Transforming workplaces into performing workspaces—Holistic evaluation concept for managing workspace change projects

Annette Kämpf-Dern · Mascha Will-Zocholl

Received: 7 December 2021 / Revised: 17 April 2022 / Accepted: 28 April 2022 / Published online: 31 May 2022
© The Author(s) 2022

Abstract Transforming traditional workplaces into high-performing workspaces is a complex venture, not only in terms of design and preparation, but also in terms of implementation and management with regard to the realization of the intended goals. To be successful, holistic management is essential.

Starting with the definition of goals and performance metrics, evaluation must be established from the very beginning and then continuously be applied to the project.

The evaluation concept—like a controlling system, only with workspace-specific aspects and KPIs—covers two areas: The main dimensions of workspace design with the involved stakeholders and their performance parameters, and the processes of implementation, the change management aspects. The interaction of these areas must also be considered.

The overall study discusses both success factors and potential pitfalls regarding the content and processes of designing and implementing modern office work environments in Germany. The study excerpt presented here addresses the evaluation of transformation projects in the field of working environments. Conceptually, instruments of marketing research are combined with components of controlling systems to develop an evaluation concept, which was then applied in a first empirical concept test at a German financial institution.

An evaluation concept supports those responsible for the workspace project to keep on track by deducting and tracking relevant KPIs, offering tools and methods for group and team processes regarding the change project, and providing those.

Annette Kämpf-Dern
Real Estate Research Lab, Faculty of Architecture—Civil Engineering—Geomatics, Frankfurt University of Applied Sciences, Frankfurt, Germany
E-Mail: kaempf-dern@fb1.fra-uas.de

Mascha Will-Zocholl
Research Group “Digitalisation and the Work Environment”, Hessian University for Public Management and Security, Wiesbaden, Germany
E-Mail: mascha.will-zocholl@hfpv-hessen.de
To combine design and change management of workspace projects in one evaluation concept and to provide a structured list of possible instruments/methods for evaluation over the different phases of such a project is new and thus original for workspace management.

**Keywords** Workspace change · Workspace controlling concept · Evaluation · Mixed-methods change instruments

1 Introduction

1.1 Change of ‘workplace’ to ‘workspace’

Historically, people worked and lived in their houses, on their farms, or nearby. The industrial revolution then brought the spatial division of labour and life. Today, the question of workplaces is newly addressed as the use of internet technologies enables the emergence of global information spaces (Boes et al. 2017), that offer enormous potential for flexible working times and places. During the Corona pandemic, questions about the role of the office in the context of the voluntary and prescribed home office were increasingly tackled (e.g. Nappi and de Ribeiro 2022). Especially the local attachment of work to specific workplaces is questioned. A number of studies in the past have already shown that the place of work is not trivial and that there is no place-lessness in the making; the local embeddedness of work and people remains important (Will-Zocholl and Roth-Ebner 2022; Flecker and Schönauer 2016; Felstead and Henseke 2017).

The demands that modern knowledge workers have on their workplace, or rather their working environment, have been changing significantly. More precisely, they are rising. Knowledge workers are increasingly aware of their importance and scarcity in today’s working world and are correspondingly more demanding. Companies must respond to this if they want to achieve their strategic goals. They have to address individual needs, especially flexibility in terms of working hours and location as well as the desire for social encounters. In this respect, there is a need for a transformation from physical, fixed workplaces in the corporate office to multidimensional work environments, which enable employees to select their respective physical and virtual work settings in line with their needs in order to fulfil their work tasks healthily and productively (Weber and Gatersleben 2021). By taking advantage of the technological developments, corporates are enabled to accomplish employees’ individual needs, and—of course—maximize their—and thus the corporate’s—performance.

Provision of work environments that fulfil all these requirements is much more complex than it has been in the past when it was sufficient to assign a desk, equipped with some company hard- and software, and deliver some functional core services like cleaning or IT admin.

It is a transformation from ‘workplace’ to ‘workspaces’: In terms of work, ‘workplace’ is the physical location of where somebody is working. For knowledge work, this has traditionally been at the desk in the company, but now can be anywhere
in the company, at home, in the car or at another third place. ‘Space’ in this concept follows the understanding of ‘social spaces’ (Lefebvre and Nicholson-Smith 1991), which emerges through the action and communication of people involved. In this logic, ‘workspaces’ are spaces that can emerge from different places by people working together on one object of labour. Yet, working on one object, alone or together, does no longer require to be at the same physical (work)place. Instead, the term ‘workspace’ includes a broad variety of physical work environments, used technologies, data space, services provided, corporate culture etc. ‘Workspace’ thus reflects much better the complexity of today’s work, and the multidisciplinary efforts that are necessary to transform traditional ‘workplace’ concepts into today’s modern ‘workspaces’ to reach new levels of performance.

1.2 Workplace transformation projects’ evaluation

The built as well as the ‘virtual’ work environment therefore have to reflect the current changes in the world of work and need an adaptation by the organization (Harris 2015; Windlinger et al. 2015; Coles 2011). In this respect, workplace transformation projects are part of organisational development processes that need to be managed accordingly.

A larger organizational development project in Germany, more precisely a request ‘to evaluate a workspace transformation pilot’, gave the impulse for the concept presented here. The ‘evaluation’ in the sense of ‘results control’, to be performed by externals, had been requested to get a neutral impact assessment of the pilot of a larger workspace transformation initiative. On basis of the evaluation, a decision was planned to be made about the implementation of further transformation measures. Generally, a good idea. However, the pilot was almost completed, the moving date planned for in four weeks. And though the project had competently been planned in many regards, fundamental planning information was missing to make a truly meaningful assessment. The opportunity to really learn from the pilot was gone, reflecting what Wild (1982, p. 44) already stated: “Planning without control is pointless and control without planning is impossible” (ibid., p. 44) [own translation].

This led us to reflect, and resulted in the question addressed here:

What are the preliminaries for an impactful evaluation, an evaluation that effectively supports a learning organization in its work environment transformation projects?

