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The added value of healthy workplaces - In search for evidence

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ABSTRACT

Purpose: This paper aims to explore the added value of healthy workplaces for organizations, employees, other stakeholders, and the society as a whole, and what evidence is available about the impact of healthy workplaces on end user satisfaction, productivity, and cost. The paper ends with reflections and suggestions for follow-up research.

Design/methodology/approach: A literature research of journal papers, conference papers and other sources covering the disciplines and fields of Building Research, Corporate Real Estate Management (CREM), Facilities Management (FM), Environmental Psychology, Ergonomics, and Health Management.

Findings: The paper presents a conceptual model of influencing factors on health and wellbeing, possible interrelationships with other values, and possible benefits on individual, organizational and societal level. The literature review shows that limited research is available on the impact of healthy workplaces on other value dimensions. Most research regards the positive relationship between healthy workplaces and employees' wellbeing, satisfaction and productivity. Data on economic benefits are available as well, with a focus on health promoting programs.

Practical implications: The conceptual model and findings from the literature can be used to assess a work environment on its impact on end users' health and wellbeing, and to define objectives, interventions and priorities in value adding management.

Originality/value: This conceptual model of influencing factors on healthy work places and possible impacts of healthy workplaces on other value dimensions is new and can be used to define the agenda of future transdisciplinary research.

Keywords: health, wellbeing, satisfaction, productivity, cost, workplace

1 INTRODUCTION

The World Health Organization WHO defines health as a state of complete physical, mental and social wellbeing, which presents a wider scope than just the absence of disease or infirmity. As

such, a healthy workplace can be defined as a workplace that contributes to the physical, mental and social wellbeing of its users and avoids negative impacts on people's health and wellbeing. Various concepts are used to identify a positive contribution of the physical environment to health and wellbeing, for instance:

- *Healthy office* (Nelson and Holzer, 2017): a concept that covers both environmental adjustments - e.g. healthy lighting (daylight, higher brightness of artificial light, installing a circadian-friendly schedule) and incorporating nature (e.g. by potted plants and flowers and view on nature) - and stimulating healthy choices, e.g. by offering healthy nutrition, facilitating mental balance by providing rooms for meditation, yoga, naps and chair massages, and "active workspaces" that stimulate physical exercise (e.g. treadmills at desks, sit-stand desks and walking meetings);
- *Healing office*: a design method that has been developed by design studio D/DOCK in the Netherlands (Bauer, forthcoming), which defines ten design qualities with positive effects on happiness and health: diversity (both functional and a good balance of complexity, mystery, coherence and legibility), connectedness, (day)light, contact with nature, sense of ownership of the workplace (including personal control), sustainability, physical activity, opportunities to re-energize and recover from fatigue and stress), and healthy food;
- *Healing architecture* (Nickl-Weller and Nickl, 2013) and *healing environment* (Ulrich et al., 2008): a concept that is used in the health care sector to emphasize the healing effects of daylight, plants, appropriate indoor climate and outside view (preferably on nature)
- *Biophilic design*: according to Wilson (1984) biophilia refers to love for nature and can be described as the innately emotional affiliation of human beings to other living organisms; biophilic design focuses on strengthening the connection with nature i.e. by natural light, views on nature, pictures of nature, plants, water, natural materials, textures and patterns (Browning et al., 2014; Designcurial, 2019);
- *Salutogenic design*: a concept that focuses on factors that support human health and wellbeing, in contrast to the *pathogenic* approach, which is primarily concerned with prevention of factors that cause disease (Antonovsky, 1987, Roskams and Haynes, 2020). An interesting concept in salutogenic design is sense of coherence (Antonovsky, 1987), i.e. individual perceptions regarding the extent to which events occurring around them are structured, predictable, and explicable (comprehensibility), the extent to which the individual perceives sufficient resources to meet the challenges posed by the environment (manageability), and the extent to which events are perceived as challenges worthy of investment and engagement (meaningfulness).

