Methods for eliciting user experience insights in workplace studies: spatial walkthroughs, experience curve mapping and card sorting

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Abstract

Purpose – Drawing on a user-centred design perspective, the purpose of this paper is to (i) provide an overview of three contextual user research methods, namely, spatial walkthroughs, experience curve mapping and card sorting, (ii) exemplify their applications in different case studies and (iii) compare the methods according to their contributions for the study of users' workplace experiences. Previous workplace studies with qualitative approaches mainly rely on methods such as interviews and observations. Although these methods provide rich data, the understanding of office users, their use situations and finding more fitting workplace designs can benefit from deeper user experience insights.

Design/methodology/approach – Three methods and their variants were tested in studies of user experience in flexible offices: spatial walkthroughs, experience curve mapping and card sorting. The methods were tested during workshops and interviews in four case studies with a total of 114 participants.

Findings – Spatial walkthroughs were more immersive and provided the most insights on the actual context with respect to spatial design qualities, while experience curve mapping enabled understanding the temporal aspects of the user experience and card sorting enabled exploring user experiences with respect to predetermined spatial qualities and contextual aspects.

Originality/value – Spatial walkthroughs, experience curve mapping and card sorting methods have not previously been applied in workplace studies. They facilitate dialogue, participation and user involvement and provide insights for making evidence-based recommendations for designing or redesigning office environments that fit users' needs and preferences.

Keywords Work environment, Qualitative methods, User involvement, Flexible offices, Office evaluations, User-centred workplace design

Paper type Research paper

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1. Introduction

New ways of organising work and flexible office environments are being increasingly implemented in organisations worldwide. Flexible offices are defined here as those where employees can choose between different office settings depending on the activity at hand, need for interaction or preferences, for example, activity-based and combi-offices (Bodin Danielsson, 2016). These implementations take place amidst larger societal transitions such as the need to mitigate negative environmental impacts of human activities and the built environment (Edenhofer *et al.*, 2014; Altomonte *et al.*, 2015), as well as technological changes such as the prevalence of portable computing devices and cloud services in daily life. However, research on the outcomes and implications of relocating to flexible offices shows challenges in terms of satisfaction with workspaces and perceived performance (Engelen *et al.*, 2019) due to unassigned workstations and lack of privacy (Morrison and Macky, 2017), as well as poor ergonomics and mismatches with employees' needs and preferences (Babapour, 2019a). This highlights that the design of such new and flexible offices is often inadequate due to a limited understanding and anticipation of the needs and preferences of employees as users of these workplaces.

A large number of workplace studies address how office environments impact employees' well-being (Appel-Meulenbroek *et al.*, 2018; Berlin and Babapour, 2020; Colenberg *et al.*, 2020; de Croon *et al.*, 2005) and how the experience of well-being relates to productivity, job satisfaction or creativity (Clements-Croome, 2015). However, there is limited knowledge regarding methods to aid workplace designers and decision makers when exploring, creating, evaluating or further developing office solutions from a user-centred design perspective. One methodological contribution is made by Post Occupancy Evaluations with usability walkthroughs (Alexander, 2010; Hansen *et al.*, 2011; Windlinger *et al.*, 2016). Workplace usability studies address effectiveness and efficiency of and satisfaction with (International Organization for Standardization, 2018) offices and acknowledge that workplace usability also depends on the context and personal and social experiences (Lindahl *et al.*, 2012). In design disciplines, "user experience" is a broader term than usability or satisfaction. For example, Jordan (2000, pp. 11–58) defines user experiences according to physio, psycho, socio and ideo-pleasures, being usability a variable within the psycho-pleasure. According to Norman (2004, p. 4), usability does not inherently imply satisfaction and vice versa. This distinction is also evident in office designs where users experience spaces and artefacts as aesthetically pleasing but also having usability flaws (Babapour *et al.*, 2020). Satisfaction has been frequently addressed in the context of offices with respect to a set of factors such as thermal comfort, air quality or noise control (Minyoung *et al.*, 2019). However, the office's indoor environment and its occupants characterise a complex system that requires focussing on employee's experiences of using the office rather than single factor-response relationships (Bluyssen, 2014). Thus, focussing only on usability or satisfaction does not suffice for the study of experiences of using offices. Instead, a more holistic approach is required to gain a deeper understanding of users' complex and multidimensional experiences.

