Corporate Coworking Spaces – Determinants of Work Satisfaction in Future Workspaces

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Abstract: Corporate coworking environments have gained traction in the latest debate. The aim of this study is to obtain a deeper understanding of the factors that determine work satisfaction in a corporate coworking environment and to illuminate determinants for collaborative and interactive work. Survey data were collected through five corporates using an internal corporate coworking space in Germany (n = 200). The study reveals new insights into the flexible working environment of corporate coworking spaces and identifies factors influencing work satisfaction, which is commonly linked with organizational outcomes. Determinants of work satisfaction are physical environmental factors, communication, concentration, collaboration and social interaction which indicates that informal meeting spaces for collaboration and communication as well as concentration spaces are highly valued. Corporate coworking spaces, therefore, unfold their potential through activity-based working (ABW) configurations and the various types of spaces associated with it. To the best of the authors' knowledge, this is the first study that applies workplace factors on corporate coworking environments. Corporate coworking spaces offer an important complement to home offices and traditional office workplaces, especially in a post-COVID-19-pandemic era, as they allow for real physical encounters and collaboration.

Keywords: corporate coworking space, workplace, work satisfaction, flexible office space, activity-based working

Corporate Coworking Spaces – Determinanten der Arbeitszufriedenheit in zukünftigen Arbeitsräumen

Zusammenfassung: Flexible Arbeitsumgebungen und die Rolle des physischen Arbeitsplatzes sind derzeit in aller Munde. Eine Form neuer, flexibler Arbeitsorganisation sind Coworking Spaces, die in der jüngsten Debatte an Bedeutung gewonnen haben. Firmeneigene Coworking Spaces, auch als Corporate Coworking Space bezeichnet, entfalten ihr Potenzial durch flexibles, aktivitätsbasiertes Arbeiten (ABW) und einem Layout an unterschiedlichsten Raumtypen. Ziel des Beitrags ist es, ein tieferes Verständnis der Faktoren zu erlangen, die die Arbeitszufriedenheit in einem unternehmensinternen Coworking Space beeinflussen. Die Erhebung (n = 200) zeigt, dass physische Umgebungsfaktoren den wichtigsten Einfluss auf die Arbeitszufriedenheit haben.

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Räumliche Möglichkeiten zur Kommunikation, Kollaboration und Konzentration haben ebenfalls einen signifikanten Effekt, was darauf hindeutet, dass ein Mix aus informellen Begegnungsräumen und Arbeitsflächen für konzentrierte Arbeit hoch eingestuft werden. Faktoren, die Privatsphäre ermöglichen, ruhige Arbeitszonen und wenig visuelle Ablenkungen werden mit einer hohen Arbeitszufriedenheit verbunden. Corporate Coworking Spaces sind besonders in einer Zeit nach der Covid-19 Pandemie eine wichtige Ergänzung zum Homeoffice und traditionellen Büroarbeitsplatz, da sie echte physische Begegnungen und Zusammenarbeit erlauben.

Stichwörter: Unternehmensinterne Coworking Spaces, Arbeitsplatz, Arbeitszufriedenheit, flexible Büroräume, aktivitätsorientiertes Arbeiten

1. Introduction

The workforce is becoming increasingly dynamic and tasks are becoming more complex, more distributed, and more often performed in collaborative teams with a high degree of social interaction (*Paarlberg/Lavigna* 2010; *Mitev et al.* 2019). Furthermore, COVID-19 has forced people to work remotely in an unprecedented, large-scale work-from-home experiment. This has resulted in a more conscious use of the physical workplace and perception how spatial factors influence work success (*Pfnür et al.* 2021). Corporates respond to these social and environmental changes with reconfigured work environments such as corporate coworking spaces.

Coworking spaces have emerged as permanent or temporary spaces for working. Their worldwide diffusion over the last fifteen years, spreading from urban to rural areas has shown that this form of work has been established as a solid working model. Whereas coworking spaces started to focus mostly on independent creative workers, mainly freelancers and self-employed workers, they tend to focus more and more on employees of larger corporates. WeWork, for example, nowadays has a share of roughly one-quarter corporate occupiers (*Nagy/Lindsay* 2018; *Gauger et al.* 2021). The spaces promote flexibility in work and workspaces. Their benefits are manifold, from strengthening communities of practice, meeting people with diverse skills and competencies, building ties, creating knowledge spill overs, to working less hierarchically (*Spinuzzi* 2012; *Bouncken/Reuschl* 2018).

Corporates have started to take advantage of those benefits and create their own internal corporate coworking spaces with these specific characteristics in mind, i.e., high social interaction, creative spaces, and organizational empowerment. They want to benefit from the creative atmosphere, generate social interactions with workers from outside the company, and increase business opportunities. Corporate real estate management (CREM) is thus keen to know, how they can foster collaboration, knowledge-sharing, social interaction, and work satisfaction in these environments. Literature shows that a specific design (*Appel-Meulenbroek et al.* 2020), comfortable spaces (*Mariotti et al.* 2021), and the configuration of these spaces (*Orel/Del Alonso Almeida* 2019) are main factors to optimize knowledge interactions and work satisfaction between users. As *Bouncken et al.* (2020a, 102) state, "the alignment of workspace and social spaces can facilitate organizational empowerment supporting individual work satisfaction".

Meanwhile, another reason has urged corporates to rethink their traditional office space. COVID-19 is forcing people to work from home and changes the way work is

executed beyond the pandemic duration. In this regard, the workplace design perspective is gaining relevance (*Armitage/Amar* 2021) and it is becoming apparent that the office has the role to create real physical or temporary interactions, mutual collaboration, and find new ways to create innovation (*Nathan/Overman* 2020). If work becomes more distributed and flexible, corporates are forced to reorganize their workspaces, to react to a more flexible work model and a higher space efficiency use (*Pfnür et al.* 2021). A recent survey by Microsoft among 31,092 workers states that 67 % of employees want more in-person work or collaboration post-pandemic, and 66 % of managers say their company is considering redesigning office space (*DelBene* 2021). New work environments that support high work satisfaction are even more relevant, as employees are reluctant to return from working at home to unsatisfactory offices. After the pandemic, the office needs to serve as a social place with a community that is not found at home.

