

## Make It Work! How To Facilitate Knowledge Work in Universities

Brenda Groen, MSc Phd & Hester van Sprang, MSc

Saxion University of Applied Science

[b.h.groen@saxion.nl](mailto:b.h.groen@saxion.nl); [h.vansprang@saxion.nl](mailto:h.vansprang@saxion.nl)

+31(0)645594501; +31(0)645594392

### ABSTRACT

**Purpose:** This paper aims to define the influence of the physical and social dimensions of the work environment on knowledge productivity of academics in Dutch Universities of Applied Sciences.

**Design/methodology/approach:** Literature review; a multiple case study based on literature review (6 cases); a survey (n=188).

**Findings:** Knowledge workers share two basic needs: their productivity requires isolation (internalization of knowledge) and interaction (externalization of knowledge), supported by different spatial concepts. None of the work environments involved in the study adequately support all of the phases in the knowledge development process adequately. Collective productivity is primarily determined by the physical dimension of the workplace; whereas the social dimension is crucial for personal productivity. Social interaction has a stronger effect than distraction; and the layout has a stronger effect than comfort.

**Conclusions** - A high performance workplace supports both externalization and internalization of knowledge, allowing group members to collaborate and communicate according to need. More traditional work environments support internalization; innovative workplace designs (the office as meeting place) are more suited to support interaction and collaboration. Discover why freedom of choice is the key.

**Recommendations** - Academics should be allowed to choose as to how, where and when they work and involved during the development of new concepts.

**Paper type:** Research paper

### KEYWORDS

Facilities management, knowledge development, work environment, productivity, workplace design, added value.

## 1 INTRODUCTION

In these times where budgets are under pressure due to the economic crisis; with an increasing shortage of talent due to baby boomers leaving the workforce and a shifting global competition, research groups in Dutch universities of applied science (UAS) are facing the challenge of increasing their contribution to the strengthening of the knowledge economy with declining budgets. In a report by the Dutch UAS Council (2010) on research in UAS, eight critical success factors were identified that seem to determine the successful development of research in European UAS. Three of these are relevant to facilities management as they are related to the work environment:

1. Strengthening the relation between research and education;
2. Expansion of networks and partnerships;
3. Qualification and increasing the capacity of staff and facilities.

For a facilities manager this means that he has to accommodate a new type of users in a building designed and used for the transfer of knowledge in an educational setting. It also means that the researchers have to function in a social context that is primarily focused on sharing knowledge,

whilst most research activities require deep concentration (i.e. data analysis). Previous research has shown that the work environment influences employee satisfaction, and that satisfied employees report to be more productive.

The physical environment plays a vital role in how knowledge is passed through an organization. Space is an implicit knowledge medium: knowledge flows first through people, second through technology and third through space (Aznavoorian & Doherty, 2011). Knowledge workers' output is thus determined by human relations and the quality of interaction in the office environment. This interaction in turn, is affected by the workplace (Appel-Meulenbroek, 2010; Brill et al, 2001; Duffy, 2005; Haynes, 2007-1, 2007-2, 2007-3, 2008; Kaplan & Aronoff, 1996; Van der Voordt, 2003). Statistical analysis by Brill et al. (2001) shows that workspaces add up to 5% of the productivity of an individual worker and 11% to that of the team performance. Interventions in the workspace may, through exertion of a lever effect, exert severe negative or positive effects on the returns of an organization in terms of productivity of labour. This raises questions for facilities managers: how to adequately support researchers in a building designed for educational purposes, with limited resources? How can you create an ambiance of innovation? How can you stimulate cooperation (within and outside the university building)?

The central research question this study aims to address is:

*What is the influence of the physical and social dimensions of the work environment on knowledge productivity of academics in Dutch Universities of Applied Sciences?*

If the effects of changes in the physical and social dimension of the work environment in terms of (perceived) knowledge productivity can be predicted, it then becomes possible to use the work environment as a resource to increase the knowledge base of the organization as a whole. The research methods applied in this study are:

- Literature review.
- Case study involving 6 research groups in 2 Dutch UAS: logbook analysis (28 responding: 5 lecturers, 10 researchers, 2 research assistants, 6 teachers, 5 students) and interviews (28 responding: 5 directors, 6 lecturers, 15 researchers - 22 responding to both logbook analysis and interview).
- Quantitative analysis: written un-accompanied survey (188 responding: 44 lecturers, 132 researchers, 12 research assistants).

