Pre-occupancy evaluation: comparison of two questionnaire approaches to inform renovation design in existing buildings

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Abstract

This paper explores the challenge of gathering occupant feedback in real office environments, focusing on the difference between continuous versus one-time questionnaire methods. Continuous feedback methods are valuable for understanding occupant needs, but they can lead to disengagement and fatigue over time , while one-time questionnaires usually focus on one moment in time and they cannot capture changes or trends over time.

A Pre-Occupancy Evaluation (PrOE) was conducted in a German office before a design intervention. This study compares the data obtained from the German office in a one-time and a continuous questionnaire to evaluate their respective benefits and limitation in informing required design solutions for a pilot area.

Both a one-time online questionnaire and a continuous feedback system (implemented using QR codes) were used to collect data on occupant (dis)satisfaction with the office design.

The results of this research show different perception on occupant's satisfaction between the two surveys. Both surveys show congruency in the dissatisfaction with open offices without partitions than in shared enclosed offices. The one-time survey highlights a lowest satisfaction with the availability of personal control, while the continuous survey presents lowest satisfaction with the acoustic privacy.

Keywords Pre-Occupancy Evaluation (PrOE), continuous occupant feedback continuous retrofit, occupant satisfaction, office space design

1.0 Introduction

Pre-intervention evaluations of occupant requirements offer the opportunity to enhance occupant satisfaction by better understanding their requirements and preferences (1). By prioritizing the needs of building occupants alongside technical and architectural considerations, designers are informed on how to create environments that perform efficiently while ensuring occupant satisfaction and well-being (2)(3).

Post-occupancy evaluation (POE) is widely utilized to assess user satisfaction and building performance once a space is occupied, allowing designers to refine and improve future projects based on real-life feedback (4). Equally important, though less commonly employed, is pre-occupancy evaluation (PrOE). This approach offers information by engaging with occupants before a building space is designed or retrofitted, capturing expectations, preferences, and concerns of occupants in advance (5). For instance, it can provide valuable insights into building features—such as layout, lighting, furniture, thermal comfort, and usability—that can influence occupants' satisfaction with the office space. When integrated early in the design process, pre-occupancy evaluations help shape environments that not only perform efficiently but also align closely with the needs and desires of future occupants (5,6).

There is a scarcity of research related to methods for PrOE of existing buildings various questionnaire deployment methods in the context of retrofitting existing spaces. Also, the focus of research is more in Post-Occupancy Evaluations which happen after an intervention or change in the office design has been made.

This study aims to investigate the differences between one-time questionnaires and continuous feedback questionnaires by analyzing the outcomes obtained from continuous feedback systems and one-time questionnaires to evaluate their respective benefits and limitations.

This study aims to contribute to a broader understanding of how the frequency and timing of questionnaires can affect both the reliability of the data collected and the insights generated from it. By employing different questionnaire intervals (such as one-time versus continuous questionnaires) the research seeks to assess how temporal factors might shape the respondents' engagement and reflection on their work environment. A more frequent questionnaire deployment could potentially capture more nuanced shifts in attitudes and satisfaction over time, revealing patterns that a single, static questionnaire might miss. Conversely, too frequent data collection could lead to questionnaire fatigue, which might distort the results or reduce participation rates .

2.0 Methodology

2.1 Case study

This study was conducted in an office building located in Dortmund, Germany, classified as having a Cfb climate according to the Köppen climate classification. The research focused on the first floor of the building (see Figures 1a and 1b), covering a total area of 1,200 m². The north-facing upper portion of the floor plan features a perforated façade, while the south-facing side, along the bottom of the plan, has a structured glazed façade.

As shown in Figure 1c, the floor layout includes three meeting rooms (Meeting 01, Meeting 02, and Meeting 03, highlighted in turquoise), three single offices (Office 01, Office 02, and Office 08, in green), six group offices (Office 03–07 and 09, in yellow) for up to eight employees, four open offices (Open Office 01–04, in red) accommodating up to twelve employees, and two work cafés (in purple) designated as informal work and break areas for up to six employees each.