A significant body of research on workplace factors for traditional working environments (*Kim/Dear* 2013; *Appel-Meulenbroek et al.* 2018) and on office types with shared workspaces (*Danielsson/Bodin* 2009; *Zamani/Gum* 2019) exists. Various studies prove the relevance of the office environment as an operational resource on work satisfaction, performance, and health (*Moleski/Lang* 1982; *Wells* 2000; *Feige et al.* 2013; *Hoendervanger et al.* 2018). Nevertheless, research on corporate coworking spaces impacting work satisfaction is scarce. *Bouncken et al. (2020b)* analyze the physical layout of coworking spaces under a sociomaterial perspective in two qualitative cases. ABW settings, that are found as the underlying office concept in coworking spaces, have been the subject of research. However, the organizational structure of several corporates making use of this office concept requires new scales of research.

This research gap is addressed by showing the underlying determinants that the physical layout causes and evaluating these findings with a quantitative research design. For this, existing research on ABW settings is used and this view is extended with coworking literature to analyze work satisfaction in these new work environments. The following research question is being addressed: Which factors determine work satisfaction in corporate coworking spaces? The setting of a local corporate coworking space in Frankfurt, Germany, is chosen in an empirical study using factor and regression analyses.

The results add to the literature of workplace design and environmental research psychology by displaying how factors of the physical environment, communication, collaboration and social interaction, concentration, and individual work requirements are related to work satisfaction. Corporates can use the results to gain knowledge about corporate coworking spaces as a substitute and complement for the traditional office or the home office and to better design these work environments.

2. Theoretical Background and Hypotheses Development

2.1 Collaborative Coworking Spaces

Coworking spaces are flexible, shared, physical, and community-oriented workplaces that accommodate a community-based sociocultural ecosystem of exchange, where individuals are "linked together by shared social networks and shared resources" (*Lestari* 2020, 70). If corporates are starting to create coworking spaces for their own employees, this is called "corporate coworking spaces" or "corpoworking" (*Rese et al.* 2021). They can either be

restricted to employees of the corporate and their clients only, or also be used by other individuals who do not work for the same corporate (*Bouncken et al.* 2020b).

From a corporate perspective, coworking is interesting for three reasons. First, coworking offers companies spatial flexibility and greater space efficiency while at the same time representing an investment in the well-being of employees (*Weibel/Sapegina* 2018). Second, coworking can help organizations reflect and transform their current culture of collaboration in a way that is relatively low of friction and resistance, where participants do not see coworking as an imposed measure of change but rather as an invitation to explore (*Back* 2018). *Nagy/Lindsay* (2018) term this purpose as a "Trojan horse, sneaking new ways of working into an otherwise staid organization". Third, coworking can have a positive effect on the ability to innovate by providing a platform for exchange, learning, and collaboration (*Bilandzic/Foth* 2016; *Butcher* 2018; *Nagy/Lindsay* 2018).

In contrast to the use of coworking spaces of external providers, such as WeWork, a stronger corporate identity, better employer branding, and real estate economic advantages can be utilized in the corporate setting (*Wagner et al.* 2021). These corporate coworking spaces represent the next evolutionary step of new working environments and are regarded as a future model for many corporates (*Bauer* 2017). *Gauger/Pfnür* (2019) show different adaptation strategies for corporate coworking and differentiate between two development stages. First, corporates can apply the principles of coworking spaces to their own office environment. This includes, for example, the establishment of a community manager to cater to the community, the establishment of collaboration tools and platforms, and innovative room concepts with ABW configurations for creativity and social interaction. Various departments can use these spaces to create a vibrant and diverse atmosphere.

Second, corporates can open their spaces for other external users to integrate new talents, contacts, business opportunities, and external viewpoints and knowledge into the firm. In contrast to using external coworking spaces, this offers the advantage that corporates can specifically control who works in their work environment.

2.2 Activity-Based Working and Desksharing Configurations as Basis of Collaborative Coworking Spaces

The physical design of the workplace has a specific role in creating interactions and innovation. Companies have evolved their office design from traditional cellular structures to new work environments (*Bouncken et al.* 2020b). In the 1990s, a new office concept arose under the term "activity-based working". This office design has a focus on collaboration and increased creativity, knowledge sharing, engagement, and productivity. Different physical spaces provide different functionalities, e.g., concentration spaces, formal meeting rooms, and activity areas to suit the different activities. In this context, the areas offered do not have to be attributed to a single type of use but can be visited to perform a plurality of tasks (Appendix A). Thus, in optimally implemented ABW concepts, employees look for the appropriate space for each activity according to their work tasks and needs (*Kim et al.* 2016).

Furthermore, a desksharing configuration is typically applied in these new work environments. Desks are not assigned to individuals but can be occupied on an as-needed basis. This desksharing, also called "hot-desking" or "non-territorial working" where employees share a fixed number of workstations, has a high degree of flexibility through

the lack of a fixed allocation of desks, without the possibility to personalize the workplace. This specific design is typical of coworking spaces, as interactions are curated in an ambiance that promotes the possibility of collaboration between two or more users (*Orel/Del Alonso Almeida* 2019). When desksharing is designed accurately, the layout typically provides more room for interaction and collaboration among employees and contributes to interdisciplinary collaboration because employees are no longer tied to a specific location and have ample opportunities to interact with colleagues (*Elsbach* 2003; *Kim et al.* 2016).

2.3 Work Satisfaction in Collaborative Coworking Spaces

The term work satisfaction, in contrast to job satisfaction, refers to a larger context of satisfaction at the workplace (*Locke* 1976). Thus, work satisfaction is a person-environment "fit" because the interaction between the employee's values and various aspects of the workplace becomes the focus of consideration (*Mottaz* 1985; *Armitage/Amar* 2021).

Research notes on the relation between the spatial work environment and work satisfaction (*Kim et al.* 2016). *Jensen/van der Voordt* (2016) analyze the influence of the work facility (e.g., the layout of the building, privacy, concentration, communication, indoor climate) on employee satisfaction and refer to higher-rated satisfaction of climate, equipment, and rooms for individual work and meetings in ABW settings compared to work facilities with dedicated desks. The possibility to choose a workplace that fits best with work processes is commonly considered an important element for work satisfaction (*Brunia/Hartjes-Gosselink* 2009; *Danielsson/Bodin* 2009). Some research addresses employee satisfaction in ABW settings compared to fixed workstations (*Appel-Meulenbroek et al.* 2015). In shared activity-based workplaces *Brunia et al.* (2016) show that employee satisfaction is influenced by many physical characteristics of the work environment. A successful workplace layout can thus have a positive influence on employee productivity and on the added value of the company (*Zelenski et al.* 2008; *Brunia et al.* 2016).

Recently, coworking spaces have been the subject of research and, in particular, the benefits originating from the community, the social aspects, the networks, and the collaboration that form these communities of practice (*Waters-Lynch/Potts* 2017; *Bouncken et al.* 2020a). *Nagy/Lindsay* (2018) study the social capital in corporate coworking spaces and point out the innovation potential and the importance of the physical design stimulating the former. Serendipity is engineered through flexible furniture, movable walls, and whiteboards that are commonly used.