Concepts that refer to a negative contribution of the physical environment to health and wellbeing are for instance:

- *Sick Building Syndrome*: a concept that refers to poor indoor environment quality and other factors that contribute to symptoms related to the mucous membranes (i.e. the eyes, nose and throat), dry skin, headache and lethargy (e.g. Gau and Lau, 2012):
- *Toxic workplaces*: physical workplaces that are harmful to employees on a day-in and day-out basis (Too and Harvey, 2012).

What these concepts have in common is a growing awareness of the impact of the physical environment on people's health and wellbeing. This is also reflected in a growing attention to healthy work places, both in research (e.g. Van der Voordt, 2020) and in practice (e.g. by large

insurance companies like Medibank in Australia and VGZ in The Netherlands), and the risk on health complaints, illness or burnout (see for instance Aussems et al., forthcoming).

Healthy workplaces that support employees' health and wellbeing can be a goal in itself, but may also have intended or unintended effects on other values such as employee satisfaction, labour productivity, creativity and so on. The current paper aims to start an exploration of these additional impacts and searches for answers to two questions:

- 1) What is (or could be) the added value of healthy workplaces for clients, customers, end users and the society as a whole?
- 2) Which evidence (if any) is available for possible relationships between healthy workplaces and other values?

The term value refers to what extent buildings, facilities and services – in this context: healthier workplaces – contribute to the goals and objectives of the organization and other stakeholders. Added value refers to the trade-off between the benefits of different design choices or an intervention in a current environment and the sacrifices in terms of costs, efforts and risks, from the perspective of different stakeholders (Jensen, Van der Voordt and Coenen, 2012).

Figure 1 presents a conceptual model that visualizes possible relationships between workplace characteristics, health and wellbeing, and other value dimensions.