As described, workspace is of major importance for today’s corporates, and transformation projects are urgently needed; experience in this area as well as research are still limited, and failures likely. Because of the severe consequences (e.g. productivity or even employee losses) in case of not learning effectively from workspace transformation pilots and projects, the question above and the goal to optimize transformation processes systematically, using evaluations, are important. Summarized: There is still a general lack of evidence-based recommendations for action on how to plan and manage complex workspace transformation projects, from the initial idea to successful completion.
This is where our considerations for a comprehensive evaluation concept in the context of workplace transformation projects comes in. Starting with goal definition and the determination of key performance indicators, the evaluation is to be established at the very beginning and then continuously applied to the project. Subject of the evaluation concept are the workspace design, including involved actors and performance parameters on the one hand, and the process of implementation with its change management aspects on the other hand.

In this respect, after introducing and deepening the understanding of ‘evaluation’ concept and its relevance for workspace transformation projects, the different phases of an ‘evaluation concept’ and their methods are presented, followed by an example from a project in which this concept was firstly applied. Aim of this case study is to demonstrate the general applicability of such an evaluation concept, and to enable further respective research and refinements. We close with an outlook to how the evaluation concept can support such transformation processes to maximize the probability of success.

2 Need for and understanding of ‘workspace evaluation’

2.1 Change in knowledge work

As mentioned in the introduction, office work is changing considerably and the interest in ‘future workspaces’ grows. Reasons are—among others—that

- knowledge-work has an increasing share of overall work activities (Braintrust 2021; Hoppe 2019; North et al. 2016; Boes and Kämpf 2013);
- knowledge-work is performed at more and more different locations, not only on the corporate premises (Nappi and de Ribeiro 2021; Matsushita 2021; Wijnja et al. 2022, p. 17);
- work activities of individual knowledge-workers have become more and more diverse (Boes et al. 2017; Roth-Ebner 2015; Ryser et al. 2016);
- territorial workplaces can thus mostly not fulfil all requirements, neither of individual knowledge-workers nor of the organization (Petendra 2015);
- Information and communication technologies (ICT) have opened new options for mobile working in knowledge work (Roth-Ebner and Will-Zocholl 2021; Will-Zocholl 2021).

The ‘one-size-fits-all’-workspace of the 20th century does no longer address the diverse needs and demands of the heterogeneous 21st century workforce, apparently. Therefore, more and more companies ‘trial-and-error’ on new workspace projects. Yet, though awareness as well as exchange are growing—e.g. market research of global service companies, at conferences and trade fairs, in workshops, etc.—there is still limited transdisciplinary research on management aspects bringing together the numerous dimensions to be considered simultaneously.

The editors of the “Transdisciplinary Workplace Research and Management” book series (Appel-Meulenbroek and Danivska 2022, p. i) state: “... Workplace management is a complex issue that requires more strategic attention to create value
for multiple stakeholders.” They express in the handbook of theories that there is already a lack of a standard definition of workplace management (Danivska and Appel-Meulenbroek 2022, p. 2). E.g. defining a strategic approach is not available until 2020. Redlein et al. (2020, p. 179) describe workplace strategy as “the alignment of the organisation’s workplace with business strategy to optimise employee effectiveness and achieve strategic business goals” and further “It takes into account various dimensions of an organisation, its physical and virtual work environment, culture, business processes, technologies and other resources”. In the named handbook, Kämpf-Dern (2022) is the first to apply the St. Gallen Management Model as a systems approach to Workplace Management, including related instruments. These recent publications illustrate that holistic and interdisciplinary management approaches that combine insights in design and change aspects, performance measures, and organizational, geographic and cultural aspects of workplace transformation projects are still largely missing.

2.2 Performance-oriented, multidimensional model as base of effective transformation management

An integrated model bringing many of those elements together was introduced 2017 by Kämpf-Dern and Konkol (Kämpf-Dern and Konkol 2017). They called it the ‘Performance-Oriented Office Ecology Model’, thus extending the ‘Office Ecology Model’ from Windlinger Inversini et al. (2014) through inclusion of the stakeholder dimension on the one side, a focus on the performance (outcome) on the other side, and embedding it into relevant change aspects to be considered when effectively transforming workplaces.

In the centre of the model are the people affected (knowledge workers), whose knowledge-work processes and activities are lead, coordinated, and supported by leadership and the corporate’s management system. Further dimensions, which are enabling work and management, are the physical workplace, workplace technology,
and workspace services.\textsuperscript{1} When these six dimensions are configured in an effective, ‘fitting’ way, intended objectives and outcomes can be achieved, and the organisation can ‘perform’.

Finding and implementing the ‘effective, fitting way’, i.e. the configuration that enables performance, depends on the stakeholders (depicted on the left side of Fig. 1, a simplified graph of the model). The authors of the model state, that they added the stakeholders respectively their representatives because those drive and influence all aspects of the workplace transformation project.

The effective configuration also depends on the dimensions of the ‘Change Frame’. According to the authors and the referenced literature, an effective Change Management should consider the change context, the change content, the change process, and the individual characteristics of the organization and the knowledge-workers using the workspace in the future. Moreover, and only becoming visible when explicitly complementing a workspace model with the performance dimension, achieving performance is only possible when actively managing the change towards stated SMART\textsuperscript{2} objectives.

Kämpf-Dern/Konkol laid a well usable foundation by naming aspects and dimensions of a performance-oriented office ecology model, and explaining their interrelationships, including change aspects. Yet, they only briefly touched on one of the most pressing questions today:

How to manage the transformation processes to EVALUATE whether workspaces are then performing?

2.3 Status and requirements for management and evaluation of workspace transformation

Existing research discusses success factors as well as potential pitfalls regarding the contents and processes of designing and implementing modern office work environments. Personal resources like experience knowledge (implicit knowledge) and labouring capacity (Pfeiffer and Suphan 2015; Toker and Gray 2008) play an important role in these processes. The current research focus is on a priori surveys of employees to learn about their imagination of their ideal workplace or the measure of satisfaction with workplaces (i.e. Budie et al. 2018). Other studies evaluate a posteriori the outcome of workplace change projects.

Often, a significant discrepancy between expectations and reality of new office environments is found, and the disappointment about process and results is quite common for all parties involved.

\textsuperscript{1} According to the paper, the physical workplace focuses on the actual place of work, which can be designed at the location/buildings of the respective company as well as the places offered by third parties and rented locally (third places). Workplace technology deals with technical equipment in the narrower sense: hardware, software, but also wearables, headphones, etc. Workplace services focus on the concrete services at the workplace that support the work of the employee, from IT to training facilities.