Overall, the floor can be categorized into single offices (1 employee), shared enclosed offices (2–8 employees), and open space offices without partitions (9–12 employees). A total of sixty employees from the marketing and merchandising departments, which are based on this floor, were invited to participate in the study.

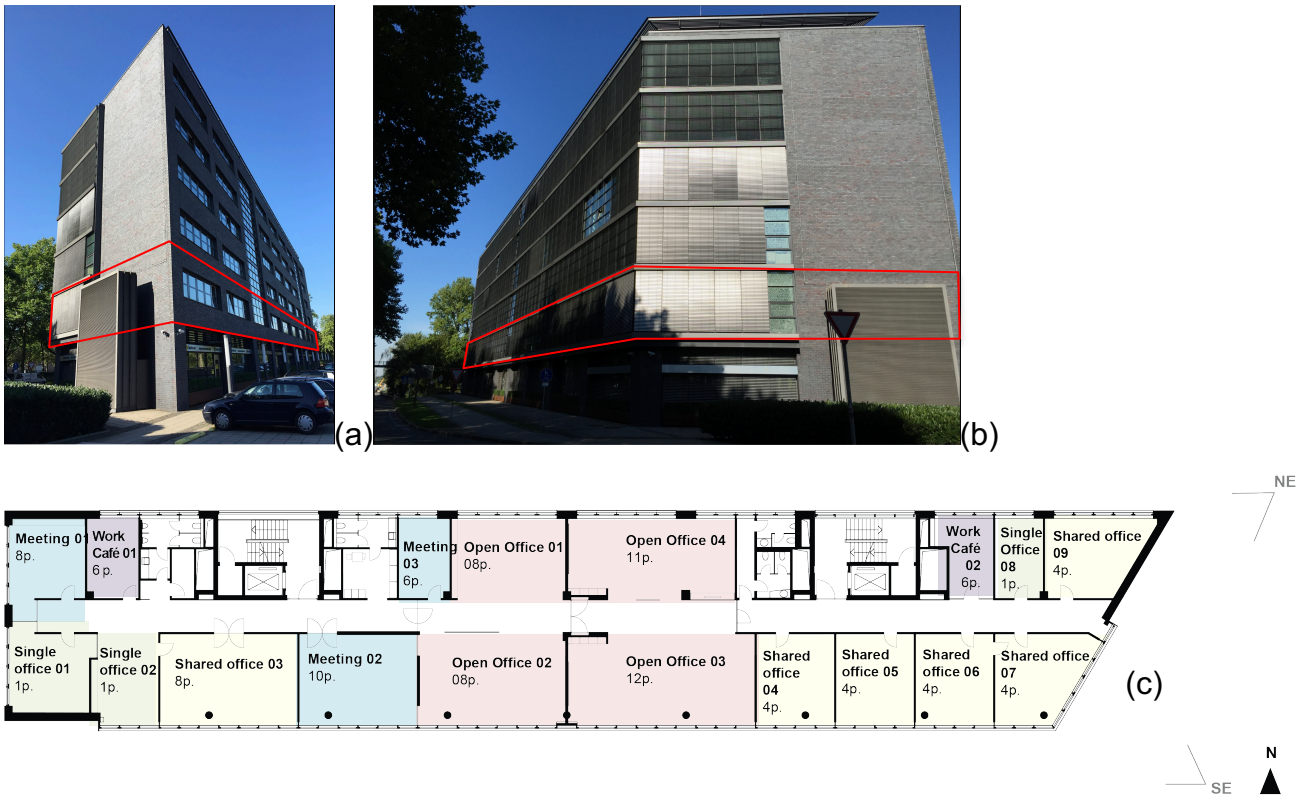

Figure 1 The north-east Façade of the building (a), the south-east façade (b) and (c) the floor plan, shows the area selected for this research.