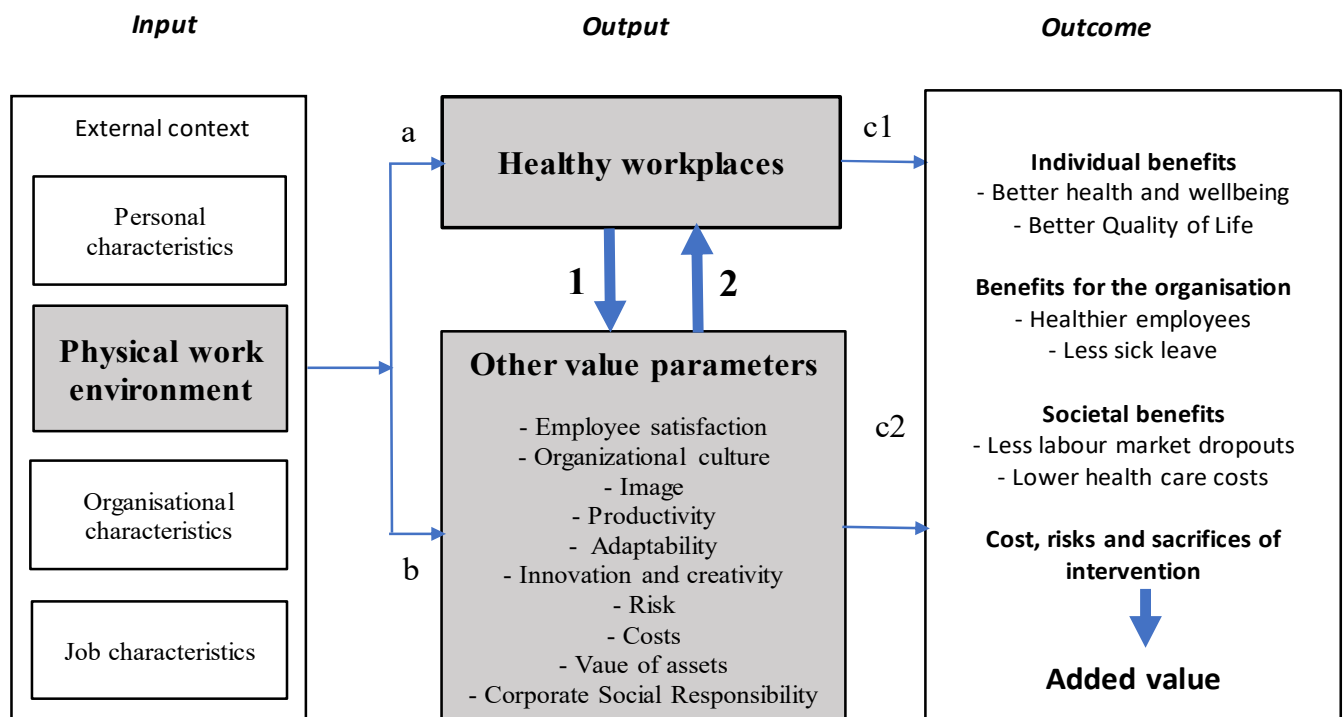


Figure 1: Conceptual model of possible relationships between physical characteristics of the work environment, healthy workplaces and other values (adapted and extended from Jensen and Van der Voordt, 2020)

The arrows a, b, c1 and c2 represents:

- a. Physical characteristics of the work environment may contribute to healthy workplaces. This assumption has been explored in various reviews of the literature (Meijer et al., 2009; Jensen and Van der Voordt, 2020); Roskams and Haynes, 2020; Forooraghi, 2020), by using questionnaires (e.g. Aussems et al., forthcoming) and in case studies (e.g. Cordero, 2020; Bauer, forthcoming). It appears that in particular a poor indoor climate, noise and distraction have a negative impact on employees' health and wellbeing, whereas plants and appropriate opportunities to communicate and to concentrate contribute to a healthy workplace. A recent literature review of the relationship between interior office space (layout, furniture, light, greenery, controls and noise) and employee physical, psychological and social well-being showed that evidence on the relationship between interior space and health has accumulated only within a few topics (Colenberg, Jylhä and Arkesteijn, 2020). On the one hand, open-plan offices, shared rooms and higher background noise are negatively related to health. On the other hand, positive relationships are found between physical well-being and aspects that encourage physical activity; between physical/psychological well-being and (day)light, individual control and real/artificial greenery; and between social well-being and small shared rooms.
- b. Physical characteristics of the work environment may contribute to many other value parameters as well. Van der Voordt and Jensen (2017) identified 12 value parameter divided in four people oriented value parameters (satisfaction, image, culture, and health and safety), four product or process oriented variables (productivity, adaptability, innovation and creativity, and risk), two economic value parameters (cost, and value of assets), and two value parameters that are relevant for the society as a whole (sustainability and corporate social responsibility). Various experts explored which environmental characteristics affect the twelve value parameters, how, and to what extent (Van der Voordt and Jensen, 2017).
- c1. Healthy workplaces aim to contribute to healthier people, less sick leave, a better quality of life, less labour market dropouts and lower health care costs. For instance, Bodin Danielson (2014) found a significant higher short sick leave spells among women in small, medium sized and large open-plan offices and among men in flex-offices. For long sick leave spells, a significantly higher risk was found among women in large open-plan offices and for the total number of sick days among men in flex-offices.
- c2. Satisfied, productive and creative employees, a positive image, a supportive organizational culture and so on contribute to attaining organizational goals and objectives, and increased organizational performance and as such add value to the organization. This assumption has also been explored in Van der Voordt and Jensen (2017).

Arrow 1 suggests that healthy workplace may have an effect on other added values as well i.e. make people more healthy, happy, productive, satisfied, creative and innovative, may have an impact on real estate and facility costs and the value of assets, and may be related to corporate social responsibility and sustainability. Vice versa, arrow 2 suggests that other values may contribute to healthy workplaces as well. For instance, green buildings are supposed to be healthier than non-green buildings. Arrow 1 and 2 are meant to represent correlations, whereas it might be that some relationships are *causal* relationships.

The rest of this paper will further explore the interrelationships between healthy workplaces and other values. Due to lack of space and because some relationships are more plausible than other ones, we will focus on user satisfaction, productivity and facility cost. These three values turned out to be most frequently prioritized in interviews with corporate real estate and facility managers Van der Voordt and Jensen, 2014).