The physical work environment is comprised three dimensions (Haynes, 2007): the physical dimension (lay-out and comfort of the work environment); the social dimension (level of interaction and level of disturbance) and the virtual dimension. In this study the emphasis is placed on the physical and the social dimension of the work environment. The production of knowledge is defined by the manner in which individual employees (individual productivity), teams and departments (organizational productivity), may realize improvement and innovation by using their knowledge. The true productivity of knowledge is difficult to quantify; knowledge cannot be counted or weighed as it encompasses more than can be made explicit: people know more than they know. Therefore in this survey, the self-perceived productivity of work is measured. This also applies to the work environment. The type of office accommodation may be

determined objectively, but its appreciation by the user cannot. Similarly in this study we chose to assess the satisfaction of knowledge workers with respect to aspects of the work environment.

A work environment is adequately designed and furnished if it effectively and efficiently supports knowledge work. Although work and learning styles differ (Kessels, 2006; Kolb, 1984; Van der Voordt, 2003), knowledge workers share two basic needs which are related to different phases in the process of knowledge development (Heerwagen, 2006):

- Time for working in isolation, to think, to analyze and to reflect (internalization).

Internalisation of knowledge is best supported by an environment providing silence and privacy (Morgan & Anthony, 2008), as speaking (incidentally, formally, telephone conversations) is the most disturbing source of sound (DeMarco & Lister, 1987, Erlich & Bichard, 2008) with a potential loss of productivity of up to 8% (Roelofsen, 2008).

- Time for interaction with others and for collaboration, in order to generate ideas and for evaluation (externalization, knowledge transfer).

An open and transparent workspace leads to interaction. Research by Geyner (2010, cited in Aznavoorian & Doherty, 2011) shows that the open plan workplace is the single most important layout for knowledge transfer. Research by Appel-Meulenbroek (2010) indicates that the level of connectivity (visual co-presence) in open plan offices is a predictor of the level of knowledge transfer.

## 2 RESULTS

Research departments are headed by Readers. The core team is formed by researchers, research assistants, management assistants. This core team is supported by lecturers involved in research on a flexible basis and students participating in projects. Even though the work environment is not limited to the physical office or school building, this study shows that the university building is still the dominant place to work. The location of the research departments within the buildings seem to be determined by available space, not by policy. Some are highly visible and situated in the heart of school activities, some are invisible and quiet as they are located at the end of corridors or in the basement. The location of research groups within the building is important for three reasons: it affects the visibility and distinguishability of a research department and thus the profile with students (connection to education); it influences the chance of meeting interesting people in corridors (informal meetings leading to transfer of knowledge); it defines the degree of perceived unity and bonding (knowledge development and transfer). Satisfaction with the present location of the individual research groups within the building vary and appear to be related to visibility, recognisability and proximity to important others; with low visibility and recognisability associated with low satisfaction, as is fractured housing (low proximity).

In workplace design, standardization is the norm, with little attention paid to comfort and ambiance. In more traditional work environments (example figure 1), knowledge workers use permanent workplaces in offices for one to three members of staff. This office concept predominantly supports the internalization of knowledge (long periods of concentrated reading,

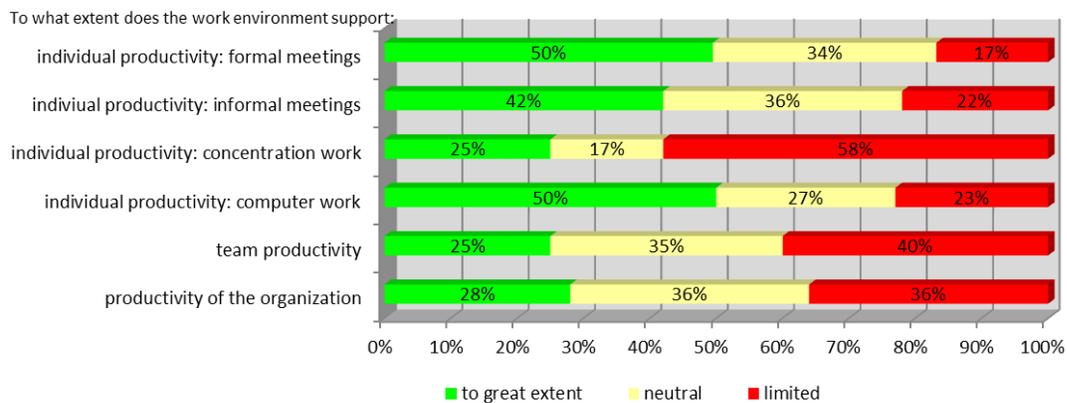
writing, and uninterrupted reflection). More recently developed environments (example figure 2) seem to be oriented towards externalization of knowledge supporting processes such as communication and collaboration. None of the physical work environments involved in the study support all of the phases in the knowledge development process adequately.