\textsuperscript{2} SMART = Specific, Measurable, Attractive, Realistic, Timed.
The causes are comparable to those of other important and complex projects: “unclear objectives and intended benefits, inappropriate project team and no end-user engagement, lack of project management skills, inadequate communication to stakeholders, and inadequate controls and reporting” (Melton and Iles-Smith 2009; also Discenza and Forman 2007).

As is clearly depicted in the office ecology model in regards to its elements, workspace transformation projects are particularly complex, not only in their design and preparation (e.g. initiating, planning and managing the physical, technological and social change processes), but also in their implementation and steering towards their objectives. Therefore, competent systematic and holistic management is necessary to avoid typical mistakes and ensure success. This is demanding, as the described nature of workspace requires more than just project management.

Contrary to e.g. new construction where problems are mostly caused by a restriction of resources (time, money, technology), workspace transformations include

![Diagram](image-url)  
**Fig. 2** From organizational objectives to workspace performance
all these difficulties plus affecting many end-users with their individual habits and needs, who are used to an already existing environment. Accordingly, methods from project management need to be combined with intensive stakeholder management, and facilities management with marketing and communication management.

Digitisation extends the opportunities for participation of employees in the transformation of workplaces to workspaces. Starting points for the participatory transformation process can be drawn from a number of concepts that have been developed in the course of “modern office worlds” (Bauer et al. 2018).

### 2.4 The role of evaluation in workspace transformation projects

For the general approach, management science and—more concrete—the ISO 55000 series, Asset Management (ISO International Standardization Organization 2014)—applied to workspace (WS) gives a head start (see authors’ Fig. 2).

1. Starting from the corporate context, mission and vision, policies and objectives, i.e. on the normative workspace management level, the organizational and overall stakeholder needs as well as expectations regarding the WS are to be understood and anchored in a WS policy.

2. Next step on the strategic level is to determine the general WS objectives and to set up a strategic plan regarding WS. The strategic plan shall ensure that the organizational needs will be fulfilled and the organizational objectives achieved when realizing the Strategic WS Plan.

3. Then, on the tactical level, a set of WS plans is developed, for certain topics and/or geographic locations and/or departments, etc. This again requires cascading strategic WS objectives to tactical WS objectives. For those tactical objectives, the term “key performance indicators (KPI)” is used. KPIs serve as guides and measures in WS plans. They are used for communication up to the strategic and down to the operative WS management level.

Effective WS planning starts with WS analyses. Most important is to understand the status quo and to identify any gaps between the actual levels of KPIs, i.e. when using the current provision of WS, and the targeted performance levels. This gap analysis relates to all performance dimensions and is not limited to the tactical WS management level.

Accordingly, effective WS plans consist of actual and target figures for the various relevant dimensions, as well as on measures to be implemented, with the implementation being managed by the operative management.

4. Then, the plan for a specific WS transformation project goes into operational planning. Operational planning includes planning the physical workplace (“design”), the workspace technology as well as accompanying services, and also information and participation measures. In view of the large number of topics, numerous internal and external experts are to be involved. The content and timing of the transformation project is planned and coordinated in detail, resulting in a myriad of interdependent activities.

Additionally, the implementation of a WS transformation project requires to plan in change phases, as e.g. mentioned in (Levin 1947), with different phases in-
volving different participants and methods of involvement. This also needs to be considered in the planning. Thus, operational planning again requires a breakdown of KPIs into operative indicators that give guidance when steering the WS project during the implementation time.

5. But considering objectives and indicators is not finished with the planning: During the entire implementation, these operative indicators as well as the targeted KPIs must constantly be monitored. It is not enough to assess the performance levels achieved at the end of the project, because then it would often be too late to change something. Instead, throughout the implementation period, measurements should be taken at short intervals and extrapolated to the result so that adjustments can be made in a timely manner. Contrary to common belief, the implementation phase does not end with the move to new premises, for example. As a rule, an important phase of acclimation and new habits development and consolidation follows. This phase should also be closely monitored before the project is considered complete and the degree of goal achievement can be measured.

6. The transformation has reached its end point when all the actions initiated have been implemented and defined indicators or metrics do not—or only barely—change any more. Then a final review of the achieved performance values with the planned target values can take place at the various management levels, at least up to the tactical level or even beyond. If the review reveals that the objectives have not been sufficiently achieved or that the goals have changed in the meantime and a gap continues to exist or has re-emerged, then a new incremental or radical transformation process must be started.

From the above description of WS management as well as from Fig. 2, it is clear that the actual success of a WS transformation project can only be determined at all if the metrics have been defined from the beginning. Appropriate metrics are those that have been derived from the company’s goals. A transformation project can only be successful, i.e., achieve the intended targets at the end of the project, if strategic goals are broken down into operational KPIs and operational control variables during the planning phase. These must be monitored continuously during the implementation phase in order to be able to take corrective action.

In summary, ISO 55001 defines that a system of monitoring, measurement, analysis and evaluation must be in place at all management levels with regard to performance evaluation and improvement. Evaluation thus is not a snapshot at the end of the project, but a continuous, phased activity from the beginning. In other contexts, this activity is also referred to as a controlling concept. An effective controlling concept is not a sophisticated system of key figures (maybe even only financial). Rather, diverse dimensions must be included, which should thus also include an advanced, integral system of methods for target planning, measurement, steering and control. The content of this article is thus a proposal for a controlling concept for WS transformation projects.

How this can look in relation to project-specific tactical and operational WS management is the subject of the following WS evaluation concept.
3 Performance-oriented workspace change project evaluation concept

As already described in Sect. 2, WS change projects are initiated to meet specified goals on different levels. The success of those change projects depends on the appropriateness and fit of the performance-oriented office ecology model parameters within and with regard to the specified corporate’s goals, and the quality of the change process on the way to achieve the target situation. In order to manage the change process as comprehensively as possible, it is important not to be mono-modal, but multi-modal in the selection of methods to be used in a continuous evaluation process. We will introduce the proposed evaluation concept in the next section.

3.1 Definition and content of workspace change project evaluation

In a departure from approaches often practised so far, which define abstract goals of a change process, in the here defined ‘WS change project evaluation’, ‘evaluation’ is to be understood literally, in the sense of ‘to judge something with respect to its worth, significance or condition’, suggesting ‘an attempt to determine relative or intrinsic worth in terms other than monetary’ (Merriam-Webster.com Dictionary 2017). In the case of a WS change project, ‘the terms’ are those SMART objectives that the organization defines individually as KPIs, as exemplified previously. Consequently, the evaluation concept needs to specify those KPIs and determine their actual level before as well as their target level after the intervention, and provide approaches to do so (Bourne et al. 2000; Laihonen et al. 2012; Riratanaphong and van der Voordt 2014; Palvalin and Vuolle 2016).

