutions to enhance interaction between researchers without compromising the possibility for solitary work.

Obviously the problem with these varied spatial requirements is the utilization rate. Laboratory spaces are rather expensive to build, and hence, it would make sense to use them intensively. With core facilities the utilization rate is not necessarily an issue, since these facilities are often widely shared and therefore, have plenty of users. However, the own bench space and office space are more difficult to share. As stated before, own bench space can be located within the same room with other researchers, and throughout that enhance the space usage. Further studies should investigate, how to enhance the utilization rate in academic working environment, including laboratories and offices.

Research limitations

Qualitative research approach may be seen as a narrow method to study this topic. In addition, the empirical research data is limited and it is based on a subjective opinion of the interviewees. Therefore the results may not represent a comprehensive assessment about the subject. Hence, further studies are needed in order to compose a full understanding. However, the study provides a firm foundation for follow-up research. Facility managers, campus developers as well as architects may benefit from the results of this study.

Generalization of the results may be limited, because seemingly minor differences in work practices can mean that workspace requirements are totally different. Hence, it is important to keep in mind the context of the working environment the results from other studies may not applicable in those environments in other field.

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