The number below the office name indicates the number of people per room

2.2 Experimental procedure

To evaluate occupants' perceptions of their office environment, two distinct types of questionnaires (in German) were compared: a one-time questionnaire and a continuous feedback questionnaire. As shown in Table 1, both questionnaires were conducted in 2023.

The first phase involved the one-time questionnaire, which was deployed on March 27, 2023. Following this, a continuous feedback questionnaire was conducted over a three-week period, from June 16 to July 7, 2023.

Table 1 Time indication of the two phases of the project with the one-time questionnaire deployment on March 27th, 2023, and the continuous questionnaire phase which lasted three weeks from June 16th to July 7th of 2023 and took place approximately two months later.

Month	March				April				May				June				July			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
One-time questionnaire deployment				↓																
Continuous questionnaire deployment				↓																
				27.03.2023											3 Weeks 16.06.2023-07.07.2023					

The one-time questionnaire was conducted to assess participants' perceptions of their working environments. The sixty participants invited to take part on the questionnaire received a link to their email address which led to the online questionnaire tool “Qualtrics” (Qualtrics, Provo, UT) on March 27, 2023.

The questionnaire began with demographic questions about gender, type of occupation, preferred days at the office and in home office, department and office type, which was categorized into single offices (one occupant), group offices (up to eight occupants), and open spaces (more than eight occupants). Subsequently, questions on the three different domains of satisfaction were introduced, namely: environmental satisfaction, design concept (which refers to the colors, materials, nature and overall interior design of the office space) and furniture (storage, chair and desk). Finally, after each satisfaction question in each domain, questions on the reasons for providing a satisfaction score were presented to the user. The complete list of questions is shown in Table 2.

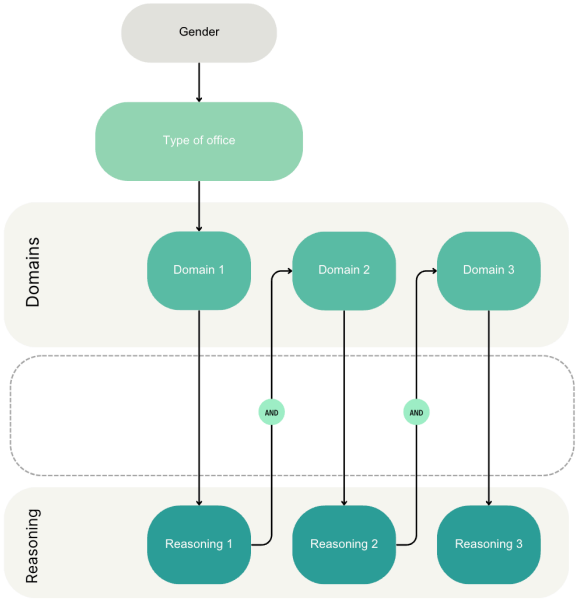

Figure 2 The general structure of the one-time questionnaire with its core building blocks and the two components: "Domains" which are more general, and "reasoning" which refer to statements on items that are part of a domain.

Satisfaction with environmental quality, design concept and furniture were measured through a Likert scale from 1-10 satisfaction scale (1 being "dissatisfied" and 10 being "satisfied") per domain. These satisfaction questions were then followed by questions related to the reason for evaluating items, where occupants were asked to evaluate their agreement with a set of statement regarding potential causes of dissatisfaction or satisfaction from 1 ("Completely Disagree") to 5 ("Completely Agree").

The questionnaire addressed the domains in sequence: environmental quality satisfaction first, followed by design concept, and lastly, furniture. All questions were mandatory, and the average completion time was approximately 15 minutes.

Table 2 The questions, domains and reasonings included in the one-time questionnaire focusing on the three domains chosen for this study (environmental satisfaction, design concept and furniture) with their respective items and scales.