3. Hypotheses Development

Bouncken/Reuschl (2018) suggest future research regarding communication and collaboration in coworking spaces, to which this study adds by analyzing whether the spatial possibilities for communication are related to work satisfaction. Spatial possibilities for communication are operationalized on the one hand for face-to-face communication by the existence of meeting rooms, their accessibility, and availability, and on the other hand for telecommunications by the possibility of making undisturbed telephone calls. In coworking spaces, the social aspects of work such as "time for interaction, being creative, and having private thinking time if the completion of a given task requires it" (*Fuzi et al.* 2018) are key features. *Croon et al.* (2005) state that employees must be offered space

to exchange thoughts and ideas. Whereas *Krupper* (2015) and *O'Neill* (1994) identify a medium positive influence of communication on work satisfaction in traditional work environments, a focus on communication is regarded as essential in coworking spaces. According to *Appel-Meulenbroek et al.* (2013), communication is directly supported by parameters such as visibility, accessibility, responsiveness, and visual contact. *Kim et al.* (2016) state in their research that interaction between colleagues is better facilitated in non-territorial work. *Yang et al.* (2019) add that possibilities for communication in coworking spaces include zoned areas for different types of work, conference rooms, small individual rooms, and open spaces with physical proximity. Thus, the following hypothesis is formulated:

H1: *The more spatial possibilities for communication are created, the higher the work satisfaction in corporate coworking spaces.*

The concept of open innovation calls for knowledge sharing and social interaction between the company and the external world and refers to the idea that companies do not have all the skills needed for internal innovation. Possible factors for collaboration and social interactions are supportive environments for collaboration, an environment that enables team performance, and spaces for informal interactions. These can be provided, for example, in the form of spaces for social interaction, movement spaces, or kitchenettes. As employees spend more time with informal communication than in formal meetings nowadays, it becomes essential to provide various types of workspaces where serendipitous interactions take place (*Davis et al. 2012; Cai/Khan* 2010; *Dittes et al.* 2019; *Zamani/Gum* 2019). Typically, coworking spaces have open social spaces that facilitate social interaction and collaboration through group dynamics and teamwork (*Bouncken et al.* 2020a). According to the concept of open innovation, the opportunity to rely on external knowledge is one of the main advantages of coworking spaces for firms and their employees. *Fuzi* (2015) and *Gauger/Pfnür* (2019) add that the main value of coworking is the possibility of collaboration among each other. Research has analyzed the collaboration that emerges through social- (*Merkel* 2015) and work-related (*Fuzi* 2015) interactions. Impromptu interactions among workers, social networks, and knowledge-sharing opportunities are important factors in developing creative solutions and a sense of belonging (*Kojo/Nenonen* 2015). These interactions can be actively enforced by providing shared amenities for chats, such as café-like open spaces, display areas, and serendipitous encounters through proximity. Thus, opportunities for collaboration and social interaction should be promoted by the work environment and contribute to work satisfaction (*Hoendervanger et al.* 2018). The combination of workspace and social space in coworking spaces enables, for instance, joint work, knowledge exchanges, and individual work satisfaction (*Spinuzzi* 2012; *Reuschl/Bouncken* 2017). Thus, it is hypothesized that:

H2: *The more possibilities for collaboration and social interaction exist, the higher the work satisfaction in corporate coworking spaces.*

Physical environmental factors, also defined as indoor environmental quality (IEQ) factors, typically comprising temperature/thermal comfort (*Danielsson/Bodin* 2009), air quality, and light quality (*Frontczak/Wargocki* 2011) are affecting human life inside a building. Early coworking spaces generally had open layouts (*Gertner/Mack* 2017) that are likely

to stimulate interaction between workers, but considerably underperform in terms of IEQ comfort, as employees have less possibility to adapt these factors according to their needs. *Appel-Meulenbroek et al.* (2020) have recently analyzed that coworker prefer half-open layouts in favor of open layouts. This is related to the fact that employees rate IEQ factors higher in half-open layouts where they are more able to adjust those to their needs. IEQ factors are commonly measured. Temperature and the supply of fresh air influence work satisfaction, but they also influence the mental perception of workload and exhaustion (*Varjo et al.* 2015). *Park et al.* (2019) conducted post-occupancy evaluation on 64 buildings and linked indoor air quality with occupants' health, comfort, and satisfaction. Thus, the following hypothesis is formulated:

H3: *The higher physical environmental factors are rated, the higher the work satisfaction in corporate coworking spaces.*

Coworking spaces serve different work styles. Although high expectations are put on collaboration and social interaction, corporate coworking spaces should support privacy and the spatial possibility to withdraw for concentrated work absent from distractions in quiet work zones. For open-plan offices, research has identified a high need for concentration (*Seddigh et al.* 2014). It was found that noise and lack of privacy are two main reasons for concentration difficulties (*Kaarlela-Tuomaala et al.* 2009). Increasing privacy improves the ability of employees to concentrate on tasks and allows tasks to be performed with care (*Kaarlela-Tuomaala et al.* 2009). Pods and booths in coworking spaces allow for partial acoustic separation and fewer interruptions. Focused work suffers if it is interrupted by unexpected sounds (*Yang et al.* 2019). *Hoendervanger et al.* (2018, 11) state that "activity settings that are intended to be used for concentration work deserve special attention". Thus, the following hypothesis is formulated:

H4: *The more spatial possibilities for concentration exist, the higher the work satisfaction in corporate coworking spaces.*

Individual work requirements and equipment need to fit to ensure work satisfaction *(Appel-Meulenbroek/Danivska* 2021). The work equipment here includes not only the available premises, but also their equipment and furniture. In shared workspaces employees might struggle with equipment fit, as resources such as printers and work materials are used jointly. If efficiency cannot be maintained through searching for equipment, materials, and resources, work satisfaction might be lowered. Therefore, all necessary work equipment should always be available to employees. In a post-occupancy study, *Gerdenitsch et al.* (2016) show that the perceived fit between work requirements and office facilities is increased and distractions decreased. *Dittes et al.* (2019) note that workers seem to be on a continuum in regard to comfort levels with technology, IT, and infrastructure. Therefore, the personal fit of the work requirements with the equipment seems to be of particular importance in corporate coworking spaces. Thus, it is hypothesized that:

H5: *The better individual work requirements and equipment fit are, the higher the work satisfaction in corporate coworking spaces.*

Literature shows that older employees report lower satisfaction in new working environments as they might be more sensitive to auditory and visual distractions (*Pullen* 2014). It is thus controlled for, whether younger employees show higher work satisfaction in corporate coworking spaces. *Haapakangas et al.* (2018) find that managers have higher

work satisfaction in activity-based offices, thus we control if work satisfaction is related to managerial position. ABW configuration and desksharing are typical office configurations for coworking spaces (*Orel/Del Alonso Almeida* 2019). For frequent changes of the workplace higher well-being is reported *Haapakangas et al.* (2018). Therefore, the preference to frequently use the same desk (as a measure for desksharing) and the frequency of changing work locations (as a measure for ABW use) are also included as additional control variables in the model. *Figure 1* summarizes the hypotheses and presents the research model.

