Reimagining Work: Journey to Thriving

ADDENDUM

Design Guidelines & Considerations for Office/Home Office

ANNOTATED BIBLIOGRAPHY

1 **Appel-Meulenbroek, R., Voordt, T. v. d., Aussems, R., Arentze, T., & Blanc, P. L. (2020). Impact of activity-based workplaces on burnout and engagement dimensions. *Journal of Corporate Real Estate*, 22(4), 279-296. http://dx.doi.org/10.1108/JCRE-09-2019-0041**

Appel-Meulenbroek et al. (2020) sought to explore "which characteristics of activity-based offices are related to the position of workers on the burnout - engagement continuum." Their conceptual model includes five main constructs: office layout, office comfort, office use, teleworking, and information and communication technology access. The burnout-engagement continuum has three dimensions: individual strain, interpersonal strain, and self-evaluation strain. The researchers compiled data between July and September 2018 from an online questionnaire surveying 14 organizations with activity-based work asking about workplace characteristics, utilizing individual control variables and opinion on various situations. Out of the five main constructs, three were significant on at least one of the burnout-engagement dimensions: 1) distraction (office use) had "a direct and indirect...negative relation with individual strain," 2) office comfort had an "indirect positive relations...with interpersonal strain," and 3) teleworking had "an indirect positive relation...on the self-evaluation."

2 **Arundell, L., Sudholz, B., Teychenne, M., Salmon, J., Hayward, B., Healy, G., & Timperio, A. (2018). The impact of activity based working (ABW) on workplace activity, eating behaviours, productivity, and satisfaction. *International Journal of Environmental Research and Public Health*, 15(5), 1005. http://dx.doi.org/10.3390/ijerph15051005**

Arundell et al. (2018) sought to understand the "potential to influence employee health and workplace outcomes" around the principles of activity-based working (ABW). The researchers conducted a natural, quasi-experimental test when a local government area in Victoria, Australia implemented a new purpose design building for one workplace while maintaining a traditional office-based workplace for another. They analyzed data compiled from a survey and an accelerometer worn by participants to obtain various physical activity metrics, with baseline taken prior to relocation and a follow-up after 6-9 months. There were improvements in workday sedentary time, physical activity, job satisfaction, and relationship to colleagues for ABW participants, but these results were not statistically significant. ABW participants also stated that they "felt frustrated due to lost time finding desks and colleagues, noise in the workplace, and a period of time [was] needed to adjust to the new ways of working." From a qualitative perspective, researchers noted that "ABW employees associated ABW with greater opportunities for movement and collaboration, but had mixed views on the impact on productivity."

3 **Bernstein E. & Turban, S. (2018). The impact of the 'open' workspace on human collaboration. *Philosophical Transactions B*, 373(1753). http://dx.doi.org/10.1098/rstb.2017.0239**

Bernstein & Turban (2018) sought to examine "the effect of open office architectures on employees' face-to-face, email, and instant messaging interaction patterns." The researchers devised two different studies: the first study had individuals wear sociometric badge, or sensor, while focusing on this empirical question: "what is the effect of transitioning from cubicles to open workspaces on the overall volume and type of interaction, [and] with what implications for organizational performance based on the company's own performance management system"; and the second study replicated the first study, adding two additional questions: "how does spatial distance between workstations moderate the effect of transitioning from cubicles to open workspaces and how do individual employee interaction networks, both [face-to-face] and electronic, change differentially." Bernstein & Turban (2018) stated that "contrary to common belief, the volume of face-to-face interaction decreased significantly (approx. 70%) in both cases" while electronic communications increased "by roughly 20% to 50%."

4 **Colenberg, S., Jylhä, T., & Arkesteijn, M. (2021). The relationship between interior office space and employee health and well-being - A literature review. *Building Research & Information*, 49(3), 352-366. https://doi.org/10.1080/09613218.2019.1710098**

Colenberg et al. (2021) undertook a meta-analysis to examine the relationship between interior space of offices and their effects on employee health. Starting with a broad keyword scope, the researchers implemented a multi-step screening process to identify research with criteria (office-only setting, empirical studies or systematic reviews, and dependent variables that specified health and/or well-being with independent variables measuring characteristics of the interior space) which narrowed the number of papers used in the analysis (n=50). However, they stipulate that "it is unclear for which office type the data are collected: open-plan, cellular, or combination; and allocated workstations or flexible use." The results from their research were mixed: while "open-plan offices, shared rooms, and higher background noise are negatively related to health," interior space had positive effects, such as "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."