In the case of flexible offices, understanding users' experiences is crucial, as the user preferences and actual usage patterns vary considerably amongst office users (Babapour, 2019a; Cobaleda-Cordero, 2019). Earlier studies on flexible offices operationalise users' behaviour in terms of switching patterns captured by the frequency at which users change workstations (Hoendervanger *et al.*, 2016). However, users' behaviour in flexible offices goes beyond switching patterns and includes preferences, choices, interactions or social norms (Babapour, 2019a). In contexts other than office environments, e.g. consumer products or interaction design, qualitative

contextual inquiries are recommended to elicit rich user experience data and understand conditions of users' activities in real-world situations (Forlizzi, 2008; Nardi, 1996). However, the use of qualitative methods and comparisons between different qualitative data collection approaches for the study of office environments is limited. Therefore, the focus of this paper is to provide an overview of qualitative methods, commonly used in product design/HCI approaches, that can expand the way that users' workplace experiences are operationalised and understood in facility management.

The aim of this paper is to:

- provide an overview of three contextual user research methods, namely, spatial walkthroughs, experience curve mapping and card sorting;
- exemplify their applications in different case studies; and
- compare the methods according to their contributions for the study of users' workplace experiences.

The three methods are outlined with a theoretical background, followed by applications of the methods in case studies, as well as reflections on insights acquired by using the method.

2. User research methods and their application in workplace studies

This section

(1) provides background on probing methods for eliciting user research insights; and

(2) presents the three methods that were applied in different case studies, outlined with a background, the specificities of each application and the insights acquired from the different applications.

Researching users' everyday behaviour and experiences in workplaces requires users to reflect on their habits and routinised operations. Therefore, workplace studies may benefit from the application of methods that encourage and trigger user reflections on aspects that are otherwise difficult to capture. In user-centred design research, cultural probes are used to investigate users' daily lives and gain insights into the participants' personal contexts, desires, needs, attitudes, emotions, interactions, beliefs and social values (Mattelmäki, 2006). This type of methodology involves providing the participants with material to provoke their thoughts about a given situation and encourage them to talk about otherwise disregarded or routinised aspects of everyday life. Cultural probes can be seen as a way of collecting information, triggering reflections and encouraging dialogue by having the participants create and document their own visual and written data (ibid.). The first application of cultural probes involved using postcards, maps and cameras to learn about elderly persons and their experiences in different environments (Gaver *et al.*, 1999). The participants then used the material to reflect on and explain their trains of thought. The self-documentation assignments in studies that use cultural probes are often given prior to interviews and dialogues with researchers (Mattelmäki, 2006). Prior applications of cultural probes have mainly concerned the contexts of the home and home technologies (ibid.), which may pose practical limitations for researchers' participation during the self-documentation assignments. The context of workplace studies, however, makes it easier for the researcher to take part and immerse in the participants' daily work lives, especially when organisations agree to or volunteer to participate in a study.

In this paper, three methods are presented that can be viewed as cultural probes:

- spatial walkthroughs that elicit users' preferences and non-preference;
- experience curve mapping that focusses on the temporal aspects of the user experience in flexible offices; and
- card-sorting that elicits insights on how well the office environment matches the users' ideal and why (See Table 1 for an overview).

The data collection was carried out during workshops and interviews in the context of the participants' office environments. The methods were used in four case studies with a total of 114 participants. Each case study had unique research designs informed by a user-centred design perspective. The case studies were conducted between 2018 and 2019 and the participating organisations were all located in a province in West Sweden.

2.1 Spatial walkthroughs and annotations on architectural drawings

Spatial walkthrough is a variation of "cognitive walkthrough", which is used to evaluate whether a system is aligned with how users process tasks (Martin *et al.*, 2012; Polson *et al.*, 1992). Similar to cognitive walkthroughs, a spatial walkthrough evaluates how users understand spatial characteristics of the environment, whether the environment is easy to use, contributes to a positive user experience and helps employees achieve their goals. This method has had advantages over occupancy studies that mainly show usage of spaces rather than allowing for understanding users' motives and reasons behind their workspace preferences. An alternative walkthrough is using architectural drawings as a mediating tool in interviews, encouraging the participants to mark their workspace preferences and comment on the drawings. The spatial walkthrough method is similar to workplace usability walkthroughs in the sense that it collects