2 METHODS

The literature review applied a structured approach according to Webster and Watson (2002), where the review is based on leading journals in the field. In a former paper about impact factors on healthy workplaces (Jensen and Van der Voordt, 2020), we checked four FM and CREM oriented journals for relevant papers in a ten-year period, covering 2008-2017: *Journal of Corporate Real Estate* (JCRE), *Corporate Real Estate Journal* (CREJ), *Facilities*, and the *Journal of Facilities Management* (JFM). We also screened the *Workplace Health & Safety Journal* and the *International Journal of Workplace Health Management*. However, most papers in both latter journals focus on organizational interventions such as fitness programs, healthy food, weight management, hygiene, pet-friendly workplaces, burnout prevention, health code of conduct, and prevention of bullying and violence.

For the current paper we extended our search to the period 2018-2019 (and 2020 when available) and to other journals selected based on paper citations and journal titles. In particular, we have screened the last five volumes of *Applied Ergonomics*, *Building and Environment*, *Building Research & Information*, *Environment and Behavior*, *Ergonomics*, *Intelligent Buildings International*, and *Journal of Environmental Psychology*. We also screened the journal with the promising title *Performance Enhancement & Health*, but it mostly included papers on sport, performing arts, drugs and doping. We searched in particular on (combinations of) the keywords health, wellbeing and workplace.

3 FINDINGS ON THE ADDED VALUE OF HEALTHY WORKPLACES

General findings

Environmental characteristics that effect healthy workplaces and related values include office type (cellular offices; combi offices with assigned workplaces; flex offices with non-assigned workplaces; open plan offices), teleworking, office layout, desk location, architecture, comfort (air quality, lighting, temperature, humidity, noise, acoustics, size of windows, access/distance to windows, carbon dioxide, carbon monoxide), plants, workspace segregation (versus openness), workspace territoriality, individual environmental control, aesthetic quality, distraction, cleanliness, sustainability (green buildings), and flexibility criteria. So there is a huge range of independent variables.

Papers that link healthy workplaces to other value dimensions regard a variety of topics, in particular employee satisfaction, productivity, or a combination of both values, individual and organizational performance, effectiveness, privacy, concentration, distraction/disturbances, communication, social contact/interaction, territoriality, depression-enthusiasm, anxiety, absenteeism, creativity, and user experience. So apparently healthy workplaces may have many intended or unintended side effects as well.

Ways to measure employees' health and wellbeing include inter alia surveys, semi-structured interviews in which respondents are asked to freely reflect on their feelings of wellbeing (with open questions such as "what in the office makes you feel well" or particular questions about comfort, ergonomics, privacy and stress levels), workshops and group interviews, prototype testing and pilot projects, self-measurement of health and health supportive behaviour (e.g. by using wearables and apps to measure the number of steps per day, heart rate, calories, sleep etc.), and data on sickness absence. Ways to measure health supporting or hindering characteristics of the physical environment include observations, identifying healthy office design qualities, scores on the WELL standard, and data about toxic substances in the air such as carbon monoxide, carbon dioxide and volatile organic compounds. See for instance Cordero et al. (2020), Forooraghi et al. (2020), Jensen and Van der Voordt (2020) and Bauer (forthcoming). For an overview of ways to measure all twelve values see Van der Voordt and Jensen (2018).

Health, satisfaction and productivity

Two literature reviews concern the relationship between wellbeing/comfort and productivity in a broad sense. Isham et al. (2019) present a review on wellbeing and productivity in a report for the Economic and Social Research Council in the UK together with recommendation for further research. The executive summary presents three key findings; (1) Wellbeing is linked to higher levels of labour productivity; (2) Certain factors may be able to explain the positive relationship between levels of wellbeing and labour productivity; (3) Productivity growth may have detrimental effects on wellbeing. Recommended topics for further research are divided in eight research areas, which include Workplace factors and ICT as two of the areas. Al Horr et al. (2016) discuss the importance of comfort in a review on office indoor environmental quality (IEQ) and occupant productivity. The review is divided in 8 IEQ factors: indoor air quality and ventilation, thermal comfort, lighting and daylighting, noise and acoustics, biophilia and views, look and feel (including color), and location and amenities. The conclusions include that thermal comfort, indoor air quality, office layout, and noise and acoustics were found to be highly significant in affecting occupant productivity. Occupant comfort directly relates to the physical factors of the indoor environment, but comfort is highly subjective and depends on various independent personal variables such as individual metabolism, clothing preference, activity patterns and the localized conditions of different zones inside an office.