As not only monetary or technical values are looked at, which can be quantified relatively easy, the evaluation concept needs to include qualitative as well as quantitative methods, resulting in a mixed-methods approach that combines various instruments.

Additionally, it would be short-sighted to only evaluate final results, especially in projects with major capital expenses and long lifespans as it is the case in WS situations. If in such a limited evaluation the final results would turn out not to be satisfying, it would be too late or costly to make necessary changes. Therefore, an evaluation concept should also include and cover some KPIs’ leading indicators that are determined at different moments of the change project to enable the organizations to set up the project in the best way and identify and make adaptations early on, if necessary.

The purpose of the evaluation concept is thus more than judging secluded questions (e.g. the potential of a project = ex ante, or the impact of changes on performance = ex post; Palvalin and Vuolle 2016, p. 165). If set up comprehensively, the evaluation can help steering the project in such a way that it actually provides the values intended. Declared in business terms, the evaluation concept should take the form of a project controlling concept with checks and balances at different stages of the project:
• At the project beginning: Identifying the gap between target and actual values and checking the premises for a successful project.
• During the project realization: Surveying the leading indicators for project success and the impact of adaptations taken.
• With project conclusion: Determining the project performance and identifying optimization potential for future projects.

The ‘Performance-oriented office ecology model’ with its dimensions ‘people’, ‘leadership/management systems’, ‘workspace processes/activities’, ‘workspace/technology/services’, ‘project team’ and ‘performance’ provides a large spectrum of leading and results indicators. It is thus suggested as a base to holistically evaluate work environment concepts. In addition, the workspace change management process shall be evaluated as well, with the factors for a successful implementation being in the focus. Together, they can be used as a guideline to performance-oriented design, implementation, and evaluation of new work environments.

3.2 Concept to evaluate workspace change projects

Building on the model and the change process, and using the phases as described there, the following concept to evaluate workspace change projects is suggested (Table 1). The single phases, their instruments and participants, are briefly introduced in a chronological way.

As can be seen, a mixed-methods approach is needed, consisting of various data collection instruments in the context of workspace change projects:

1. Workspace analysis  Prerequisite for an effective WS change project and its evaluation is the profound knowledge of the WS situation. An actual state-analysis regarding the WS of those departments and users that will be affected by the change is indispensable in the diagnosis and setup phase. Information required comes from visual surveillance regarding occupancy and activities performed at different workplace settings, complementing information from floor and furnishing plans and people/job information that regularly is used as base information. To establish effective objectives, performance parameters that are specific for the jobs performed on the space should be available as well.

In this phase, different methods are used to analyse the existing WS and ideas of the workspaces in the making. In addition to surveys and observations, newer methods such as card sorting or spatial walkthroughs can be used (Babapour and Cobaleda-Cordero 2020). Sensor technologies to measure the frequencies and occupancies automatically are further options to conduct WS analyses.

If done before the intervention, a solid WS analysis not only reveals fields of action and the foundation of a successful design, but also provides, in the end, a reliable reference point for the evaluation of effects of the project.

2. Strategy audits  The same holds true with regard to the evaluation of KPIs. Defining the corporate strategy respectively the WS strategy is not subject of this paper, yet, it is inevitable to have detailed knowledge of the goals that shall be
| Instruments          | Participants | Assumption controlling                                                                 | Change controlling                                                                 | Familiarization & support | Results controlling |
|---------------------|--------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------|---------------------|
| 1. Workspace Analysis | Workspace users (incl. Management) | Occupancy & activities of/on work places                                                | –                                                                                 | –                         | –                   |
| 2. Strategy Audit   | Top- & Middle Management          | Key objectives = actual & target from p-o office ecology model                          | –                                                                                 | –                         | –                   |
| 3. Focus groups     | Selection/representatives of workspace users (incl. Management) | Change context, change content awareness, workspace needs & fears                      | –                                                                                 | –                         | –                   |
| 4. Activity Analysis | Workspace users (incl. Management) | –                                                                      | Frequencies/timing/place of work activities                                      | –                         | Frequencies/timing/place of work activities |
| 5. Full Survey      | Workspace users (incl. Management) | –                                                                      | Office ecology, performance, change management                                    | –                         | Office ecology, performance, change management |
| 6. Interviews       | Workspace users (incl. Management) | –                                                                      | Change context, content, process, indiv. characteristics                          | Change context, content, process, indiv. characteristics | –                   |
| Instruments       | Participants                                                                 | Change Phases: | Unfreeze                        | Awareness & Direction | Change          | Familiarization & support | Refreeze         | Aftercare & review |
|------------------|------------------------------------------------------------------------------|----------------|--------------------------------|-----------------------|-----------------|---------------------------|------------------|-------------------|
| 7. Pulse Checks  | Workspace users (incl. Management)                                           | Project Phases: | Diagnosis & setup             | Process controlling   | Action & preparation | Process controlling      | Process controlling | Process controlling |
|                  |                                                                              |                | Assumption controlling         |                       |                 |                           |                  |                   |
| 8. Workshops/    | (Enlarged) project team                                                      |                |                                  |                       |                 |                           |                  |                   |
| Sessions         |                                                                              |                |                                  |                       |                 |                           |                  |                   |
| 9. Final Focus   | Selection/representatives of workspace users (incl. Management) & project    |                |                                  |                       |                 |                           |                  |                   |
| group            | team                                                                         |                |                                  |                       |                 |                           |                  |                   |
achieved respectively supported by the WS change project, to evaluate and steer it. General corporate or vague work-related goals shall be translated into SMART objectives that explicit those dimensions and parameters of the performance-oriented office ecology model and the WS change process that seem to be relevant for the determined goals.

WS strategy audits between top and middle management and workplace experts (Lauenstein 1984), combining corporate knowledge with the results from the WS analysis results, form the base and are the guideline for the evaluation at the end of the project.