Method	Application		Case	Data collection (participants)
Spatial walkthrough (WT)	WT1	Walking through the premises in pairs and leaving post-it notes about (non-) preferences	1. City administration	2 workshop sessions (32)
	WT2	Walking through the premises in groups and marking (non-) preferences on architectural drawings	2. Province administration	11 focus groups (52)
	WT3	Talking through and annotating on architectural drawings	3. Municipality administration	Individual interviews (14)
Experience curves (EC)	EC1	Mapping daily activities and experiences (in pairs)	1. City administration	2 workshop sessions (32)
	EC2	Mapping daily activities and experiences	2. Province administration	11 focus groups (52)
	EC3	Mapping long-term experiences post-relocation	3. Municipality administration	Individual interviews (14)
Card sorting		Mapping personal preferences of and appraisals of spatial qualities	4. University	Individual interviews (16)

Note: The walkthroughs and experience curves were used in three case studies and the card sorting in a fourth case study. In total, 114 participants took part in the four case studies

Table 1.
An overview of the three methods and their applications in different case studies

insights during a walking tour of a worksite (Hansen *et al.*, 2011). The main differences between spatial and workplaces usability walkthroughs are:

- the stops and the time spent at each stop is predefined and steered by the investigators in usability walkthroughs, while spatial walkthroughs are more flexible encouraging the participants to identify user preferences and non-preferences; and
- the usability walkthroughs focus on "where and why solutions function well or poorly" (Hansen *et al.*, 2011), while spatial walkthroughs allow for not only capturing functional aspects but also experiential aspects of the workplace solution.

What follows is the application of spatial walkthroughs in three case studies of office environments.

2.1.1 Application. We have used three variants of spatial walkthroughs in different case studies of flexible offices to understand users' needs and preferences and to analyse the design of the physical work environment.

WT1. In-situ walkthroughs with post-it notes – A total of 32 participants marked their usage preferences and non-preferences and their motives on post-it notes during a walking tour around their offices (Figure 1(a)). This application was conducted as a part of a workshop series that was intended to identify areas of improvement. The case organisation was a public service provider that had implemented flexible offices six months prior to data collection. The participants went on a walking tour during which they showed each other their personal user preferences and left their post-it notes around the offices. After the

Notes: (a): In-situ walkthroughs with post-it notes; (b): In-situ walkthroughs with architectural drawings; (c): "Offline" walkthroughs with annotations on architectural drawings; (d): Synthesis of walkthroughs in one of the case studies showing preferences and non-preferences, as well as overlapping and at times conflicting preferences amongst the different participants

Figure 1.

walking tour, the participants returned to the workshop area and gave their general impressions. The time required for the completion of this activity ranged from 20 to 40 min per workshop. After each workshop, the researcher documented the post-it notes by taking photos of the environment and collecting the notes.

WT2. In-situ walkthroughs with architectural drawings – This application was conducted with 11 groups of three to seven participants (a total of 52 participants) prior to focussing group interviews. The case organisation was a public service provider that had relocated to flexible offices one year prior to the study. An architectural drawing was provided for each participant with a predefined path to follow and five text boxes: three for noting and motivating their preferences during the walkthrough and two related to personal control over the environment, which was the theme for the study (Figure 1(b)). Participants were instructed on the "how-to" before the walkthrough and were accompanied by a researcher during the process to solve doubts and listen to their comments. The time required for completion of this activity ranged between 10 and 20 min per group.

WT3. "Offline" *walkthroughs* – This version involved a *talkthrough* by going through an architectural drawing during individual interviews with employees, instead of walking around an office environment. The participants were asked to mark their preferences and elaborate on their experiences (Figure 1(c)). The time required for completion of this part of the interview was approximately 5 min. In total, 14 participants from a municipality completed the offline walkthroughs. The participants had relocated to flexible offices three years prior to the data collection (see more about this study in authors, 2019).