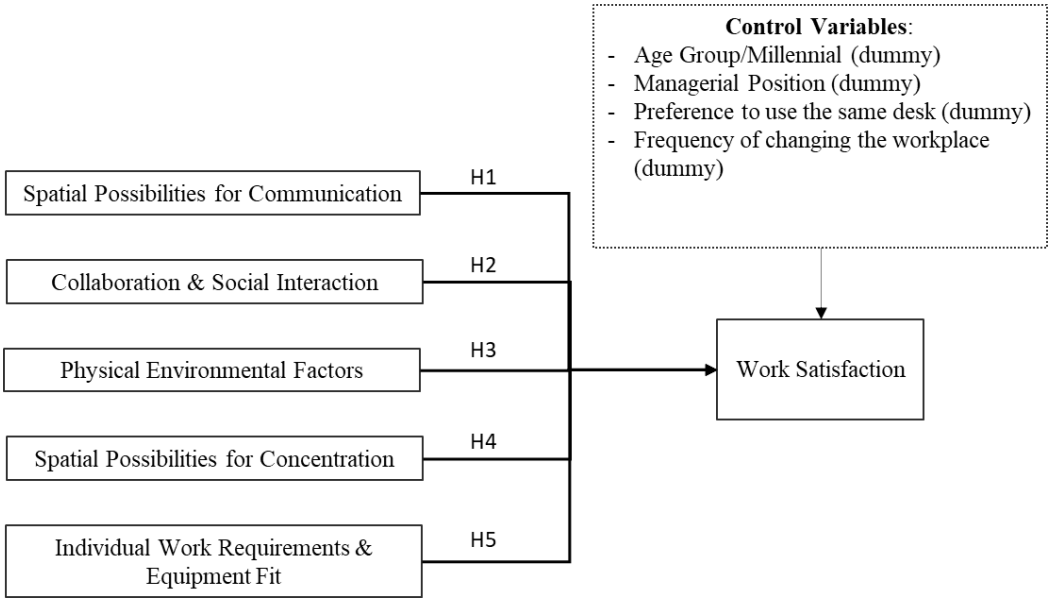

Figure 1: Research Model

4. Methodology

4.1 Data Collection

The empirical base is a case study of a corporate coworking space in Frankfurt, Germany, where five corporates of an international consulting holding work collaboratively on four floors. They share 4,240 sqm workspace. Users work in the construction industry, consultancy, construction management, environmental research, and engineering. The office contains 27 shared meeting rooms and around 220 individual workstations. The coworking spaces comprise rooms for groups of two to three people as well as rooms suitable for more than ten people.

The work environment is an open design with various workstations and transparent materials (e.g., glass doors) are used. At the same time, privacy is ensured by enclosed spaces. Individual workstations are provided as single offices, shared offices, open benches with up to six workstations, and workstations without directly surrounding walls. An exemplary overview of the floor plans is shown in Appendix A. In addition, employees can work in the common break area, or one of the multitudes of meeting and relaxation

zones. Apart from the assistance workstations, all employees share the workstations according to desk sharing principles. Employees have lockers and portable storage systems to carry their personal items during the day and lock them after work. At the time of this study, only the employees of the five corporates worked in the coworking space (this is regarded as the first implementation stage of a corporate coworking space, see also Section 2.1). In the future, collaboration with start-ups and other corporates in the workplace is being considered.

To evaluate work satisfaction with the new corporate coworking concept, a survey was launched in April 2019 for 14 days and aimed at 459 employees. The survey was designed to be completed in less than 15 minutes. 237 completed questionnaires were received, corresponding to a response rate of 51.63 %. Questionnaires with too short a response time were excluded, resulting in 200 usable responses. Work satisfaction was answered by 172 people, resulting in a net response rate of 37.47 %. Harman's single-factor test for common method bias was checked and no indication for such a problem was found. All analyses were performed with IBM SPSS Statistics.

4.2 Measures and Data Analysis

The respondents answered predominantly closed questions, using a five-point Likert scale with 1 = strongly disagree and 5 = strongly agree. Items were derived from existing survey instruments as they are pretested and reach a high explanatory value. They were combined from Work Environment Diagnosis Instrument (WODI) and Office 21 questionnaire. WODI is a Dutch questionnaire with the main purpose "to measure employee satisfaction about their work environment" (Maarelveld et al. 2009, p.184). It was established with the rise of new flexible office concepts and the concerns whether these open space offices lead to increased labor productivity. The questionnaire was used to explore and test hypotheses about the best possible fit between people, processes, and place in post-occupancy studies. The Office 21 survey by the Fraunhofer Institute, IAO (*Bauer et al.* 2018) was designed to specifically investigate communication, concentration, well-being, and creativity at work to promote corporate success factors. The tool was used with 13,000 participants consisting of 45 items on a five-point Likert scale. Relevant items for this research were extracted and extended from these two questionnaires and can be found in Appendix B.

4.3 Variable Construction and Sample Description

Dependent Variable. The dependent variable is work satisfaction. It refers to the perception of the office environment, but also to the perception of work and sense of unity (see Appendix B for items). Cronbach's Alpha reaches a value of 0.872 (≥ 0.8) (*Cortina* 1993).

Independent Variables. The five factors of the work environment physical environmental factors, communication, concentration, collaboration & social interaction, and work requirements & equipment are identified from the literature and validated with a principal component analysis.

Control Variable. Dummy variables are used as control variables for the managerial position and age groups[1]. Age groups are divided by year of birth with non-millennials

1 For reasons of anonymity, it was not possible to obtain the age more precisely. It was also not possible to collect a gender variable.

born between 1945–1980 and millennials between 1981–1999. Further on, it is controlled whether employees prefer to use the same desk or have no preference for desk-ownership. The frequency of changing the workplace controls if employees have internalized the activity-based working environment and use the various spatial possibilities to best support their work tasks. *Table 1* reports employees' characteristics for the sample. The characteristics of the sample are representative for the five companies' structures.