Domain	Item Satisfaction scale 1-10 1= not satisfied, 10= satisfied	Reasoning Likert Scale 1= completely disagree, 5= completely agree
Environmental Comfort	Satisfaction with overall lighting	• I am satisfied with lighting in this office. • I am satisfied with the sun shading in this office.
	Satisfaction with overall thermal environment	• I am satisfied with thermal environment in this office • I am satisfied with the availability of personal control in this office.
	Overall acoustic satisfaction	• I am satisfied with the acoustic environment in this office.
Design concept	Satisfaction with the overall office design	• I am satisfied with the with the color concept in this office. • I am satisfied with the material concept in this office. • I am satisfied with the nature concept in this office.
	Satisfaction with the overall privacy	• I am satisfied with the availability of visual privacy in this office • I am satisfied with the availability of acoustic privacy in this office
Furniture	Desk satisfaction	• I am satisfied with the comfort of the desk in this office.
	Chair satisfaction	• I am satisfied with the comfort of the chair in this office.
	Storage satisfaction	• I am satisfied with the availability of personal storage in this office • I am satisfied with the availability of storage space in this office (for archiving or storing work-related objects)

After the one-time questionnaire was distributed, approximately 10 weeks later, we implemented a method for the enabling continuous collection of occupant feedback. This was performed by installing Quick Response codes (QR Codes) with a permanent website link to an online questionnaire. The link was always accessible to occupants to provide real time feedback. This questionnaire was designed as a flexible, interactive and on-demand system, that allowed participants to provide feedback at their convenience, and as frequently as desired. The QR codes were placed at each desk and at the entrance of each office, as shown in Figure 4a and 4b. Participants were allowed to scan the QR code and answer the questionnaire in any room and at any time during the day.

(a)

(b)

Figure 4 Image of the signs with QR Codes to access questionnaires to provide feedback both on the desk (a) as well as below the light switches (b) in each office room

Figure 5 displays the general structure of the continuous questionnaire. Upon starting the questionnaire, participants first selected the specific office they were occupying at the time of completion, ensuring that feedback was location specific. This questionnaire had three components: selection of the domain to be evaluated (referred in Figure 5 as “Domains”), questions on the satisfaction with the selected domain (referred in the figure 5 as “item satisfaction”, and questions for investigating the reasons behind the satisfaction score provided (referred in Figure 5 as “Reasoning”). They then chose the domain to provide feedback —environmental satisfaction, design concept, or furniture. Participants were then asked to rate their satisfaction with items within the selected domain using a 1-10 scale (1 = dissatisfied; 10 = satisfied).

The continuous feedback questionnaire employed conditional logic to enhance response efficiency. Specifically, if a participant rated their satisfaction as 5 or below on the 0-10 scale, they were prompted with additional Likert-scale statements (ranging from "completely disagree" to "completely agree") to elaborate on their reasons ("reasonings"). Conversely, if their rating was above 5, the next item within the same domain appeared. Once all items in a domain had been rated, the questionnaire concluded.

This logic-based design focused questionnaire efforts on areas of dissatisfaction, thereby reducing the respondent’s burden by eliminating unnecessary questions when satisfaction levels were high, while still collecting comprehensive feedback on all items relevant to the selected domain. The complete list of questions is reported in Table 3.