3. Focus groups (also 9.) Focus groups, formed by a selection or representatives of WS users, incl. management, and, on a case-by-case basis, including members of the project team, are an efficient way to collect qualitative information, especially regarding the change process parameters, at various points of the project (Finch and Lewis 2013). In the beginning, during the unfreeze phase, understanding people’s position of change context and their awareness regarding the change contents is key. In addition, getting to know needs and fears about intentions and ideas of the planned WS changes from those affected, is important for setting direction, preparing a favourable project environment and keeping an eye on the development of such social concerns, as for example studied in terms of work-family matters (Brannen and Pattman 2005).

At the end of the project, focus groups are an effective tool to validate, interpret and discuss the results of the overall evaluation, and to generate insights for the optimization of the project or further project plans.

4. Activity analysis At the start of the change phase, a more detailed activity analysis sheds light on frequencies, timing and place of activities. Only if this analysis is done at this stage, an evaluation regarding changed behaviour after the WS change, different amount or kind of communication, for example, has an appropriate reference point and thus provides insight concerning the true and individual impact of the specific WS change (Steffen and Schulze 2020; Tagliaro et al. 2020).

5. Full surveys Surveys are a standard tool for evaluations because they efficiently allow the inclusion of a large number of people who can answer anonymously. Ideally, the same survey is used, at least before and after the intervention (Laihonen et al. 2012, p. 106; with regards to measuring impacts of change projects; Vischer 2017). It should cover the project specific aspects of office ecology, performance, user preferences (Weijs-Perrée et al. 2020), change management, job specifics and other demographics, that help to discover general patterns that can be used for future projects.

---

3 Focus group are simultaneously an effective instrument of communication and participation, but this is not in the center of the present considerations regarding the evaluation.

4 An activity analysis is also necessary to calculate an appropriate number of different work settings, but this is neither focus of this paper.
As with any survey, the challenge is to find a balance between a meaningful number of questions and a meaningful participation rate. Due to the many dimensions and influencing factors of WS, a standardized survey may not be sufficiently specific, while a specified survey will most likely not cover all areas to be comparable to other organizations and situations. This ‘dilemma’ can in parts be solved by using modules from a larger question database.

6. Short surveys (“pulse checks”) Like in medicine, “pulse checks” are very short surveys with the most relevant questions, performed at higher frequency, in order to quickly and systematically identify pressing issues. They could be done weekly after the move for the first month, bi-weekly in the second and third month, and monthly from the fourth to the sixth month, later on followed by a full survey. Taking the questions for the pulse check from the full survey allows for longitudinal comparisons, not only between the pulse checks but also between pulse checks and full surveys. Today, it is even possible to assign individual (but anonymous) survey codes to the participants that are valid for the whole evaluation series, allowing to track the experience of individuals respectively certain characteristics over time without repeatedly asking demographic information and thus saving time. An example of pulse check design is presented in Sect. 4.

7. Interviews Interviews can effectively complement surveys because they leave room for individual, more qualitative statements. With a trusted interviewer, interviewees may give information they would not provide in a written form. Therefore, questions regarding the individual opinion of the change context, or personal experience with and valuation of change content and process, as well as individual characteristics and preferences, can be more effectively addressed through interviews and qualitative analyses. Further, the setup of interviews is less formal than that of surveys, facilitating additional ad hoc surveying when necessary. For the evaluation of WS change projects, interviews can be used additionally with focus groups or at certain events, e.g. after moving into the new space (Tuzcuoğlu et al. 2020) and in different forms, like semi-structured interviews (Kavantera et al. 2020) or expert interviews (Kohlert 2020).

8. Workshops/project team protocols Workshop based evaluation is quite familiar in workplace research (i.e. Kohlert 2020). Based on pulse checks and interview information, the project team can evaluate and discuss the ongoing process, identify and address upcoming problems, provide respective communication, and thus actively steer the process. From an evaluation viewpoint, protocols that document adaptations linked to e.g. pulse check questions, allow for identifying important and effective measures versus others where the decision—good or bad—was to ‘wait and see’. The evaluation team that actively accompanies the project team can make ongoing comparisons of these points and give effective advice—for now and possibly future projects.

In summary, the usage of the instruments described above expands the suggestions of Laihonen et al. (2012) and Palvalin and Vuolle (2016) through complementing and specifying instruments and suggesting a schedule according to change and project
phases. The concept supports to comprehensively collect and analyse relevant data regarding the performance-oriented office ecology model and the change process. While it seems necessary, according to ISO 55000 to conduct all activities shown in the table cells according to the project phases, the instruments used in each case can be adapted to the company and project situation (e.g., depending on the size, focus group discussions can be replaced by interviews or surveys). As suggested, evaluation as defined and proposed here, is not a final, passive activity, but an interactive and iterative process with the purpose to consult the team with the actual project and also get insights for future projects. Comprehensive evaluation of WS change projects as suggested is thus an important contribution to a learning organization.

4 Case study: directbank

4.1 Brief description of the case study

Facing new competitors in the field, directbank ltd. set up a new strategy to agilitise their organisation. One of the selected aims was the creation of a WS based on collaborative work and exchange among the employees, enabling creative and inspiring ideas and increasing performance.

With an activity-based approach, the bank’s aims (not yet objectives that fulfilled the SMART-criteria!) were to

- increase employer attractiveness;
- promote creativity;
- promote the ability to innovate;
- provide more alternatives for communication and exchange;
- promote project work;
- create space for concentrated work;
- realize more efficient work through appropriate technical equipment;
- support agile working methods;
- generally create an environment that allows people to enjoy their work and increases their well-being.

The company started prototyping “Work 2020” with only a few employees. This start contained desk-sharing-trials, think tanks, techno-checks, etc. In a second phase, facilitated by a broad-based participation process, a sound concept was developed and implemented with professional design support. Almost 1 year after the launch of “Work 2020” and 4 months after the 82 employees had moved into an interim space, the employees then moved back into the previous, now completely transformed space.

4.2 Evaluation of “Work 2020”

An external, neutral evaluation had also been part of the planning. The systematic evaluation work, however, did not begin until about 4 weeks before the employees
were to move back into the new space. According to Fig. 3, the evaluation in the case study (only) covered the following steps:

- Semi-structured primary interviews with selected participants from different functional units, hierarchy levels etc. within the first three days of moving into the new space
- Weekly pulse checks and pulse check follow-ups (both further explained in the next segment)
- Online surveys, addressing all affected employees, the first within three months, the second within 12–15 months after the move. Those surveys were supposed to be linked with the pulse checks through anonymous identifiers allowing a longitudinal analysis on individuals’ user journey
- Final interviews respective focus groups to discuss the insights of the prototype with representatives of all stakeholder groups: employees and affected managers, as well as from the involved departments like HR, IT, etc.