2.1.2 Design insights elicited from spatial walkthroughs. The application of spatial walkthroughs allowed for understanding users' preferences and non-preferences (Figures 1 (b) and 1(d)), as well as for identifying successful and sub-optimal features in the design of the studied offices, including both architectural aspects and design of furniture and office products (Authors, 2020). Putting the results together allowed for capturing patterns of similar and/or dissimilar preferences amongst the participants, identifying conflicting needs of some employees and generally underused spaces. In each case, multiple data sources were integrated into the findings but the motivations for such findings obtained with the spatial walkthroughs facilitated formulating evidence-based recommendations for re-design of the studied cases. For the case illustrated in Figure 1(b), participants' insights were cross analysed with data collected in observations about occupancy and chattering in the different spaces (Figure 2) to gain a deeper understanding of different office use situations. An illustrative insight from EW2 was the recommendation for replacing the soft seating in some interactive areas that had little or no use with the more popular standard workstations. According to the participants "the sofas are impossible to sit on, they are not ergonomic (V-P29)" and "the side tables are too small [for the laptops] (V-P52)". The participants found office desks better suited for the type of interactive activities that they conducted in this flexible office.

2.1.3 Methodological insights on spatial walkthroughs. The walkthroughs were appreciated by the participants as the process triggered reflections on their workspace choices: "It was very interesting to take the drawing and reflect; do I feel well and thrive here or not? And why? I haven't actually thought about this before. I have only gone around and wondered why I don't like it here. I have just taken or disregarded the different spots without stopping and thinking why" (V-PN). Furthermore, some participants mentioned that the walkthroughs helped them discover and consider new places that they had otherwise not paid *attention* to. These benefits were only mentioned regarding the in-situ walkthroughs, as the offline walkthrough was more of a *talkthrough* and did not trigger reflections or new discoveries to the same extent. It was also observed that the participants

Figure 2.
Representation of the combined findings from the spatial walkthroughs and observations

were reluctant to mark the drawings in the offline version and instead preferred to point at the drawings. As a result, the researcher had to encourage and remind the participants to mark the drawings. The variants of the walkthrough that were conducted in pairs or groups took a longer amount of time but also helped the participants build on each other's reflections. Finally, the walkthrough with post-it notes was appreciated due to the accumulation of the post-it notes that provided a visual summary of the participants' preferences. This encouraged reflections on collective preferences and norms.

2.2 Experience curve mapping

Experience curves are commonly used in the field of interaction design to understand temporal changes in users' experiences of interacting with computers (Kujala *et al.*, 2011). The method aims at "assisting users in retrospectively reporting how and why their experience with a product has changed over time" (ibid.). The method resembles customer journeys (Lemon and Verhoef, 2016; Nenonen *et al.*, 2008), in the way that it focusses on temporality. The main difference is that customer journeys focus on identifying touchpoints and measuring their effects on user experience (Lemon and Verhoef, 2016), while user experience curves are more open-ended and capture the experience as a whole and not necessarily coupled with specific touchpoints. This method enables determining the quality of long-term user experience and the influences that improve user experience over time or cause it to deteriorate. In the context of flexible offices, this method can be used in two ways:

- to understand the office users' experiences over a pre-determined and relatively short duration e.g. a day or a week; and

- to explore the employees' long-term experiences post-relocation. In addition, the method can be used in both individual and group interviews.

2.2.1 Application. Three applications of experience curve mapping were tested in different case studies of flexible offices to capture temporal changes in employees' experiences (Figure 3).

EC1. Daily experiences (in pairs) – A total of 32 participants (same as WT1) were paired in a series of workshops. The groups were asked to map their activities in a typical workday and mark their experiences with respect to pleasurability in the workspaces. The participants were instructed to think aloud and explain the reasons (for each other) behind the "peaks and valleys" of their experience curves. After completion, they were asked to suggest improvements that could potentially resolve the negative experiences (Figure 3, left). Once all groups had finished the activity, a common discussion was held about the peaks and valleys of the different experience curves. This activity took a total of 15 to 20 min and was conducted after spatial walkthroughs with post-it notes.

EC2. Daily experiences (individual) – This variant is analogue to the previous one, but it was used during focus group interviews with a total of 52 participants (same as WT2). The participants were asked to individually map their daily activities and draw their experience curves before a group discussion. In total, this activity took between 10 and 15 min and was conducted as the last part of the focus group interviews.

EC3. Long-term experiences (individual) – A total of 14 participants (same as WT3) were asked to mark changes in their experience in a flexible office over a three-year period post-relocation (Figure 3, right). They were then encouraged to reflect on the peaks and valleys of their experience curves and highlight the events that were the turning points in their experiences. The total time required for this activity was approximately 5 min.