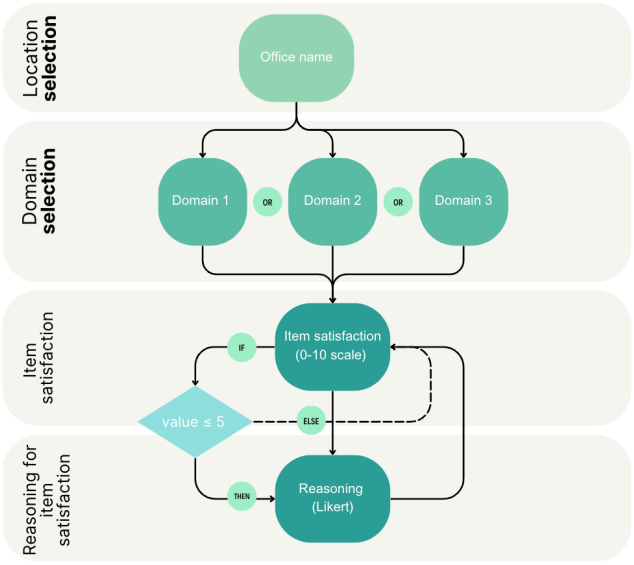

Figure 5 The general structure of the continuous questionnaire with the three components: “Domains” (the category the participants choose to respond), “Items” (the domain of the question) and the “reasoning”.

Domain Satisfaction scale 1-10 1= dissatisfied, 10= satisfied	**Reasoning** Likert Scale 1= completely disagree, 5= completely agree
Satisfaction with Environmental Comfort	• I am satisfied with the room lighting in the office. • I am satisfied with desk lighting in the office. • I am satisfied with the sun shading at the office. • I am satisfied with the thermal environment in the office in summer. • I am satisfied with thermal environment in the office in winter • I am satisfied with the with air quality in the office. • I am satisfied with the acoustic environment in the office. • I am satisfied with the availability of personal control in the office
Satisfaction with the design concept	• I am satisfied with the availability of visual privacy in the office. • I am satisfied with the availability of acoustic privacy in the office. • I am satisfied with the nature concept in the office. • I am satisfied with the color concept in the office. • I am satisfied with the material concept in the office.
Satisfaction with the furniture	• I am satisfied with the condition of chair and desk (too worn or used) • I am satisfied with the comfort of desk and chair • I am satisfied with the Ergonomics of desk and chair • I am satisfied with the availability of personal storage • I am satisfied with the availability of storage space.

Table 3: List of questions per each domain (environmental satisfaction, design factors and furniture), related to the satisfaction and the reasons for satisfaction or dissatisfaction.

2.3 Data analysis

The statistical analysis was conducted in multiple stages, utilizing both descriptive and inferential statistics to comprehensively evaluate occupant satisfaction and compare questionnaire methodologies.

To gain an initial understanding of the data, frequency and percentage distributions were evaluated for each Likert-scale option across all questionnaire items. This provided a clear overview of how satisfaction levels were distributed within each domain, highlighting the most and least common responses. By examining these distributions, patterns in occupant satisfaction could be identified, offering insights into areas of strength and those needing improvement. The mean and count of responses were computed for each questionnaire item to summarize the typical response within each domain. Additionally, measures of dispersion such as standard deviation and range were calculated to assess the variability and spread of responses. For the

continuous feedback questionnaire, we assessed to detect temporal trends or shifts in satisfaction levels over the three-week questionnaire period. The Mann-Whitney U Test was applied to compare mean satisfaction scores for each item comparing the type of room on the continuous feedback questionnaire.

3.0 Results

3.1 Results from the one-time questionnaire

Out of the sixty occupants who agreed in participating, fifty-six participants completed the one-time questionnaire, which represents a participation rate of 93,33%. The gender distribution was 55,35% female and 44,64% male. There were no answers recorded for “non-binary” or “prefer not to say”.

Figure 6 shows the overall satisfaction across the three domains. For comparison purposes, the scale has been normalized.
The graph shows a higher proportion of dissatisfactory responses. Specifically, the design concept domain received 16 responses for 5 (dissatisfied), followed by the domain “furniture” with 15 responses at “dissatisfied” and environmental satisfaction with 13 responses no statistically significant differences between these categories. However, the design concept domain had a greater concentration of responses in the lowest range (below the midpoint of 3) totaling 35 responses, compared to the environmental satisfaction (33 responses) and furniture (31 responses). Notably, none of the three domains reached the maximum satisfaction score of 5.