A very important part of the evaluation was the continuous analysis of the data that included reflection of the team of internal managers and external scientific team regarding the findings and the resulting necessary adaptation measures.

4.3 Pulse-Check in focus

One of the methods applied in the course of the case study and an important part of the evaluation were the pulse-checks and pulse-check follow-ups mentioned above.

---

5 As this paper is about the application of the concept to a case study and the sequence of measures, specific dates of the individual steps, number of participants, or case-specific results and measures of the case are not presented here, but can of course be provided upon request.
The pulse-checks were selected here as examples and presented in more detail, because they are a rather unknown, though comparatively simple method to monitor change processes, i.e. during implementation of WS projects. They enable active steering of the project measures as developments that deviate from originally planned goals become visible in time and can be discussed and treated in a fruitful way.

The purpose of ‘pulse checks’ is thus to quickly measure the status of ‘health’ of the project and its participants in a metaphorical sense: How is the individual doing? At individual functions and overall? Are there any comments or complaints?

A well-done pulse-check leaves it up to the respondent to decide whether to quickly respond “all is well” to overarching questions, or to express concerns in specific areas. In the first case, she is quickly finished. In the latter—as in the case of a patient’s elevated pulse rate or even palpitations—it is possible to dig deeper and find out what the problem is in a very timely and uncomplicated manner. Therefore, the pulse-check instrument must be designed to be easy to use, so that a very high proportion of sufferers will use it again and again.

The Pulse Check in our Case Study was limited to nine standard questions and one “Question of the Week”. The first nine questions are initially each only one-line and can be answered by one click per question. Only if the respondent explicitly decides to do so or his own rating is ‘bad’ or ‘very bad’, the question is opened up into always the same 3–5 sub-questions, which are again to be answered by one click. In addition, in all cases there is the option to leave a shorter or longer comment (see Fig. 4).

The 10th question dealt with the “Topic of the week”, aspects that only need to be asked once, because there is usually no further change from week to week. Such topics are e.g. the quality of the move management, the coffee machine, the ‘caddy’ for storage of personal items, overall change management, the felt support of communication & exchange through the new work environment, or the social spaces provided.

The Pulse Check thus makes it very easy for the employees involved in the transformation to express themselves.

It must similarly be easy to analyse the emerging data, at any time, so that problems can not only be identified very promptly, but also acted upon. This is done as part of the pulse-check follow-up. This regular appointment should take place within a maximum of 1–2 days after the respective completion of the pulse-check.

At the pulse-check follow-up, all stakeholders and employee representatives come together—physically or virtually—and discuss the data and their changes or recognizable trends. Even more important, however, is addressing identified or emerging issues, as well as reviewing the effectiveness of previously made decisions.

Pulse check, data analysis, pulse check follow-up, action initiation and action review based on the subsequent pulse checks thus represent a very operational PDCA (Plan-Do-Check-Act)-circle for workplace transformation projects. They enable the project to be managed in a timely manner and ensure that the objectives are achieved.
1. The standard workstations (in the area, in the Green Garden) ... completely agree agree neutral disagree do not agree at all no statement

... are very good overall

Voluntary detailing or automatic if overall rating is "disagree" or "do not agree at all"

... are optimally equipped in terms of furnishings and materials in accordance with their function
... are attractively designed
... are comfortable with regard to noise, light, air
... support my activity optimally

You are welcome to use the following field for an explanatory comment:

Fig. 4 Pulse Check—Question line and details

4.4 Final steps of evaluation at directbank

While the pulse checks form the basis for the ongoing management of WS transformation projects, the final surveys and focus groups serve to assess the achievement of objectives on the one hand, and—in comparison with the original objectives—also to gather knowledge for subsequent projects.

Accordingly, the surveys, about 3 months as well as about 12–15 months after move-in, should pick up the themes and questions of the survey at the beginning of the project to enable this comparison and the learning that emerges from it (Note: Due to the very late start of the evaluation set-up and process in the case study context, this was unfortunately not possible here, and comparability was not given.).

If the pulse-check questions and topics are also aligned with the survey, in addition to the control possibilities, the continuous learning effects are particularly high.

Even though the original baseline of the specific case could no longer be reconstructed in detail due to the late start of the evaluation, it was possible to substantiate the stated aims into objectives in cooperation with the project team of the bank and to determine their actual state after the end of the project through the survey. The concretization of the ‘original’ objectives took place in the course of the creation of the survey questions and the possible answer items. It was then interesting to observe and analyze the respondents’ assessments in this regard. These were positive in most areas. In those areas where this was not the case, the qualitative comments provided sufficient justification to understand the issues. In this respect, a significant
amount of learning could be achieved even without a baseline. However, the not uncommon situation of the case example, regarding the missing baseline values and the resulting difficulty to objectively determine the project “gains”, confirmed the necessity in this respect.

It is therefore highly recommended to plan and coordinate all relevant evaluation parameters and methods—to a large extent concretized in terms of time and content—at the beginning of the transformation project. Based on such good planning, not only can the best possible decisions be made, but they can also be well controlled, the goals achieved, and lessons learned for the future.

5 Conclusion

5.1 Limitations of the proposed evaluation concept

The first application of the evaluation concept in the directbank case study shows that to develop a holistic perspective is associated with challenges. In order to reflect the complexity of WS transformation projects adequately, a concept is developed that also is very comprehensive and complex. This is reflected in the large number of proposed steps and methodological procedures. Here is potential for further development. Some aspects might be able to become more standardized (e.g. developing a set of questions and items than can be re-used across companies) and the process simplified in terms of methods, e.g. by omitting costly surveys or workshops in favour of low-threshold instruments such as the pulse checks. The experiences from the case study show that the greatest difficulties are the strategic management approach needed on the one hand, and the practical implementation of all these steps and procedures, on the other. The latter relate primarily to two issues:

1. at the level of costs: the effort to carry out these continuous steps, to evaluate them and to draw conclusions.
2. at the level of the employees: as the evaluation progresses, participation in the surveys decreases.

In addition, it became clear that undesirable interim results can influence the whole process and can lead to the termination of the evaluation process. This issue shows the importance of external evaluation expertise. More limitations can appear in the future application of our concept, which will lead to improve methods and advice for the design of KPIs and indicators. A further operationalisation of key performance indicators is necessary to improve the evaluation process and the choice of methods.