5 **Eraslan, E., Güneşli, I., & Khatib, W. (2020). The evaluation of appropriate office layout design with MCDM techniques, *Springer Nature Applied Sciences*, 2, 388. https://doi.org/10.1007/s42452-020-2181-x**

Eraslan et al. (2020) performed a meta-analysis "to propose a method in order to analyze and compare the office layout design" with a focus on multi-criteria decision-making methods. After performing their literature review, the researchers gathered six office experts to provide rankings of identified factors and their criteria on three office layouts using three methods: the analytic hierarchy process (AHP), elimination and choice translation reality (ELECTRE), and permutation. After rankings were given for each method, the researchers developed a hierarchical model to showcase these relationships. The researchers concluded that the position of materials was the "most essential criteria" when analyzing through the AHP method. When analyzing the rankings of the office layout alternatives, the AHP and permutation method identified the same alternative that was most preferred by the office experts; the ELECTRE method was inconclusive because the rankings of the three office layout alternatives were similar and not statistically different.

6 **Gerards, R., de Grip, A., & Baudewijns, C. (2018). Do new ways of working increase work engagement? *Personnel Review*, 47(2), 517-534. https://doi.org/10.1108/PR-02-2017-0050**

Gerards et al. (2018) sought to examine the impact of new ways of working (NWW) on employee work engagement. The researchers partnered with a market research company to survey Dutch households in June 2013 (n = 901). They established a framework by defining five NWW facets (time and locationof independent work; management of output; access to organizational knowledge; flexibility in working relations; and freely accessibly open workplace), and analyzing them with two variables (social interaction and transformational leadership) to measure work engagement utilizing the "Utrecht work engagement scale." After verifying the interaction, variables have "a positive and highly significant direct effect of NWW on work engagement," their analysis showed three of the facets (management of output, access to organizational knowledge, and a freely accessible open workplace) "positively affect employees' work engagement" when testing a multiple mediation model.

7 **Gerdenitsch, C., Korunka, C., & Hertel, G. (2018). Need-supply fit in an activity-based flexible office: a longitudinal study during relocation. *Environment and Behavior*, 50(3), 273-297. https://doi.org/10.1177/0013916517697766**

Gerdenitsch et al. (2018) wanted to investigate the effects of changing the office environment to an activity-based workplace (A-FO), specifically the "perceived need-supply fit, distraction, interaction across teams, and workspace satisfaction during relocation from a cellular office to an A-FO." The researchers conducted a three-wave longitudinal study (four months prior to redesign, one month after, and eight months after) via surveys for a consultancy company in Vienna, Austria employing around 60 individuals. A research framework was established by identifying office location, office layout, and office use and their effects on distraction (job stressor), interaction across teams (job resources), and work satisfaction with perceived need-supply fit acting as a potential moderator. They concluded from this study that there was "a linear increase of perceived need-supply fit, a decrease in distraction, and a significant interaction effect where workspace satisfaction and interaction across teams increased more strongly for participants reporting a better perceived need-supply fit."

8 **Haapakangas, A., Hallman, D., Mathiassen, S. E., & Jahncke, H. (2019). The effects of moving into an activity-based office on communication, social relations and work demands - A controlled intervention with repeated follow-up. *Journal of Environmental Psychology*, 66, 1-8. https://doi.org/10.1016/j.jenvp.2019.101341**

Haapakangas et al. (2019) wanted to explore the effects of activity-based workplaces (ABW) on interaction, social relations, and work demands given the lack of controlled longitudinal studies on the topic. The researchers used a natural experiment when the Swedish Transport Administration announced that they will be relocating offices from multiple locations by setting an intervention group (moving from traditional office plans to ABW) and a control group (remaining with existing office plan). They surveyed employees of the offices (n= 408) through a questionnaire at three points during the process: 1) prior to relocation, 2) three months after, and 3) 12 months after. The researchers noticed that "satisfaction with communication and the sense of belonging to a community had decreased 3 and 12 months after the relocation," while "work pace did not change in the intervention group compared with the controls." Quantitative demands saw a statistically significant increase in both time periods only for workers who transitioned from private offices to ABW.

9 **Haapakangas, A., Hongisto, V., Varjo, J., & Lahtinen, M. (2018). Benefits of quiet workspaces in open-plan offices - Evidence from two office relocations. *Journal of Environnemental Psychology*, 56, 63-75. https://doi.org/10.1016/j.jenvp.2018.03.003**

Haapakangas et al. (2018) aimed "to investigate the role of office distractions in the emergence of other problems, and to examine the benefits of quiet workspaces in open-plan offices." The researchers identified two public companies within the Finnish public sector that were planning to relocate from private offices to an open-office plan and conducted survey questionnaires before and after the relocation for employees who experienced both office layouts. After the relocation, the researchers noticed that both organizations experienced an increase in perceived distractions within the open-plan office which impacted both collaboration and stress. However, the researchers noted that "negative effects on environmental satisfaction, perceived collaboration, and stress only emerged in the open-plan office where the number of quiet rooms was low."