2.2.2 Design insights elicited from experience curve mapping. The experience curve mapping encouraged the participants to recall memories of past use of the office and elaborate on personal experiences. In the "daily experience" version, participants reflected on particular episodes of previous office usage, eventually revealing the accrued impact of momentary experiences. The participants started with the daily episode of arriving at the flexible office and the recollection of moments while entering the building, using the lockers to leave/pick up belongings and the search for an available desk to start the day. Due to the particular routines for arrival and departure enforced by the design of flexible offices and clean desk policies, it is consistent that the exemplified episode of arrival/departure often played a central role in the experience curve mapping: "Before you could quickly finish your work and just walk

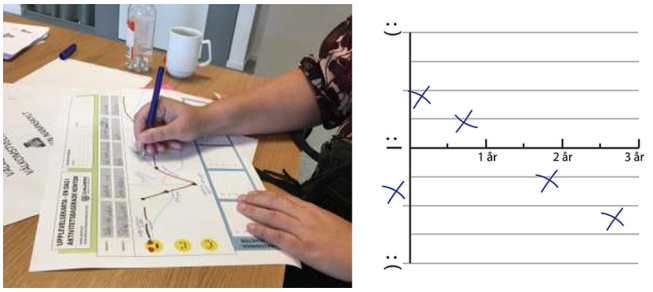

Figure 3.
Left: experience curve, mapping a typical day's activities right: an example of the user experience curve mapping over a longer time frame

away. Then the next morning everything is there and it only takes a minute to continue where you left it. Now it's restart, restart and restart all the time" *(V-D21)*. Further, design insights coupled with experience peaks entailed having access to quiet spaces and meeting spaces for different purposes, while the experience valleys were motivated with visual and audible distractions, uncomfortable chairs, insufficient restorative spaces and technical problems with screens "There is almost never any peace and quiet when you are going to sit in the coffee area and have coffee or a little break because there is an incredible amount of noise that comes up from every floor and from all directions. The soft furniture is not enough to dampen the sound (V-PD23)".

In the long-term experience mapping variant (EC3), the focus was on the participants' experiences over a longer period (versus daily experiences). Thus, participants reflected on cumulative experiences after periods of use and non-use of the different spaces and artefacts at the office: "We were very positive in the beginning. It took a while [about six months] until we understood that it wasn't as good as we had thought. It was new, nice and neat. There were those different zones we thought would work. It turned out quite quickly that they really did not" *(K-P5)*. Another insight gained from this variant was a feeling of resignation and frustration with the lack of changes or improvements with respect to workspaces that did not work well. The participants felt that the design was rigid and did not easily allow for changes; for example, it was not possible to change the direction of desks due to the placement of the power outlets, despite issues with visual ergonomics and window glare. This variant of the method helped capture hedonic adaptations and the adoption processes over time (Authors, 2019).

2.2.3 Methodological insights on experience curve mapping. After introducing the method and giving the instructions, the participants had to take some minutes to recall and reflect on their activities and experiences. The experience curve mapping was used as a mediating tool during interviews, focus groups and workshops and the time required for the completion of the activity ranged between 5 and 20 min depending on the complexity and level of detail of the mapping. The individual variants (EC2-3) allowed participants to elaborate freely on personal experiences and with rich detail, while the variant with pairs of participants (EC1) facilitated more discussions and allowed the participants to build on each other's reflections.

2.3 Card sorting

The card sorting method is used to understand users' mental models about the information architecture of a product, software or website and gather their feedback (Spencer, 2009). Users are requested to organise cards, each with a piece of content or functionality, into groups. Patterns in how the users expect information to be found can be identified and used later for usability improvements (Nurmuliani *et al.*, 2004). There are two modalities of card sorting, "open card sorting" and "closed card sorting", that differ in the ability that the user has (or not) to define the content of the cards and the categories for clustering them (Paul, 2008). Traditionally, the outcome of the card sorting method is a representation of how users expect to find the information architecture of a product, software or website. The method presented here shares the focus on user experience and adopts the fundamental principle of sorting cards, but with the aim of understanding users' preferences and workplace ideals rather than usability issues. In the context of office environments, card sorting can be used to elicit insights on how well the office environment matches the users' ideal, as well as the circumstances that motivate such perceptions.