	N	Percentage
Occupational Position		
1= Management	28	14.00 %
1= Project Manager	115	57.50 %
0= Assistance	57	28.50 %
Generation		
1= Millennials	112	56.00 %
0= Non-Millennials	88	44.00 %
Work Concept (Desk Sharing)		
1= Prefer to use the same desk	123	64.50 %
0= No preference to use the same desk	71	35.50 %
Change of Workplace (ABW)		
0= Once a day	162	81.00 %
1= More than once a day	38	19.00 %

Table 1: Sample Descriptive Statistics

4.4 Construct Validation

Principal component analysis (PCA) was performed for data reduction and construct validation by transforming several possibly correlated variables into a smaller number of uncorrelated variables (called "principal components"). *Table 2* presents the results of the PCA and shows the items that are included in the analysis. The Kaiser–Meyer–Olkin measure is 0.846 (> 0.6),[2] the Bartlett's test of sphericity (χ^2 (351) = 200.460, $p \leq 0.001$), which indicates that the factor analysis should yield reliable factors. The five components explain 74.25 % of the variance. Furthermore, Cronbachs Alpha (CRA), Composite Reliability (CR), and Average Variance Extracted (AVE) are denoted. According to *Fornell/Larcker* (1981), the AVE should be higher than 0.5 to ensure a high convergence validity, which is not fully met in every component. Indications for discriminant validity are provided by the results of the factor analysis. The items load on the factor for which they are theoretically intended with only very low cross-loadings. Also, the factor loadings are sufficiently high. Since the square root of the AVE is always greater than the correlation factors between the constructs (see Table 3) discriminant validity is ensured. Thus, it can

2 Some authors recommend a minimum of 0.5 (*Field* 2020; *Hartas* 2015), while some recommend a value of at least 0.6 (*Tabachnick/Fidell* 2014).

be guaranteed that the individual constructs do not only differ in content, but also differ statistically clearly from each other (*Fornell/Larcker* 1981).

Items	Components				
	1	2	3	4	5
Physical Environmental Factors (Cronbachs Alpha=0.823, CR=0.823, AVE=0.494)					
Indoor climate	**0.7493**	0.1212	0.1478	0.1491	-0.0211
Lighting	**0.7318**	0.0372	0.2956	0.1407	-0.0227
Brightness	**0.6892**	0.0578	0.1982	0.1021	-0.1267
Feel-good atmosphere	**0.6741**	0.3284	-0.0992	0.1638	0.2521
Appealing space design	**0.6656**	0.3859	0.1135	0.0913	0.1815
Communication (Cronbachs Alpha=0.852, CR=0.850, AVE=0.496)					
Rooms for ad-hoc meetings	0.0618	**0.8530**	0.1451	0.0538	0.2249
Ad-hoc meeting room availability	0.2531	**0.8208**	0.1255	0.0544	-0.0248
Access to ad-hoc meeting rooms	0.1320	**0.7900**	0.1862	-0.0122	0.1822
Meeting room availability (for scheduled meetings)	0.1711	**0.5933**	0.1912	0.2686	-0.1477
Possibility for withdrawal for phone calls	0.1576	**0.5505**	0.2799	0.2309	-0.3323
Overall communication	0.0655	**0.5419**	0.2574	0.2898	0.1458
Concentration (Cronbachs Alpha=0.795, CR=0.811, AVE=0.390)					
Possibility for concentrated work	0.1113	0.2030	**0.7697**	0.0967	0.1840
Background noises	-0.0131	0.0517	**0.7349**	0.1020	0.1458
Quiet workzones	0.1306	0.2130	**0.7070**	0.1081	0.0813
Distraction of phoning colleagues	0.2858	0.2799	**0.6048**	0.1345	-0.2614
Visual distraction	0.2668	0.1560	**0.5455**	0.1290	0.0085
Privacy	0.4052	0.1752	**0.4950**	-0.0221	0.1906
Spatial conditions for phone calls	0.2644	0.3691	**0.4287**	0.1929	-0.1897
Collaboration & Social Interaction (Cronbachs Alpha=0.751, CR=0.810, AVE=0.589)					
Team performance	0.1035	0.1410	0.0895	**0.8132**	0.1798
Collaboration desksharing	0.1316	0.0984	0.1316	**0.7850**	0.0251
Fast, informal meetings/chats with colleagues	0.1888	0.1289	0.1317	**0.6993**	0.0278
Work Requirements & Equipment (Spearman-Brown-Coefficient = 0.817, CR=0.460, AVE=0.301)					
Work equipment	-0.0154	0.1342	0.1679	0.2837	**0.6359**
Room equipment with furniture	0.3645	0.0557	0.2710	0.0178	**0.4529**

Items	Components				
	1	2	3	4	5

Notes: Extraction method: Principal Component Analysis (PCA). Rotation with a Varimax rotation with Kaiser normalization. CR= Composite Reliability, AVE= Average Variance Extracted

Table 2: Principal Component Analysis

Five factors of the work environment are identified from the PCA. The item appealing space design loads on physical factors and noise loads on concentration, as it is closely related to privacy issues. This is in accordance with several studies (*Hedge* 1982; *Danielsson/Bodin* 2009; *Kim/Dear* 2013).

5. Results

Regarding the descriptives, nearly 65 % of the respondents claim that they prefer to use the same desk every day (see Table 1), which reveals that they have not implemented the hot-desking attitudes into their working behavior and that desk ownership is favored. This can be due to territory and privacy needs, which have been frequently noted in studies (*Oldham et al.* 1995; *Hoendervanger et al.* 2018). Furthermore, efficiency and utilization do not seem yet to be of high relevance as there is no need to search for a free desk every day. Nevertheless, 81 % of the employees change their workspace at least once a day and 19 % at least twice a day, which means that they make use of the activity-based working concept and change their workspace according to their needs and tasks, but prefer to return to the same desk when performing their ordinary tasks. This is in line with other studies (*Wohlers/Hertel* 2017; *Zamani/Gum* 2019).

Means (M), standard deviation (SD), Pearson correlations (off-diagonal), and square roots of average variance extracted (AVE) (diagonals) are shown in *Table 3*. All variables are significantly correlated on a 1 % level.