10 **Kasuganti, A. R. (2018). Do ambient conditions in offices impact learning? *Facilities*, 36(5/6), 291-307. http://dx.doi.org/10.1108/F-03-2016-0027**

Kasuganti (2018) wanted to "investigate the relationship between satisfaction with ambient conditions and perceptions of situated learning in knowledge-intensive organizations." Kasuganti devised an online questionnaire containing two sections with 22 items which asked participants (n=117) belonging to the IT and consulting domains in India that have open office designs to respond to their own experiences, ambient conditions of the office, and situated learning statements. The researcher found that "satisfaction with ambient conditions positively influences" all four of the areas studied (situated learning, learning in action, knowledge sharing, and common understanding) and the results were statistically significant. The researcher also notes that since the IT industry is heavily "project-based" and "the learning environment is constantly changing," it is important that "learning occurs informally through interactions and impromptu discussions occurring in the workplace."

11 **Khatak, S. (2019). Role of ergonomics in re-designing job design in call centres. *International Journal of Occupational Safety and Ergonomics*, 27(3), 784-793. https://doi.org/10.1080/10803548.2019.1630111**

Khatak (2019) investigated "to what extent ergonomics can be incorporated into job designs to make the workplace of a call center employee a better one." After performing their literature review, the researchers created three ergonomic factor categories to examine (physical, cognitive, and organizational) along with three job design elements that the researchers state are the "core components at the heart of the model" (complexity of task, skill and effort, and degree of worker control). The research sampled call center employees (n=17) from three major telecommunication companies in Islamabad, Pakistan utilizing a semi-structured interview method. Through their analysis, the researchers concluded that "force and mental well-being" were the primary ergonomic factors for complexity of task, "inappropriate postures, mental well-being, characteristics of work, and work environment" for skill and effort, and "repetitiveness, workstation design, mental well-being, work environment, and characteristics of work" for the degree of worker control. However, "supervisor and peer support" was present in all three job design elements.

12 **Khazanchi, S., Sprinkle, T., Masterson, S., & Tong, N. (2018). A spatial model of work relationships: The relationship-building and relationship-straining effects of workspace design. *Academy of Management Review*, 43(4), 590-609. https://doi.org/10.5465/amr.2016.0240**

Khazanchi et al. (2018) performed a meta-analysis on the impact of the physical office design on work relationships. While focusing on office space dimensions, mechanisms, and relational ties, their spatial model has two distinct parts: one focusing on the relationship-building, "such as communication content, face-to-face frequency, communication duration, and identity marking," and another on relationship-straining, "such as territoriality and ego depletion, to differentially influence both positive and negative relational ties at work." They prioritize four spatial dimensions that are common within modern workspaces (proximity, workspace assignment, privacy, and crowding) while reviewing three major office space configurations (closed/private office, cubicle, and open plan). One of their major conclusions is that "by explicating spatial influence on positive and negative relational ties at work," they "draw attention to the quality of relationships as a primary concern." An implication for managers was that "while the culture of an organization may favor one office archetype over another to embrace new or organizationally desired ways of working, organizations must also embrace office developments that provide a combination of spatial dimensions."

13 **Öhrn, M., Wahlström, V., Harder, M., Nordin, M., Pettersson-Strömbäck, A., Danielsson, C. D., Olsson, D., Andersson, M., & Järvholm, L. S. (2021). Productivity, satisfaction, work environment and health after relocation to an activity-based flex office—The active office design study. *International Journal of Environmental Research and Public Health*, 18(14). https://doi.org/10.3390/ijerph18147640**

Öhrn et al. (2021) wanted "to evaluate the effects of an activity-based flex offices (A-FOs) on perceived productivity, satisfaction, work environment and health." The researchers created a longitudinal, non-randomized, quasi-experimental study with a group of white-collar workers (n= 374) from a medium-sized Swedish municipality that experienced a relocation. Since the workers had primarily worked in a single cell office or shared room layout, the researchers were able to divide them into two groups: ones that moved into an A-FO and ones that moved in a new cell office. A baseline measurement was performed six months prior to relocation and two subsequent follow-ups thereafter (six months and 18 months after relocation) asking participants about work tasks, productivity and satisfaction, work environment (psychosocial and physical), and health. While no significant differences were uncovered for health, "employees in the A-FO with work tasks requiring a high degree of concentration experienced lower productivity while those with a high proportion of teamwork rated productivity to be continually high," and lack of privacy, increase in noise disturbance, and decrease in sitting satisfaction were also reported.