Three reviews focus on specific aspects of workplaces. Engelen et al. (2019) made a review on the impact of activity-based working (ABW) on health, work performance and perceptions. The review found that ABW has positive merits in the areas of interaction, communication, control of time and space, and satisfaction with the workspace; however, it is unfavourable for concentration and privacy. For physical and mental health, the evidence is equivocal. Vos et al. (2018) presents a review on cleanliness with a service management perspective. The review is not related to a particular type of setting or facility, but some studies concern offices. The paper covers health-related behaviour and satisfaction and includes findings on the relation between cleanliness and satisfaction, which rejects that cleanliness is only a hygiene factor with reference to Herzberg two factor theory. Chambers et al. (2019) presents a review on the effect of sit-stand desks (SSDs) on office worker behavioural and health outcomes. It examines the effects of SSDs on six domains: behaviour (e.g. time sitting and standing), physiological, work performance, psychological, discomfort, and posture. The paper concludes that SSDs effectively change behaviours, but these

changes only mildly effect health outcomes. SSDs seem most effective for discomfort and least for productivity.

Monetary costs and benefits of healthy workplaces

The ratio between cost of energy, buildings and people is estimated to be about 1:10:100 (Marson, 2018). Thus, it makes sense to reduce staff costs and to search for the cost-effectiveness of healthy workplaces. According to Marson (2018), in the US, the total annual costs of lost productivity due to employee absenteeism counts \$84bn with a reference to Investopedia and that creating and implementing wellbeing programs can reduce employee 'sick days' by 26 per cent according to The International Well Building Institute.

According to Lee (2018), to manage real estate and facility costs, it is necessary to identify and measure three key aspects: a) demand drivers, for instance real estate costs will be partly driven by the amount of space needed; catering costs will be partly driven by the number of people using the services; b) service level i.e. required quality; c) agility i.e. how quickly an organization can react to changes. The author pleas for the use of sensor technology to measure workplace performance continuously, consistently, systematically and in real time. Due to lowering prices of building and body sensors and cloud computing becoming more affordable, it is possible to capture data on many cost factors. Yet, no cost figures are presented to support this conceptual paper.

The Canadian Industrial Accident Prevention Association (IAPA) discusses the business case for a healthy workplace (Burton, 2008). They argue that a worker's health is produced by two factors: 1) what workers bring with them to the workplace in terms of heredity, personal resources, health practices, beliefs, attitudes, and values; and 2) what the workplace does to employees once they are there, in terms of organization of work in both the physical and psychosocial sense. Based on a literature review on costs and benefits of healthy workplaces they found that stress in a business contributes to 19% of absenteeism costs, 30% of disability costs, at least 60% of workplace accidents, and 40% of staff turnover costs. On the contrary, a number of organizations are presented that saved much money due to the positive impact of healthy workplaces on staff turnover and sick leave. An example is a company that emphasized 2-way communications and employee involvement and designed the entire workplace around health and cleanliness. Their average sick time is incredibly low (0.1 day per employee per year). With only three employees leaving voluntarily in the past 5 years, their turnover is also extremely low. According to the IAPA report, in spite of the difficulties to quantifying some of the results, there are many examples showing that the cost-benefit ratio may range from \$1.50 to \$6.15 for every dollar invested. The higher numbers result, when a comprehensive approach to a healthy workplace is used, rather than a single focus, and when cost-benefit is measured several years after inception of the interventions, rather than at the beginning. In particular, great cost savings can be gained, when health promotion programs are implemented in a supportive work environment.

A report by the International Green Building Council (Laski, 2018) presents 11 cases that analyze the impact of green features with environmental, health and wellbeing benefits, in particular the influence of the location and amenities, Indoor Air Quality, acoustics, and look and feel on occupant satisfaction and economic benefits. Due to the variety in projects regarding its size, type of organization and type of interventions, the cases that have calculated economic benefits show a wide range with drops in employee sick days of 25% to 58%, reductions in staff turnover of 27%

and annual savings that go up to 85,000 per year. These data have not been tested scientifically on reliability and validity.