	M	SD	(1)	(2)	(3)	(4)	(5)	(6)
(1) Work Satisfaction	3.933	0.77	**0.869**					
(2) Physical Environmental Factors	4.098	0.623	0.573*	**0.720**				
(3) Communication	4.137	0.587	0.571*	0.419*	**0.704**			
(4) Collaboration & Social Interaction	4.286	0.655	0.358*	0.309*	0.359*	**0.767**		
(5) Concentration	4.200	0.527	0.532*	0.516*	0.540*	0.350*	**0.624**	
(6) Individual Work Requirements & Equipment Fit	4.067	0.706	0.363*	0.419*	0.292*	0.359*	0.532*	**0.552**

Notes: Likert scale of 1–5 with mean value, standard deviation, and correlation matrix. Variables are calculated from average values of items derived by performing a PCA. Square roots of AVE on the diagonal (highlighted in bold). * denotes significance at the 1 % level, n=166

Table 3: Descriptives and Correlation Matrix

Regarding work satisfaction, descriptive results indicate a high satisfaction score (M = 3.93; *n* = 172; SD = 0.77). Most users are satisfied or highly satisfied with their work and workplace (58.6 %; *n* = 172) while 2.3 % are unsatisfied or highly unsatisfied.

Table 4 presents the ordinary least squares regression analysis to test the relation between the derived factors with work satisfaction, starting with the control variables in model 1 and integrating all five factors in the full model, which explains 47.8 % (adjusted r^2=0.478) of variance in work satisfaction.

	Controls	Full Model
Independent Variables		
Physical Environmental Factors		0.410*** (0.100)
Communication		0.288*** (0.087)
Concentration		0.229** (0.113)
Collaboration & Social Interaction		0.148* (0.077)
Individual Work Requirements & Equipment Fit		0.070 (0.101)
Control Variables		
Management Position (dummy)	0.155 (0.130)	0.220** (0.099)
Age Group Millennial (dummy)	0.117 (0.130)	0.097 (0.098)
Prefer to use the same desk (dummy)	-0.116 (0.128)	0.009 (0.097)
Change desk once a day (dummy)	-0.161 (0.154)	-0.052 (0.114)
Constant	10.004*** (0.175)	10.072*** (0.499)
Adjusted R^2	0.012	0.478
N	166	156
F-value	1.518	16.763***

Table 4: Regression Models with Work Satisfaction as Dependent Variable

The control variables managerial position, generation group, preference to use the same desk, and frequency of changing the workplace, are not significant predictors of work satisfaction. It is argued that the ability to freely choose one's desk is associated with a sense of autonomy and control over the workplace (*Kim et al. 2016*), though it cannot be found to determine work satisfaction in the results. The managerial position becomes

statistically significant in the full model, which reveals that a management position is related to higher work satisfaction. The workplace factors, i.e., spatial possibilities for communication *(H1)*, collaboration and social interaction *(H2)*, physical environmental factors *(H3)*, and spatial possibilities for concentration *(H4)* are all significant predictors of work satisfaction. The strongest influence comes from the physical environmental factors. Another important factor is the spatial possibilities for communication, with a significant estimate at the 1 % level. This is in line with *Yang et al.* (2019) who also attribute possibilities for communication to zoned areas for communication, conference rooms, small individual rooms, and open spaces with physical proximity.

Collaboration and social interaction that determines work satisfaction can be achieved through team performance, informal chats, and a collaborative work environment. Spatial possibilities for concentration, measured by background noise, possibilities to concentrate and withdraw, and privacy is related to work satisfaction. In particular, quiet zones and low background noises have to be met, to show high satisfactory values. Individual work requirements and equipment fit do not seem to affect work satisfaction in a coworking environment, since there is no support for H5.

6. Discussion

The results reveal that physical environmental factors are most important for work satisfaction.[3] This is in line with previous literature dealing with IEQ and shows that irrespective of whether a traditional workplace, new working environments, or a corporate coworking space is regarded, physical environmental factors explain a large variance in satisfaction (*Haapakangas et al.* 2018). *Kim et al.* (2016) compare hot-desking with fixed-desk users and revealed that the use of hot-desking rated higher scores for physical environmental factors. The authors demonstrated that occupants used their choice of seat location as a means of adjusting these environmental factors which give them personal control over their IEQ. Hence, these factors can also be used to predict satisfaction in coworking spaces. However, it is precisely these factors that are most difficult to configure for the individual, though with a high effect of control over the workspace (*Lee/Brand 2005*).

The factor spatial possibilities for communication emphasizes the presence of a variety of rooms for ad-hoc meetings, telecommunication, and face-to-face communication. Corporate coworking spaces thus unfold their potential through ABW and the various types of spaces associated with it. Literature shows that communication is attributed to social and support rooms in coworking spaces, where spontaneous and face-to-face communication happens (e.g., shared facilities such as coffee machines, printers, etc.) (*Bouncken et al.* 2020b).

The factor concentration also has a significant effect, which indicates that not only informal meeting spaces but also concentration spaces are highly valued. Open spaces alternated with enclosed rooms dedicated to concentration work provide an appropriate mix for privacy and social interaction in corporate coworking spaces. This is in accordance with extant research (*Oseland* 2009; *Brunia et al.* 2016).

3 To compare the height of influence, standardized regression coefficients are regarded: Physical factors β=0.315; communication β=0.255; concentration β=0.162 and collaboration β=0.125.

The coefficient of collaboration has the lowest impact on work satisfaction (around one-third of physical environmental factors), although it was thought to be high in a coworking setting. On the one hand, this could be due to the influence of team performance in coworking spaces being overestimated by research. On the other hand, however, this influence could be rated low, as the typical collaboration characteristics, like after-work events, collaboration apps, and a community manager in this corporate coworking space are not present (yet). Another argument is that communication was mainly measured with the spatial possibilities for communication and collaboration measured a more social, interactive perspective. Hence, the spatial architecture, the multifold rooms, and workstations to choose from, have a leading role in work satisfaction. It is also possible that the spatial components are good enough to support communication but may not be sufficient to support collaboration and might have to be accompanied by further activities, such as a community manager, more team events, and more active resources to build a community, where also business opportunities for collaboration emerge.

The exemplary floor plan in Appendix A shows the variety of spaces that are provided within the work environment. Especially in a post-COVID-19 pandemic era, demand for communication- and collaboration-enhancing spaces in corporate buildings will increase (*Pataki-Bittó* 2021). As soon as corporates realize the importance of the design perspective in working environments a more conscious and effective use of shared office time is feasible. By implementing corporate coworking spaces, employees could compensate for the lack of physical interaction with colleagues that they experience in the home office if they are designed to promote the factors identified as important, such as communication, collaboration, and concentration.