Figure 1 and 2: typical example of accommodating concentration work (left) and interaction (right)

Some respondents feel forced to work at home for lack of adequate support of concentration work. Employees have limited autonomy as to where and when they work as a result of bureaucracy and management culture. In the survey, respondents were asked to what extent the work environment supports productivity (figure 3).

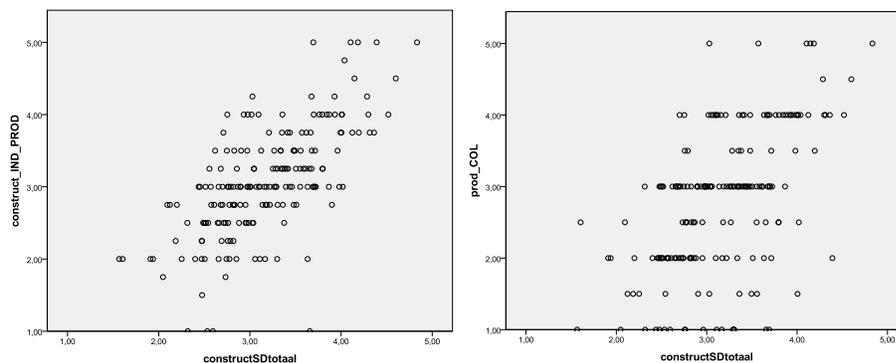
Figure 3: Work environment support on the levels of individual, team and organization productivity



Consistent with the case study results, the survey clearly shows that concentration work is not supported adequately. It also shows there is room for improvement in supporting the productivity of team and organization by the work environment. This is also consistent with case study findings, i.e. the lack of thought behind positioning a research department within the school building. The interviews and survey results both show that both the physical aspects and the social aspects of the work environment can be improved with respect to the degree in which they contribute to the effectiveness of the respondents. The listed most important areas of improvement are: quietness in relation to occupancy rate; absence of disturbance; the personal and general archive including the accessibility of scientific sources; the work place concept and the inner climate. A lack of archive space and limited access to scientific sources are frequently

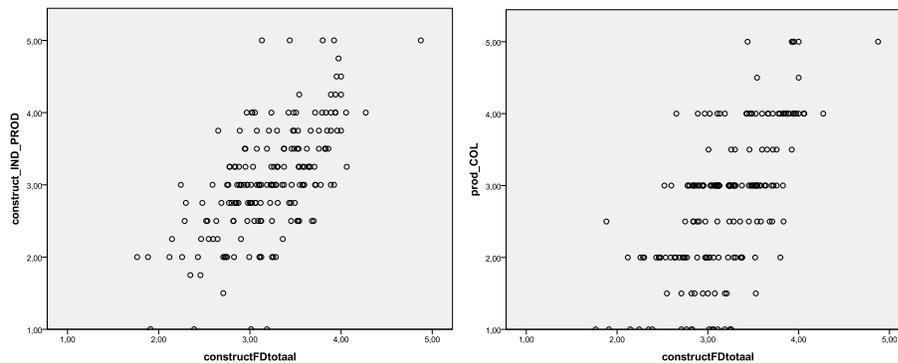
mentioned problems of the present situation. The areas of improvement most frequently mentioned with respect to the present workspace design are: more permanent workplaces for individuals; increased individualizing of such workplaces; more group workspaces for researchers. Over 48% of all respondents indicate that they are able to work most effectively at a personal workplace (1:1) and nearly 31% of all respondents work most effectively at home. Interviews learn that the perceived effectiveness of working at home is related to the level of disturbance that respondents experience at the office. Working at home is not always a positive choice; a significant number of respondents indicate that they work at home as they cannot carry out work requiring concentration at the workplace in the office. The results indicate that the perceived productivity falls as soon as workplaces are shared with others, with flexible work places as least valued in this respect. Although working in isolation can be very supportive for the individual performance; it is not the best solution from a knowledge transfer point of view. Productivity comprises more than the individual productivity; humans are part of a larger configuration of which they are both dependent and to which to contribute. For a team and an organization to function well as a whole, collaboration and interaction are required as well as the awareness of the effects of individual decisions for the larger structure. This paradox is underlined by the survey results. Figures 4 and 5 show the direct effect of the work environment on the perceived personal productivity and on the collective (team and organization) productivity.