5.2 Implications for research and practice

The paper provides a concept for evaluating WS transformation projects that relates to the ideas of the ‘Performance evaluation and improvement’ of the ISO 55000 series ‘Asset Management’, and thus is a part of the overall corporate management
systems. To fulfil the purposes of performance evaluation and the requirements of the multi-dimensional office ecology model including change management alike, the concept combines methods and instruments from strategic management and business controlling with empirical social research, communication sciences, and methods derived from medicine.

A comprehensive design and change management model together with the evaluation concept suggested here, provide an effective toolset to plan, evaluate, steer, and control WS change projects, though admittedly, the evaluation concept is to be developed further to facilitate usage and lower costs.

Regarding research, a holistic office ecology model and the evaluation concept together build the base to systematically analyse WS transformation projects, trying to identify general patterns that may be valid globally but also to detect specifics of German projects versus already existing international insights.

Practice can profit from the evaluation concept, as it is integrated in the corporates’ management systems and provides a structured overview of the most important steps, instruments and methods for evaluation, ‘translated’ to WS transformation projects including respective change processes.

This paper is the first step in an endeavour to create a theoretical base for future research regarding the evaluation of WS projects in Germany. Current work in progress will detail the model and the evaluation concept and derive more insights to the causal relationships of the different dimensions and the success factors as well as to potential pitfalls of WS change management and approaches to prevent them.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/.

References

Appel-Meulenbroek R, Danivska V (eds) (2022) A handbook of management theories and models for office environments and services. Routledge, London

Babapour M, Cobaleda-Cordero A (2020) Contextual user research methods for eliciting user experience insights in workplace studies. In: Kämpf-Dern A, Will-Zocholl M (eds) Future Workspaces Conference Proceedings of the 2nd TWR Conference 2020.

Bauer W (ed) (2018) Office Analytics: Erfolgsfaktoren für die Gestaltung einer typbasierten Arbeitswelt. Fraunhofer-Institut für Arbeitswirtschaft und Organisation, Stuttgart

Boes A, Kämpfe T (2013) Informations- und Wissensarbeit. In: Hirsch-Kreinsen H, Minssen H (eds) Lexikon der Arbeits- und Industriesoziologie. Nomos, Baden-Baden, pp 281–286

Boes A, Kämpfe T, Langes B, Lühr T (2017) The disruptive power of digital transformation. In: Briken K, Chillas S, Krzywdzinski M et al (eds) The new digital workplace. How new technologies revolutionise work. Macmillan Education Palgrave, London, pp 153–175

Bourne M, Mills J, Wilcox M, Neely A, Platts K (2000) Designing, implementing and updating performance measurement systems. Int J Oper Prod Manag 20(7):754–771. https://doi.org/10.1108/01443570010330739
Braintrust (2021) The knowledge work demand index. https://www.usebraintrust.com/knowledge-work-demand-index. Accessed 15 Apr 2022

Brannen J, Pattman R (2005) Work-family matters in the workplace: the use of focus groups in a study of a UK social services department. Qual Res 5(4):523–542. https://doi.org/10.1177/1468794105059508

Budie B, Appel-Meulenbroek R, Kemperman A, Weijs-Perree M (2018) Employee satisfaction with the physical work environment: the importance of a need-based approach. Int J Strateg Prop Manag 23(1):36–49. https://doi.org/10.3846/ijspm.2019.6372

Coles D (2011) Work on the move: driving strategy and change in workplaces. IFMA Foundation, Houston

Danivska V, Appel-Meulenbroek R (2022) Collecting theories to obtain an interdisciplinary understanding of workplace management. In: Appel-Meulenbroek R, Danivska V (eds) A handbook of management theories and models for office environments and services. Routledge, London, pp 1–12

Discenza R, Forman JB (2007) Seven causes of project failure. How to recognize them and how to initiate project recovery 2007. https://www.pmi.org/learning/library/seven-causes-project-failure-initiate-recovery-7195. Accessed 01.12.2021

Felstead A, Henseke G (2017) Assessing the growth of remote working and its consequences for effort, well-being and work-life balance. New Technol Work Employ 32(3):195–212. https://doi.org/10.1111/ntwe.12097

Finch H, Lewis J (2013) Focus groups. In: Ritchie J, Lewis J et al (eds) Qualitative research practice. A guide for social science students and researchers. SAGE.

Flecker J, Schönauer A (2016) The production of ‘Placelessness’: digital service work in global value chains. In: Flecker J (ed) Space, place and global digital work. Palgrave Macmillan, London, Cham, pp 11–30

Harris R (2015) The changing nature of the workplace and the future of office space. J Prop Invest Finance 33(5):424–435. https://doi.org/10.1108/JPIF-05-2015-0029

Hoppe M (2019) Wissensarbeit und die Beschäftigungsentwicklung in der digitalen Transformation. Dresden. https://gfa2019.gesellschaft-fuer-arbeitswissenschaft.de/inhalt/c.11.2.pdf. Accessed 17.04.2022

ISO International Standardization Organization (2014) ISO 55000:2014 Asset management. Overview, principles and terminology. https://www.iso.org/standard/55088.html. Accessed 12 Jan 2021

Kämpf-Dern A (2022) St. Gallen management model: systemic-constructionist approach to workspace organisations and management. In: Appel-Meulenbroek R, Danivska V (eds) A handbook of management theories and models for office environments and services. Routledge, London, pp 36–52

Kämpf-Dern A, Konkol J (2017) Performance-oriented office environments—framework for effective workspace design and the accompanying change processes. J Corp Real Estate 19(4):208–238. https://doi.org/10.1108/JCRE-03-2017-0009

Kavantera A, Thakore R, Whitehall G (2020) How do corporate drivers and individual preferences for agile working meet? Study of Hong Kong organisations and employees. In: Kämpf-Dern A, Will-Zocholl M (eds) Future Workspaces. Conference proceedings of the 2nd TWR conference 2020

Kohert C (2020) The ‘human’ workplace—health-relevant factors for learning and working spaces. In: Kämpf-Dern A, Will-Zocholl M (eds) Future workspaces Conference Proceedings of the 2nd TWR Conference 2020..