Individual requirements and equipment fit does not show a significant influence on work satisfaction, which might be due to the changing nature of work habits. Employees are used to working mobile and flexibly with a notebook and need less equipment, such as monitors, telephones, or other supporting infrastructure. This is in accordance with *Appel-Meulenbroek et al.* (2015) who find that workers of traditional work settings find higher satisfactory value in storage, desk/chairs, and general facilities, whereas workers of new working environments are more satisfied with rooms, climate, and leisure possibilities. They also find no significance for information and communications technology, and equipment.

Although there are many different space configurations according to the ABW concept, it can be noticed that employees rather rarely change their workplace during the day. As *Haapakangas et al.* (2018) showed that a frequent change of workplace per day increases productivity and well-being and *Lee/Brand* (2005) note that hot-desking gives personal control to suit one's own preferences, employees should be encouraged to switch more often their workplace. This also implies that large open spaces should be avoided or subdivided into smaller areas, for a low level of acoustics and higher privacy requirements. Building on *Haapakangas et al.* (2018) it is found that employees with a managerial position are more satisfied in coworking environments. This could be due to their high needs with the availability and access of (ad-hoc) meeting rooms, and their high need for privacy, but also spontaneous interactions with colleagues, which they both find in these work environments. The results derive no differences between the age groups. This is in line with *Costanza et al.* (2012) who show in their studies about generational differences in work settings that organizational commitment and job satisfaction are only weakly

related to the employees' age. However, some authors (*Young et al. 2013; Stewart et al. 2017*) find age group differences in the relationship between organizational commitment, workplace culture, and satisfaction.

7. Practical Contribution

In general, work satisfaction is found to be high in the corporate coworking space. The high mean results are most likely because of the flexibility, control, and high fit these configuration offers users. When establishing these work environments, the right share of layout for individual work, collaboration, and various amenities has to be met. As *Yang et al.* (2019) note that spatial analysis of zoning and floorplan in coworking spaces is missing, an exemplary floorplan is attached (see Appendix A). These configurations meet the needs for different types of work, such as concentration tasks, but also stimulate communication. This is in line with the literature, e.g., *Danielsson/Bodin* (2008) who point out that the more control a person has over the physical workspace (i.e., variety of work environments available, access to meeting rooms, etc.) the higher the job satisfaction is. Through architectural and functional features practitioners should ensure that users can exercise personal control over their workspace. Having personal control and workspaces to choose from might also give control over physical environmental factors, which enhances work satisfaction. As it is not possible to close the door if privacy or concentration is required, as is the case for cell offices, users must be able to change workplaces and move to a booth or small meeting room according to one's personal needs or work tasks. To satisfy these needs, the availability and access of these spaces have to be ensured. Furniture manufacturers have reacted by offering acoustic office furniture like booths and pods to buffer noise and signal the desire for uninterrupted time. If availability and easy access to these spaces for communication and concentration are high, coworking spaces can unfold their potential.

In the post-pandemic workplace, employees are embracing the flexibility to allocate their time between the corporate office and working from home. Organizations succeed in creating a satisfying complement by enabling collaboration and exchange within their work environment. This advantage of the corporate workplace will influence the overall performance of the organization and retain talent. As collaboration is an important factor for work satisfaction in corporate coworking spaces, possibilities to connect with other users have to be established to face serendipitous encounters. In this case, a schoolyard with profiles of the users was built as a social space to connect and network. Amenities have to be positioned to engineer serendipity and conversations across organizations. To further enhance collaboration, *Bouncken et al.* (2020b) propose to spatially collocate individuals with complementary skills. To make sure of the right use of ABW settings in coworking spaces and increase work satisfaction, managers should enforce strategies for motivating employees to find exactly the workplace that supports their work tasks efficiently. *Danielsson/Bodin* (2008) note that flexible offices offer many possibilities to raise workplace satisfaction, as the organization itself suits this office type. As such, not only the work environment has to support collaborative working, the corporate itself needs to support collaborative behavior through change management, human resource management, and a strong sense of unity and team spirit.

8. Theoretical Contribution

To the best of the authors' knowledge, there is no study that shows the impact of the physical workspace of corporate coworking spaces on work satisfaction. The elaboration on workplace literature shows that in corporate coworking spaces the right combination of working, social, and support spaces enhances communication and collaboration while allowing at the same time space for concentration and privacy determines high work satisfaction. These findings are relevant to the Person-Environment fit (PE fit) theory (*Hoendervanger et al.* 2018; *Armitage/Amar 2021*). The relevance of environmental psychology in workplace research is demonstrated, as having control over physical environmental factors significantly determines work satisfaction. *Bouncken et al.* (2020b) explain this relation of physical and social value of coworking spaces from a sociomateriality perspective. The high need for social aspects like communication, collaboration and social interaction extends to traditional workplace literature that is limited to environmental factors such as light and noise. Thus, coworking literature has to integrate workplace factors, but also social factors which are more common in the field of innovation theory and entrepreneurship research.

9. Limitations and Further Research

The study has certain limitations which call for further research. Methodologically, more control variables could reveal confounding influences. Also, this research was conducted as a cross-sectional study and no data is available over time, making it more difficult to differentiate between cause and outcome. While focusing on work satisfaction, this can negatively affect cognitive processes, productivity, or task performance. These outcome variables can have mutual interactions and organizations are in the need of balancing all outcomes related to a company's success. Further research could capture the impact of innovation, productivity, social interaction, and knowledge transfer in more detail. Differences in a before-and-after comparison over time can be assessed when corporate coworking spaces are established. For practitioners, it is also of interest which activities will be supported better in the traditional corporate office, coworking space, or the home office leading to a hybrid workplace with a mixture of flexible and dispersed work.

10. Conclusion

The high share of working from home during COVID-19 has made the role of the physical workplace and the spatial work environment even more conscious. Individuals value communication, creativity, and teamwork through collaboration and the satisfaction that comes with it in interaction with space, time, and other individuals. If in the future, there is a combination of working from home and working in the office (so-called hybrid working), it will be increasingly important for corporates to offer contemporary office environments that provide precisely what the home office cannot replace, work satisfaction through communication possibilities, social interaction, collaboration, and real physical encounters. Corporate coworking spaces represent an evolution of the workspaces, supporting the new collaborative way of work and fulfilling important determinants of work satisfaction.