14 **Pitchforth, J., Nelson-White, E., van den Helder, M., & Oosting, W. (2020). The work environment pilot: An experiment to determine the optimal office design for a technology company. *PLOS ONE*, 15(5), 1-33. https://doi.org/10.1371/journal.pone.0232943**

Pitchforth et al. (2020) were interested in understanding "how office designs can facilitate the best work output and company culture." The researchers worked with a large corporate tech company, based in the Netherlands but with many locations and employees globally, to identify a sample (n= 288) of participants. They created an experiment where they asked participants a series of questions regarding well-being and productivity metrics when comparing four different office designs (open-plan, zoned open-plan, activity-based, and team offices). After completing their data analysis, the researchers found that "zoned open-plan and team office designs improved employee satisfaction, enjoyment, flow, and productivity, while activity-based and open-plan designs performed poorly by comparison." The "open-plan office design was rated more poorly by employees and had higher levels of unsafe noise," and "once employees no longer had to be in the open-plan office design of the experiment, they spent more time at their desks."

15 **Wahlström, V., Olsson, D.., Öhberg, F., Olsson, T., & Järvholm, L. (2020). Underlying factors explaining physical behaviors among office workers—An exploratory analysis. *International Journal of Environmental Research and Public Health*, 17(24), 1-20. https://doi.org/10.3390/ijerph17249158**

Wahlström et al. (2020) "aimed to explore underlying factors related to sitting, standing and walking among office workers." The researchers devised a multicomponent intervention study of office employees (n=53) who worked in a public administrative workplace in northern Sweden and experienced an office relocation to either a a) cell office or b) flex office with activity-based work features. They collected repeated measurements for physical activity (sitting vs standing vs walking) and developed a questionnaire asking about lifestyle and health, work tasks, and work-related psychological factors 18 months after relocation. The researchers created six-character types from the data: "(1) harmonic and healthy, (2) disabled with poor health, (3) manager that spend a lot of time in meetings and has very high workload, (4) engaged with high workload, (5) employee with creative and computer intense work, with high workload and, (6) employee with high BMI [Body Mass Index] with creative and collaborative work." According to their regression results, the researcher concluded the character type engaged with high workload "sat more and stood less" while the character type with high BMI with creative and collaborative work "sat less."

16 **Weijs-Perrée, M., Appel-Meulenbroek, R., Arentze, T., & Romme, G. (2019). The influence of the physical work environment of business centres on social networking and knowledge sharing in the Netherlands. *Intelligent Buildings International*, 11(2), 105-125. https://doi.org/10.1080/17508975.2019.1574705**

Weijs-Perrée et al. (2019) derived a research study to examine the office design on social networking and knowledge sharing behaviour. The conceptual model included connections between demographics and organization type, the physical work environment (use of offered facilities and workspace type & use), social networking (frequency of social interacting colleagues and others), and knowledge sharing (colleagues and others). The researchers compiled data from 268 users at 53 business centers in the Netherlands between January and February 2019. They concluded that "using a lounge room is most effective for knowledge sharing between organizations" while "meeting spaces and flexibly used workspaces appear to be important for knowledge sharing within organizations." Age had a significant negative direct effect on social networking with colleagues suggesting that "older employees interact less with colleagues" and freelancers had a "significant negative direct effect on social networking and knowledge sharing with colleagues."

17 **Wohlers, C. & Hertel, C. (2018). Longitudinal effects of activity-based flexible office design on teamwork. *Frontiers in Psychology*, 9(2016). https://doi.org/10.3389/fpsyg.2018.02016**

Wohlers & Hertel (2018) investigated the impact of working habits within an activity-based flexible office (A-FO) on processes, across teams, and team management. The researchers developed a longitudinal study over three waves after the relocation (four weeks, 12 months, and 30 months) of a globally active engineering company with 136 office workers. Data was comprised of 25 in-person interviewees that switched from single cell or shared offices to A-FO and any notes taken by researchers during interviews. After a qualitative content analysis, the researchers uncovered positive effects of A-FO with "more contact, communication, collaboration possibilities (joint project work), and trusting relationships" while negative effects include "less communication and cooperation" for team-based collaboration. When interviewing managers, "team cohesion and communication among team partners were the most often mentioned challenges."