Laihonen H, Jääskeläinen A, Lönnqvist A, Ruostela J (2012) Measuring the productivity impacts of new ways of working. J Facil Manag 10(2):102–113. https://doi.org/10.1108/147259612112118749

Lauenstein M (1984) The strategy audit. J Bus Strategy 4(3):87–91. https://doi.org/10.1108/eb039037

Lefebvre H, Nicholson-Smith D (1991) The production of space. Victoria, Blackwell, Malden Oxford

Levin K (1947) Frontiers in group dynamics. Concept, method and reality in social science; social equilibria and social change. Hum Relations 1(1/2):5

Matsushita K (2021) Reconfiguring workplaces in urban and rural areas: a case study of Shibuya and Shira-hama, Japan. In: Will-Zocholl M, Roth-Ebner C (eds) Topologies of digital work. How Digitalisation and Virtualisation shape working spaces and places. Springer, Cham, pp 149–169

Melton T, Iles-Smith P (eds) (2009) Managing project delivery. Butterworth-Heinemann, Oxford

Nappi I, de Ribeiro G (2022) The duality of the physical and virtual worlds of work. In: Will-Zocholl M, Roth-Ebner C (eds) Topologies of digital work. How digitalisation and virtualisation shape working spaces and places. Palgrave Macmillan UK, London

Nappi I, Ribeiro GC (2021) The duality of the physical and virtual worlds of work. In: Will-Zocholl M, Roth-Ebner C (eds) Topologies of digital work. How digitalisation and virtualisation shape working spaces and places. Springer, Cham, pp 225–259
North K, Güldenberg S, Dick M (2016) Wissensarbeit( er). In: Dick M, Marotzki W, Mieg HA (eds) Handbuch Professionsentwicklung, vol 125. Klinkhardt, Bad Heilbrunn
Palvalin M, Vuolle M (2016) Methods for identifying and measuring the performance impacts of work environment changes. J Corp Real Estate 18(3):164–179. https://doi.org/10.1108/JCRE-11-2015-0035
Petendra B (2015) Räumliche Dimensionen der Büroarbeit. Eine Analyse des flexiblen Büros und seiner Akteure. Springer, Wiesbaden/Cham
Pfeiffer S, Suphan A (2015) The labouring capacity index: living labouring capacity and and experience as resources on the road to industry 4.0. Working paper. Universität Hohenheim, Hohenheim
Redlein A, Höhenberger C, Turnbull P (2020) Workplace Management. In: Redlein A (ed) Modern facility and Workplace management. Processes, implementation and Digitalisation. Springer, Cham, pp 177–222
Riratanaphong C, van der Voordt T (2014) Measuring the added value of workplace change. Comparison between theory and practice. In: CIB facilities management conference 21–23 May 2014.
Roth-Ebner CE (2015) The skills of the digicom worker. J Technol Hum Usability 11(2):1–9. https://doi.org/10.18848/2381-9227/cgp/v11i02/56427
Roth-Ebner C, Will-Zocholl M (2021) Synopsis: how space and place matter in the context of digital work. In: Topologies of digital work. Palgrave Macmillan, Cham, pp 263–283
Rysér T, Angerer E, Mangadu GP, Schulze H (2016) Towards a model of collective competences for globally distributed collaborations. In: Flecker J (ed) Space, place and global digital work. Palgrave Macmillan, London, pp 201–225
Steffen M, Schulze H (2020) Workplace-related needs of knowledge workers—based on their work activity profile. In: Kämpf-Dern A, Will-Zocholl M (eds) Future workspaces. Conference proceedings of the 2nd TWR conference 2020
Tagliaro C, Yaoyi Z, Hua Y (2020) Analyze group work activity pattern through work type and collaboration network in a large organization. In: Kämpf-Dern A, Will-Zocholl M (eds) Future workspaces. Conference proceedings of the 2nd TWR conference 2020
Toker U, Gray DO (2008) Innovation spaces: workspace planning and innovation in U.S. university research centers. Res Policy 37(2):309–329. https://doi.org/10.1016/j.respol.2007.09.006
Tuzcuoğlu D, Dujuan Y, de Vries B, Sungur A (2020) Social interaction in an office environment: A qualitative study after relocation to a smart office. In: Kämpf-Dern A, Will-Zocholl M (eds) Future Workspaces Conference Proceedings of the 2nd TWR Conference 2020.
Vischer JC (2017) User-centred workspace design : applications of environmental psychology to space for work. In: Clements-Croome D (ed) Creating the productive workplace. Routledge, pp 83–94
Weber C, Gatersleben B (2021) Office relocation: changes in privacy fit, satisfaction and fatigue. J Corp Real Estate Ahead-of-print. https://doi.org/10.1108/JCRE-12-2020-0066
Weij-Perrée M, Appel-Meulenbroek R, Gauger F, Pfünr A, Orel M (2020) Differences in user preferences across European coworking spaces. In: Kämpf-Dern A, Will-Zocholl M (eds) Future Workspaces Conference Proceedings of the 2nd TWR Conference 2020.
Wijnja J, van der Voordt TJM, Hoendervanger JG (2022) Corporate real estate management maturity model: Joroff et al. one step ahead. In: Appel-Meulenbroek R, Danivska V (eds) A handbook of management theories and models for office environments and services. Routledge, London, pp 13–24
Wild J (1982) Grundlagen der Unternehmungsplanung, 4th edn. Westdt. Verl, Opladen (Teilw. zugl.: Frankfurt, Univ., Habil.-Schr., 1981)
Will-Zocholl M (2021) Information Space(s). In: Appel-Meulenbroek R, Danivska V (eds) A handbook of theories on designing alignment between people and the office environment. Routledge, London, pp 82–92
Will-Zocholl M, Roth-Ebner C (eds) (2022) Topologies of work. How digitalisation and virtualisation shape working spaces and places. Palgrave Macmillan, London
Windlinger Inversini L, Konkol J, Schanne F, Sesboüé S, Neck-Häberli R (2014) Gesundheitsförderliche Büroräume : wissenschaftliche Grundlagen zum Zusammenhang zwischen psychischer Gesundheit und Büraumengestaltung sowie dem begleitenden Veränderungsprozess. 2296–5629. https://digitalcollection.zhaw.ch/handle/11475/6343. Accessed 06.12.2021
Windlinger L, Gersberg N, Konkol J (2015) Unterstützung mobil-flexibler Arbeit durch aktivitätsorien-tierte Gestaltung von Büroräumen