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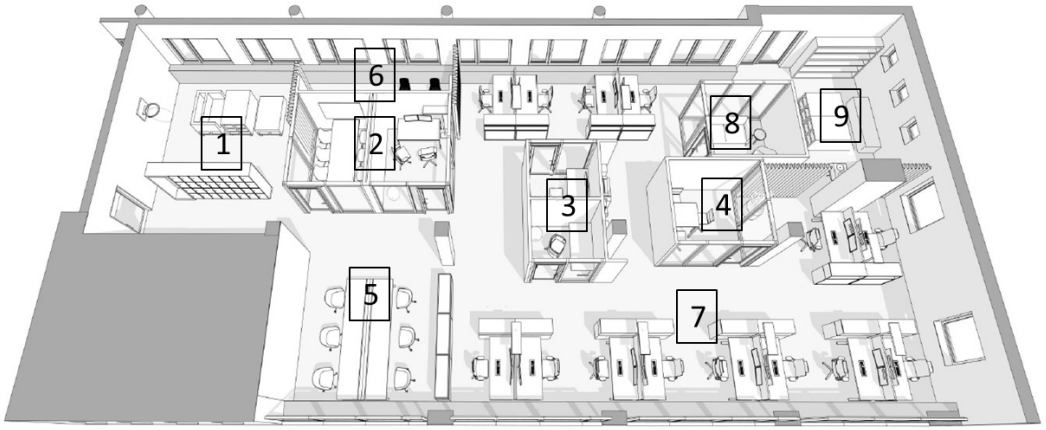
Appendix A: Exemplary Floor Plan



No.	Space Configuration Type
1	"Schoolyard"/Social interaction space
2, 3	Meeting rooms/Think tanks
4	Concentration room/Phone booths
5	Workbench
6	Bench/Short-term desks
7	Open space flex desks
8	Lounge room
9	Creative corner and material storage

Appendix B: Items of the Questionnaire

Please rate on a scale of 1 to 5 the extent to which you agree with the following statements:

Original Item (German)	Item (English)	Variable	Source
Das Raumklima ist angenehm (z.B. Temperatur, Feuchtigkeit)	The indoor climate is pleasant (e.g., temperature, air humidity)	Satisfaction with indoor climate	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Die Beleuchtung am Arbeitsplatz ist angenehm	The lighting in the workplace is pleasant	Satisfaction with lighting	(*Bauer et al.* 2018)
Die Arbeitsräume sind hell	The working spaces are bright	Satisfaction with brightness	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Die Arbeitsumgebung ist ansprechend gestaltet	The work environment is well designed	Function as a feel-good atmosphere	(*Maarleveld et al.* 2009)
Die Räumlichkeiten strahlen eine Wohlfühlatmosphäre aus	The rooms radiate a feel-good atmosphere	Appealing space design	(*Maarleveld et al.* 2009)
Es gibt ausreichend Möglichkeiten für spontane Besprechungen (z.B. Räume, Stehmöbel, Rückzugsecken)	There are plenty of opportunities for spontaneous meetings (e.g. rooms, standing furniture, retreat corners)	Rooms for ad hoc meetings	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Räume für spontane Besprechungen sind ausreichend verfügbar	Sufficient rooms are available for spontaneous meetings	Ad hoc meeting room availability	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Räume für spontane Besprechungen sind schnell erreichbar	Rooms for spontaneous meetings are quickly accessible	Access to ad hoc meeting rooms	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Es gibt ausreichend Räume für geplante Besprechungen	There are enough rooms for scheduled meetings	Meeting room availability (for scheduled meetings)	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Es gibt ausreichend Rückzugsorte für spontane Telefonate	There are enough privacy options for spontaneous telephone calls	Privacy options for phone calls	(*Maarleveld et al.* 2009)
Die Arbeitsumgebung fördert die interne Kommunikation	The working environment promotes internal communication	Satisfaction with overall communication	(*Maarleveld et al.* 2009)
Konzentriertes Arbeiten wird häufig unterbrochen	Concentrated work is often interrupted	Possibility for concentrated work	(*Bauer et al.* 2018)
Die Geräuschkulisse in der unmittelbaren Arbeitsumgebung ermöglicht ein fokussiertes Arbeiten	The background noise in the immediate working environment enables focused work	Background noises	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Es gibt ruhige Arbeitszonen für konzentriertes Arbeiten	There is a quiet work zone for concentrated work	Quiet work zones	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Konzentriertes Arbeiten wird vor allem durch telefonierende Kollegen unterbrochen	Concentrated work is mainly interrupted by coworkers talking on the phone	Distraction by coworkers talking on the phone	(*Maarleveld et al.* 2009)
Es gibt viele visuelle Ablenkungen in der unmittelbaren Arbeitsumgebung (z.B. Durchgangsverkehr)	There are many visual distractions in the immediate working environment (e.g., through traffic)	Visual distraction	(*Bauer et al.* 2018)
Das flexible Bürokonzept gewährleistet ausreichend Privatsphäre	The flexible work environment ensures enough privacy	Privacy	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)

Original Item (German)	Item (English)	Variable	Source
Die räumlichen Bedingungen für Telefonate sind optimal	The spatial conditions for phone calls are optimal	Spatial conditions for phone calls	(*Maarleveld et al.* 2009)
Die Arbeitsumgebung unterstützt die Leistungsfähigkeit unseres Teams	The working environment supports the performance of the team	Team performance	
Die Arbeitsumgebung unterstützt einen schnellen, fachlichen Austausch unter Kollegen	The working environment supports a fast, professional exchange between colleagues	Supportive environment for collaboration	(*Maarleveld et al.* 2009)
Die Arbeitsumgebung unterstützt die Zusammenarbeit auch bei wechselnden Tätigkeiten	The working environment supports cooperation also in case of changing tasks	Fast, informal meetings/chats with colleagues	(*Maarleveld et al.* 2009)
Die erforderlichen Arbeitsmittel stehen zur Verfügung (z.B. Telefon, Laptop, Tablet, Bildschirm, Drucker, Anschlüsse, Beamer)	All necessary equipment is available (e.g., telephone, laptop, tablet, screen, printer, connections, beamer)	Work equipment	(*Maarleveld et al.* 2009; *Bauer et al.* 2018)
Die zur Verfügung stehenden Räume (inkl. Ausstattung wie z.B. Mobiliar) unterstützen die Arbeit optimal	The available rooms including equipment and furniture support work optimally	Room equipment including furniture	(*Bauer et al.* 2018)
Das flexible Bürokonzept stärkt den Teamspirit	The flexible work environment supports the team spirit	Work satisfaction	(*Bauer et al.* 2018)
Das flexible Bürokonzept stärkt das Wir-Gefühl im Sinne des One-Company-Gedankens	Satisfaction with the sense of unity/belonging		(*Bauer et al.* 2018)
Wie zufrieden sind sie mit Ihrem derzeitigen Arbeitsumfeld?	Satisfaction with your present work environment		(*Bauer et al.* 2018)

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