2.3.1 Application. Card sorting was used as a mediation tool in semi-structured individual interviews with 16 participants at a university that had recently relocated to a flexible office (Authors, 2020). The participants were introduced to a biaxial chart; visualising levels of satisfaction and importance (Figure 4). Next, the participants were provided with a series of cards labelled with predefined themes, one by one. The predefined themes covered the spatial qualities of the office environment such as daylight, thermal comfort or visual privacy and contextual variables such as job conditions and social environment. The participants were then was asked to sort the cards onto the chart while motivating their decisions. Once all the pre-set cards were sorted, the participants were given the opportunity to write extra themes on blank cards and add them to the chart to bring up themes deemed to be important but that had not been addressed by the interviewer. In this sense, the application of the card sorting method proposed here can be seen both as a "closed card sorting" with predefined themes and a "semi-open card sorting" with participants being able to add their own cards. The duration of the activity varied between participants, but a general reference can be up to 30 min for up to 30 cards.

2.3.2 Design insights elicited from card sorting. This method enabled mapping how and why diverse variables in the work environment are considered satisfactory and important from the individuals' viewpoints. In addition, comparisons between participants allowed for distinguishing general patterns in positive and negative variables influencing the experiences of users at work, as well as their recurrence. For example, in the study by the Authors (2019), the majority of participants considered daylight as highly important and had a positive perception of the amount of it being let into the office, mostly because of big window openings, glass partitions instead of walls and a predominance of light-coloured surfaces. Further, they often elaborated on their own experiences: "The design of the building with the glass roof makes me feel alive [. . .] In the winter I can still see the daylight" *(A-P14).* Other aspects such as the aesthetics were satisfying overall, but attributed diverse levels of importance: "It's of less importance [for me], but from a company point of view I think it is important to have a nice office because we had a terrible location before. You were ashamed of bringing people there" *(A-P7).* Moreover, a theme such as climate comfort was often attributed high importance, but the satisfaction levels with it were more polarised: "It doesn't affect me. I'm very satisfied (A-P16)" vs "Some people even put on outdoor jackets [because of the cold temperature] and I know there have been some emails to whoever is in charge of the system [to complain]" *(A-P10).* Thus, the insights collected contributed to a richer and deeper understanding of the context, the qualities of the space and how the users appraised the spatial qualities altogether.

2.3.3 Methodological insights on card sorting. Card sorting allowed for opening a dialogue space where participants could provide rich insights about pre-set themes, as well as about themes that were not considered in the planning of the study but that surfaced as relevant during the sessions. Proposing such unanticipated themes and following up with other participants, however, remains at the discretion of the interviewer and the time constraints of the programmed sessions. Further, handing the cards one by one to the participants proved to be an effective manner to help them focus on each card's theme while allowing them to freely reflect and elaborate on how each

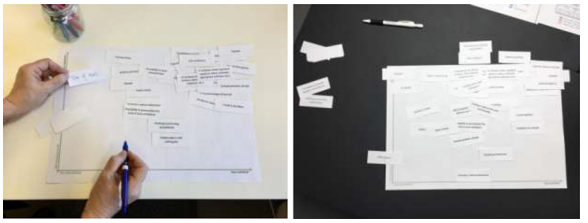

Figure 4.
Examples of how the participants sorted the cards with respect to satisfaction and importance

theme related to their daily office experiences. The more talkative participants expected to take longer to complete the sorting. In those cases, it is up to the interviewer to skip certain cards or compensate for the extra time consumed by omitting other interview questions. Ideally, the interviewer can simply stretch the session.

Regarding the chart used to sort the cards, a biaxial (satisfaction vs relevance) four-quadrant chart was initially designed and piloted. However, the experience was not as positive as expected, as the participants invested more time in familiarising themselves with it and considerable attention was given to making a precise choice for the placement of each card. A leaner, biaxial one-quadrant version of the chart was subsequently designed in accordance with the pilot experience that notably lowered the cognitive threshold for the participants and increased their speed in sorting the cards. To this respect, it is also worth considering that the exact placement of the cards on the chart should not be crucial; demanding high accuracy in sorting shifts the focus of participants from sharing insights to making precise choices in silence and demanding extra time. In summary, the main benefit of using this method is that it triggers discussions on a diversity of themes and facilitates eliciting user experience data in workplace studies.