**Figure 1: Scatter plots comparing the effect of the social aspects of the work environment on individual productivity (left) and the productivity on team/organizational level (right) (survey results)**



With regards to individual productivity the social aspects are most strongly correlated (b value .579 versus .527 for the physical aspects). The collective productivity bears a much stronger correlation with the physical aspects of the work environment than with social aspects (b value 1,026 versus .357 for the social aspects). The physical and social aspects combined explain 51% of the variance of the perceived personal productivity and 44% of the variance of the perceived collective productivity. With respect to both personal and collective productivity interaction has a stronger effect than distraction (reversed), and lay-out has a stronger effect than comfort.

**Figure 2: Scatter plots comparing the effect of the physical aspects of the work environment on individual productivity (left) and the productivity on team/organizational level (right) (survey results)**



### 3 CONCLUSIONS

Based on the findings of the field research we conclude that the physical work environment has a substantial influence on the perceived productivity of knowledge work by academics in research departments, and that there are opportunities for improvement at the level of the individual as well as that of the team and organization. It warrants emphasis that these conclusions are based on the perceptions of the respondents; the data does not allow for conclusions with respect to the factual effects of the work environment and the factual productivity of knowledge workers. Discussion of the research findings with facility managers learns that the outcomes are recognized both by UAS and professional college education.

A high performance workplace is comfortable and supports the knowledge development process. Activities related to externalisation and internalisation of knowledge require different spatial solutions. Neither the dynamics of an open office concept, nor the isolation and privacy offered by a small personal office space, is sufficient in itself to optimally facilitate all phases of the knowledge development process. Lay-out should fit the internalization/externalization ratio as well as the need for vicinity essential for collaborative knowledge development. The physical work environment may have a facilitating role in binding and attracting the right people and in transferring (company) culture. Binding and interesting in this case specifically applies to the student who must be enticed to take part in research, but an inspiring workplace can also have a spin-off effect on colleagues in education and the market. As academic workers differ greatly work and learning styles and the circumstances in which they perform optimally, it is important that academics be given the choice with respect to how, where and when they work. Freedom of choice is the key to individual productivity. In order to facilitate this freedom of choice work environments need to be spacious in design; a demand for a high population density will result in knowledge workers working under sub-optimal circumstances. Some specific recommendations:

- Location: centrally and visibly located in the vicinity of relevant partners in education (lecturers and students), to support the connection with education and business partners.
- Workplace: activity based workplace concept linked to the different stages in knowledge development (concentration, collaboration, sharing) with sufficient archive and storage

space. Informal meeting areas should be easily accessible (near entrance) and attractive to stimulate informal meetings between researchers, lecturers and students. Concentration areas should be situated away from the meeting areas to minimize disturbance, but within sight of the meeting areas to stimulate transfer of knowledge and support team productivity. This requires high standard acoustic isolation of the concentration areas.

- Functional combinations: concentration area can be combined with a library function. Meeting areas can be used for brainstorming sessions and for relaxing. Project rooms can accommodate research teams working on the same project, but can also be used for concentrated work in small settings.
- Stimulate the correct use of the different areas by specific interior design emphasizing the states of mind that academics associate with these two different activities. Colour, furniture and decoration may be used to express the appropriate atmosphere and impression.
- The added value of facilities management is subjective and is determined by the customer. Involved customers are more satisfied customers. Of course requirements for standardization and costs preclude tailoring each workplace to the individual's needs. However it is important to include workers in the development of new concepts in order to include basic needs in the program of requirements.
- Housing costs are relatively small compared to the cost of staff. Use an integrated business case approach to prevent an unwanted negative impact of workplace interventions by a leveraging effect.

## ACKNOWLEDGMENTS

ir. C.B. (Carla) Brouwer; drs. R.S.F. (Rienk) van Marle; drs. R. (Ruth) Pijls; dr.ir. D.J.M. (Theo) van der Voordt.