4 CONCLUDING REMARKS

Due to the impact of many interrelated variables, it is difficult to trace cause-effect relationships between characteristics of healthy work environments and health related value dimensions. Usually, various interventions are conducted simultaneously. Furthermore, employees' health not only depends on what the workplace does to employees, but also on what workers bring with them to the workplace. Cause-effect relationships are even more difficult to trace from aggregated data on national or international level. In order to be able to interpret the impact of separate measures, reflections on data by an interdisciplinary team and experimenting with particular interventions may be helpful.

Taking care for healthy work environments is a matter of moral responsibility. On the other hand, organizations must be financially healthy. For this reason, business cases often focus on financial costs and benefits. The relationships between design choices and interventions in the work environment and different values and between values themselves plea for a more integrated, holistic business case. An obstacle may be that the cost of interventions and its resulting output and outcomes are not always easy to measure in a quantitative way. One solution is to base business cases not only on financial data but to take into account well-argued qualitative considerations as well. Additional research may help to provide input to both the input and outcome side of interventions that aim to provide more healthy environments.

In spite of methodological limitations and measurement difficulties and the limited scope of this review, it may be concluded that providing healthy workplaces is relevant, both from a point of view of corporate social responsibility and due to the many positive impacts of healthy work places on employees' health and wellbeing, employee satisfaction, productivity and economic benefits.

The conceptual framework that is presented in this paper can serve as input to follow-up transdisciplinary research by academics from different fields, including corporate real estate management, facilities management, human resource management, environmental psychology and work and organizational psychology, in order to get a more deeper, holistic and evidence based understanding of the added value of healthy workplaces.

REFERENCES

Al Horr, Y., Arif, M., Kaushik, A., Mazroei, A., Katafygiotou, M. and Elsarrag, E. (2016), "Occupant productivity and office indoor environment quality: A review of the literature. *Building and Environment* 105, 369-389.

Antonovsky, A. (1987), *Unraveling the mystery of health: How people manage stress and stay well. The Jossey-Bass social and behavioural science series and the Jossey-Bass health series.* San Francisco, CA, US: Jossey-Bass.

- Aussems, R. Appel-Meulenbroek, R., Le Blanc, P., Van der Voordt, T. and Arentze, T. (2020), "Impact of activity-based workplaces on burnout and engagement". *Journal of Corporate Real Estate*, forthcoming.
- Bauer, A. (2020), "Pride & Productivity. Post Occupancy Evaluation of the Healing Office Design Concept". Forthcoming.
- Burton, J. (2008), *The Business Case for a Healthy Workplace*. Toronto: Industrial Accident Prevention Association IAPA.
- Bodin Danielsson, C.B., Chungkham, H.S., Wulff, C. and Westerlund, H. (2014), "Office design's impact on sick leave rates", *Ergonomics* 57(2), 139–147.
- Browning, W.D., Ryan, C.O., and Clancy, J.O. (2014), *14 Patterns of Biophilic Design*. New York: Terrapin Bright Green, LLC.
- Chambers, A.J., Robertson, M.M. and Baker, N.A. (2019), "The effect of sit-stand desks on office worker behavioral and health outcomes: A scoping review". *Applied Ergonomics* 78, 37–53.
- Colenberg, S., Jylhä, T. and Arkesteijn, M. (2020), "The relationship between interior office space and employee health and well-being. A literature review, *Building Research & Information*. Published Open Access.
- Cordero, A.B., Babapour, M. and Karlsson, M. (2020), "Feel well and do well at work: A post-relocation study on the relationships between employee wellbeing and office landscape". *Journal of Corporate Real Estate*, 22(2), 113-137.
- Designcurial (2019), "Biophilic design and architecture – 10 of the best biophilic buildings. Traced from <http://www.designcurial.com/news/biophilic-design-and-architecture---10-of-the-best-biophilic-buildings-4527750/> at 23 October 2019.
- Engelen, L., Chau, J., Young, S., Mackey, M., Jeyapalan, D. and Bauman, A. (2019), "Is activity-based working impacting health, work performance and perceptions? A systematic review". *Building Research and Information*, 47(4),468-479
- Feige, A., Wallbaum, H., Janser, M. and Windlinger, L. (2013), "Impact of sustainable office buildings on occupant's comfort and productivity", *Journal of Corporate Real Estate* 15(1), 7-34.
- Forooraghi, M., Miedema, E., Ryd, N. and Wallbaum, H. (2020), "Scoping review of health in office design approaches", *Journal of Corporate Real Estate* 22(2), 155-180.
- Gou, Z. and Lau, S.S-J. (2012), "Sick building syndrome in open-plan offices: Workplace design elements and perceived indoor environmental quality", *Journal of Facilities Management* 10(4), 256-265.
- Isham, A., Mair, S. and Jackson, T. (2019), *Wellbeing and productivity: a review of the literature*. Report for the Economic and Social Research Council. December 2019.
- Jensen, P.A., Van der Voordt, T. and Coenen, C. (2012) (eds.), *The added value of facilities Management: concepts, findings, perspectives*. Lyngby, Denmark: Centre for Facilities Management & Polyteknisk Forlag.
- Jensen, P.A. and Van der Voordt, T. (eds.) (2017), *Facilities Management and Corporate Real Estate Management as Value Drivers: How to Manage and Measure Adding Value*. London/New York: Routledge.