3. Discussions

To facilitate the understanding of office users' experiences in relation to the design of workplaces, three user-centred research methods were outlined with their variants applied in case studies on flexible offices. It is important to highlight the extensive research on methods and tools for user studies within the fields of product design and human-computer interaction (for further reading, see Interaction Design Foundation, 2020). This paper exemplifies the application of such methods in workplace studies by building on previous work on user experience that can complement qualitative studies on workplace usability or satisfaction and take the concern for user-centric approaches even further. Also, it provides insights on methodological implications for eliciting rich data on users' experiences of their workplaces, as it is also the case with the qualitative methods used in workplace usability studies. However, there are few differences between the workplace usability studies and user experience perspective that are worth noting:

- User experiences as understood in design disciplines allow for a systemic perspective, beyond the ability of the office to deliver its intended utility, efficient and satisfactorily;
- User experience approaches cover the anticipated, momentary, episodic and cumulative temporal perspectives of using offices (Roto *et al.*, 2011);
- User experience theories not only focus on what worsens an experience but also on what contributes to making it meaningful and memorable, providing a solid base to explore design opportunities that enable users to thrive at work.

The outlined methods in this paper provided rich qualitative data in all of the applications and guidance for the re-design of the studied offices. Previous research on flexible offices emphasises making incremental improvements post-relation (Babapour, 2019b) and that a lack of improvements can lead to prolonged dissatisfaction, frustration and a sense of resignation amongst employees (Babapour *et al.*, 2018). The outlined methods can support organisations in finding ways to mitigate the unintended mismatches and problems that surface after relocation to flexible offices. We argue that these methods can also be used before relocation to facilitate needs and activity analyses and enable an evidence-based and participative design process.

3.1 Side-by-side comparison of the methods

To inform the choice of a method (or a combination of them) when studying users' experiences in office environments, it is fundamental to consider the different characteristics of the outlined methods. It is important to note that these methods capture different aspects of user experiences in offices. While they can be used separately depending on the purpose of the study and aspects of the user experience to be investigated, it is recommended to consider method triangulation to acquire a thorough understanding of workplace experiences. The major differences between the outlined methods are in terms of:

- the extent to which the actual context is brought up in the elicited insights,
- the extent to which the participants are immersed in the context,
- the temporality that the method covers: whether it relates to anticipated experiences in the future, ongoing momentary ones, episodic everyday experiences or cumulative experiences over time (Roto *et al.*, 2011),
- the extent to which the participants are guided or encouraged to be spontaneous,
- how disruptive the application of the method is with respect to the surrounding activities in the organisation; and
- the time required for the participants to complete the proposed steps for each method.

These differences define the contribution that each method will make in a study. As shown in this paper, the methods can be fine-tuned to create new variants. Table 2 summarises the methods presented in this paper with regard to the above-described criteria. Careful consideration of these differences in conjunction with coherent and motivating method triangulation is fundamental to adequately serve the purpose of any study.

Spatial walkthroughs provide concrete, direct and open feedback about the studied office environment, encouraging the participants to elaborate on their preferences and daily experiences. The method allows for spontaneity and complete immersion in the workspaces. It triggers recollection of emotional reactions and reflections related to the momentary experience of walking through the office and the episodic experiences of having recently used the workspaces. The offline walkthroughs with annotations on architectural drawings are, however, less immersive, relying on the ability of the participant to interpret the floor plan and recall experiences without the sensorial stimuli of the actual context. This entails a more filtered impression of the office context. Therefore, it is more likely to elicit information on cumulative experiences. The immersive walkthrough is, however, disruptive to some extent, as it can distract other employees, while the non-immersive version can avoid

Table 2. Summary of methods and main differences

	Spatial walkthrough	Experience curve mapping	Card sorting
Context captured	Appraisals of spatial design qualities Personal preferences Work-related needs	Appraisals of the spaces Work context Daily routines Adoption processes	Appraisals of spatial qualities and contextual aspects Personal preferences
Participant's immersion	Lower/higher	Lower	Lower
Temporality covered	Episodic/cumulative	Episodic/cumulative	Cumulative
Guided vs spontaneous	Spontaneous	Mostly spontaneous	Mostly guided
Disruption in application	Lower/higher	Lower	Lower
Required time	5–20 min	5–20 min	Up to 30 min for 30 cards

disruptions. Nonetheless, the spatial walkthrough method allows for eliciting user experience data and provides insights for further improvement of office environments.