## REFERENCES

- Appel-Meulenbroek, R., 2010. Knowledge sharing through co-presence: added value of facilities. *Facilities*. Vol. 28 (3/4), pp. 189-205
- Aznavoorian, L. & Doherty, P., 2011. The forces driving change [chapter] in: *Work on the move. Driving strategy and change in workplaces*. Houston: IFMA Foundation.
- Batenburg, R. & Van der Voordt, D.J.M., 2008. *Effecten van de facilitybeleving op de ervaren arbeidsproductiviteit*. Delft: Stichting Kenniscentrum Center for People and Buildings.
- Brill, M., 1986. Using Office Design to Increase Productivity, *Workplace Design and Productivity*. Buffalo Organization for Social and Technological Innovation (BOSTI).
- Brill, M, Weideman, S., 2001. *Disapproving widespread myths about workplace design*, Kimbal International, Jasper, USA.

- Duffy, F., 2005. *The impact of office design on productivity*, DEGW & Commission for Architecture & the Built Environment and the British Council for Offices, date accessed May 4th 2011 <[www.cabe.org.uk](http://www.cabe.org.uk)>
- Haynes, B.P., 2007-1. Office productivity, a theoretical framework. *Journal of Corporate Real Estate*, Vol. 9 (2), pp. 97-110.
- Haynes, B.P., 2007-2. The impact of the behavioural environment on office productivity. *Journal of Facilities Management*, Vol. 5 (3), pp. 158-171.
- Haynes, B.P., 2007-3. Office productivity, a shift from cost reduction to human contribution. *Facilities*, Vol. 25 (11), pp. 452-462.
- Haynes, B.P., 2008. Impact of workplace connectivity on office productivity. *Journal of Corporate Real Estate*, Vol 10 (4), pp. 286-302.
- Heerwagen, J.H., Kampschroer, K., Powell, K.M. & Loftness. V., 2004. Collaborative knowledge work environments. *Building Research and Information*, Vol. 32 (6), pp. 510-28.
- Heerwagen, J.H., Kelly, K.V., Kampschroer, K. & Powell, K.M., 2006. The cognitive workplace, in: *Creating the productive workplace* [chapter 9]. New York: Taylor & Francis.
- Jensen, P.A., 2010. The Facilities Management Value Map: a conceptual framework. *Facilities*, Vol. 28 (3/4), pp. 175-188.
- Jensen, P.A., Van der Voordt, D.J.M., Coenen, C., Von Felten, D., Lindholm, A., Balslev Nielsen, S., Riratanaphong, C. & Pfenninger, M., 2011. In search for the added value of FM. What we know and what we need to learn. *Facilities* [accepted for publication].
- Kaczmarczyk, S. & Mutough, J., 2002. Measuring the performance of innovative workplaces. *Journal of Facilities Management*, Vol 1 (2), pp. 163-176
- Kaplan, A. & Arnonoff, S., 1996. Productivity paradox: worksettings for knowledge work. *Facilities*, Vol. 14 (3/4), pp. 6-14.
- Kolb, D.A., 1984. *Experiential Learning: experience as the source of learning and development*. New Jersey: Prentice-Hall
- Morgan, A. & Anthony, S., 2008. Creating a high-performance workplace: a review of issues and opportunities. *Journal of Corporate Real Estate*, Vol. 10 (1), pp. 27-39.
- Nonanka, I. & Takeuchi, H., 2003. *De kenniscreërende onderneming, hoe Japanse bedrijven innovatieprocessen in gang zetten*. Translated from English by Drs. Th.H.J. Tromp. 3<sup>e</sup> druk. Schiedam: Scriptum.
- Roelofsen, P., 2002. The impact of office environments on employee performance: The design of the workplace as a strategy for productivity enhancement. *Journal of Facilities Management*, Vol 1 (3), pp 247-264.
- Roelofsen, P., 2008. Performance loss in open-plan offices due to noise by speech. *Journal of Facilities Management*, Vol. 6 (3), pp. 202-211.
- Wiersema, F. D. & Treacy. M., 1993. *Customer Intimacy and Other Value Disciplines*, Harvard Business Review, January 1993.
- Van der Voordt, D.J.M., 2003. *Kosten en baten van werkplekinnovatie. Een definitie en - programmeringsstudie*. Delft: Center for People and Buildings.
- Weggeman, M., 1997. *Kennismanagement, inrichting en besturing van kennisintensieve organisaties*. Schiedam: Scriptum.