- Jensen, P.A. and Van der Voordt, T. (2020), "Healthy workplaces: what we know and what we should know", *Journal of Corporate Real Estate* 22(2), 95-112.
- Laski, J. (2016), *Doing right by planet and people. The Business Case for Health and Wellbeing in Green Building*. London/Toronto: World Green Building Council.
- Lee, C. (2018), "Delivering and managing high productivity, low cost workplaces: A data driven perspective", *Corporate Real Estate Journal* 7(3), 243-255.
- Marson, M. (2018), "The business value of an innovative building", *Corporate Real Estate Journal* 8(2), 154-164.
- Meijer, E. M., Frings-Dresen, M. H. and Sluiter, J. (2009), "Effects of Office Innovation on Office Workers' Health and Performance". *Ergonomics* 52(9), 1027-1038.
- Nelson, E. and Holzer, D. (2017), *The healthy office revolution*. Amstelveen: Learn Adapt Build Publishing.
- Nickl-Weller, C. and Nickl, H. (2013), *Healing architecture*. Salenstein: Braun Publishing.
- Roskams, M. and Haynes, B. (2020), "Salutogenic Design in the Workplace: Supporting Sense of Coherence through Resources in the Workplace Environment", *Journal of Corporate Real Estate* 22(2), 193-153.
- Too, L. and Harvey, M. (2012), "TOXIC" workplaces: the negative interface between the physical and social environments", *Journal of Corporate Real Estate* 14(3), 171-181.
- Ulrich, R.S., Zimring, C., Zhu, X., DuBose, J., Seo, H., Choi, Y., Qan, X. and Anjali, J. (2008), "A review of the literature on evidence-based healthcare design", *Health Environments Research & Design Journal* 1(3), 101-165.
- Van der Voordt, T. and Jensen, P.A. (2014), "Adding value by FM: exploration of management practice in the Netherlands and Denmark". *EFMC 2014*, Berlin, 4-6 June 2014.
- Van der Voordt, T.J.M. and Jensen, P.A. (2018), "Measurement and benchmarking of workplace performance: key issues in value adding management", *Journal of Corporate Real Estate* 20(3), 177-195.
- Van der Voordt, T. (2020), "Healthy work environments", Guest Editorial, *Journal of Corporate real Estate* 22(2), 93-94.
- Vos, M.C., Galetzka, M., Mobach, M.P., van Hagen, M. and Pruyn, A.T.H. (2018), "Cleanliness unravelled: a review and integration of literature". *Journal of Facilities Management* 16(4), 429-451
- Webster, J. and Watson, R.T. (2002), "Analyzing the past to prepare for the future: writing a literature review, Guest editorial", *MIS Quarterly* 26(2), 13-23.
- Wilson, E.O. (1984), *Biophilia: The Human Bond with Other Species*. Cambridge: Harvard University Press.