Experience curve mapping can be labelled as a temporal walkthrough during which the participants are encouraged to elaborate on personal experiences related to specific time frames. The method is explorative with direct and open feedback from the participants. Revisiting a time frame instead of a physical setting involves less immersion in the actual context. It is important to highlight that this method captures what remains important from the users' viewpoint about their experiences. If the purpose of a study is to ensure in-situ accuracy of experiences and avoid retrieval failure, we recommend using diary methods instead, for example, the quantitative application of the diary method by Gerdenitsch *et al.* (2018). Nonetheless, the experience curve mapping method provided insights on what users found important about their office environments. The choice of the timeframe for the application of the method should be tailored based on the purpose of the study.

Card sorting is less explorative than the walkthroughs as it departs from set cards with predefined themes upon which to reflect and discuss. As a result, the actual context of the office somehow shifts to the background, with less immersion and disruption than the walkthroughs. Thus, the temporal aspect mostly focussed on the cumulative experience of the participants as longer-term users of the studied offices. We recommend card sorting for studies aiming to collect rich user experience data on predetermined aspects of the office environment known to influence users' experiences. This method can also be used to understand users' preferences in terms of these predetermined aspects in the design process as it is not dependant on the actual context.

3.2 Practical implications and considerations

Memories of past experiences tend to be shaped by the most intense and the latest episode of such experiences; a phenomenon called "peak-end" effects (Ariely and Carmon, 2000; Cockburn *et al.*, 2015; Fredrickson and Kahneman, 1993; Kahneman *et al.*, 1993). This entails that the insights elicited with the methods presented here may be biased, as participants may foremost recall the intense and recent episodes amongst past experiences and, consequently, "paint a picture" that may not fully reflect the ordinary user experience. However, such cognitive bias can also be used as a strategy to positively influence the user experience through design interventions that target both the "peak" and the "end" moments of experiential episodes (Caraban *et al.*, 2019; Kahneman *et al.*, 1993). Thus, the insights collected in the office context with the spatial walkthroughs, experience curve mappings and card sorting are considered to be representative of real and valuable office user experiences that also enabled us to elaborate on office re-design proposals. Further, the use of multiple data collection methods helps to mitigate biases on both ends, the participants' and the researchers' biases, by comparing and contrasting findings with regard to, for example, the incidence or the recurrence of events within the studied population.

The outlined methods have practical implications for stakeholders involved in the decision-making, design and maintenance of workplaces. The main essence of the cultural probes outlined in this paper is dialogue, participation and a high degree of user involvement, as they mainly rely on personal experiences, perceptions, affective states, needs, etc. (Mattelmäki, 2006). Previous studies on flexible offices emphasise the role of employee participation during the design process (Babapour, 2019a; Lahtinen *et al.*, 2015; Rolfö, 2018; Ruohomäki *et al.*, 2015), but studies on how to ensure and facilitate this process are limited. The methods outlined in this paper facilitate employee involvement both during the design process and for incremental adjustments post-relocation.

4. Concluding remarks

Three types of cultural probes and their variants were outlined in this paper – spatial walkthroughs, experience curve mapping and card sorting. These three methods enable capturing different aspects of user experience with respect to office environments from a user-centred design perspective. Demonstrating the application and outcomes of these methods:

- illustrate and promote the value of qualitative approaches in workplace studies; and
- expands the way that users' workplace experiences are operationalised and understood in facility management.

Furthermore, six criteria were identified as relevant for comparing the methods presented in the paper, namely: the contextual aspects captured, participants' level of immersion in the context, covered temporality aspects, level of guidance or spontaneity in the method application, disruption during the data collection and the required time for completion of the activities by the participants. These criteria are important to consider when choosing the type(s) of cultural probes to be used in interviews and focus groups.

The methods focus on episodic and cumulative user experiences with flexible offices, capturing insights on different temporal dimensions and qualities of past memories. Cognitive biases in participants' past memories present opportunities for identifying design recommendations, which can be captured using the outlined methods. Furthermore, the methods enable dialogues and reflections, facilitate employee involvement and participation and provide opportunities for making experience- and evidence-based recommendations for the (re-)design of workplaces. We recommend a multi-method approach for triangulation of data to capture a holistic and thorough understanding of the office users' experiences.

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Further reading

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