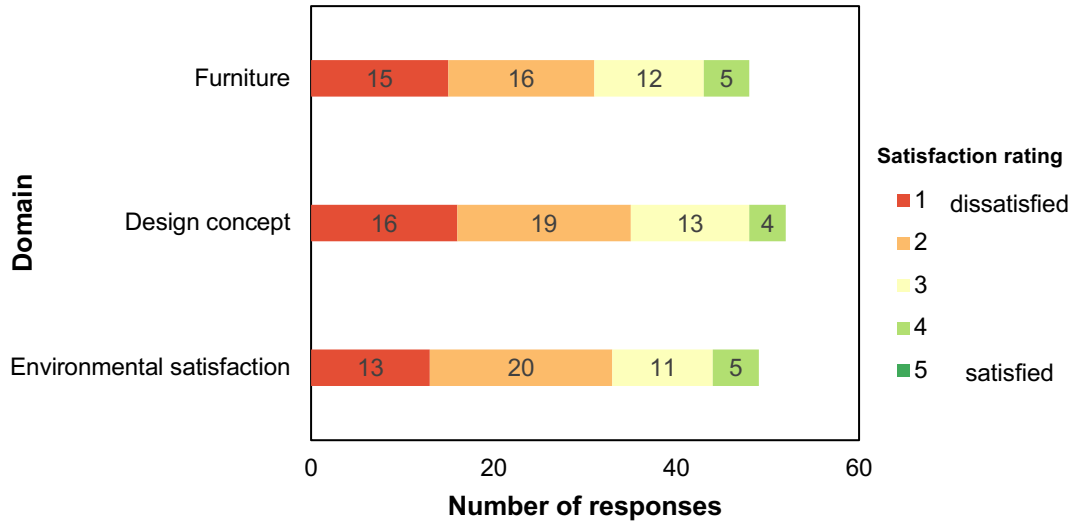

Figure 6 Total number of feedback provided per response rating in each of the domains.

The overall satisfaction level per domain in two office typologies: shared enclosed offices (2-8 occupants) and open space offices with no partitions (9-12 occupants) is shown in figure 7. Overall, satisfaction scores are notably low, with no domain reaching a mean score of 3 on the 1 to 5 satisfaction score scale.

The results indicate that satisfaction levels in shared offices are higher than in open space office. Environmental satisfaction scores the lowest satisfaction ratings in open office spaces.

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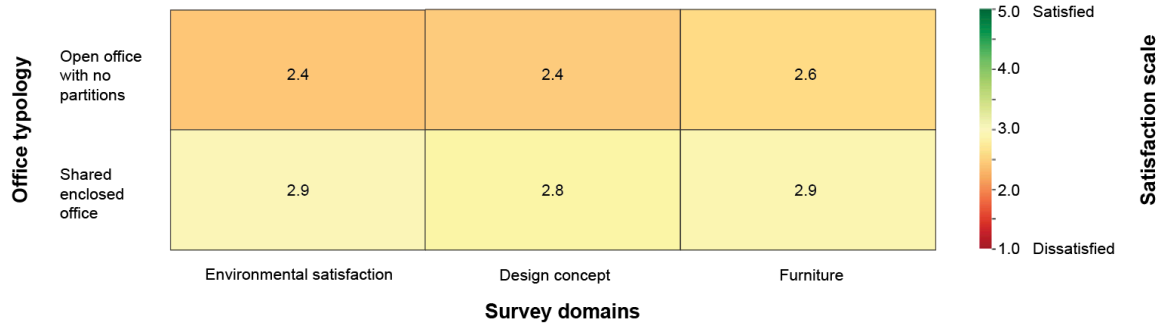

Figure 7 Overall satisfaction level per room typology (shared office and open office) across the three domains: environmental satisfaction, design concept, and furniture.

Figure 8 shows the overall responses in terms of satisfaction levels and related reasons. Varying satisfaction levels were observed within the reasoning across the three domains. Regarding environmental satisfaction (Figure 8a), sun shadings and room lighting have the highest satisfaction scores in this domain, (above 3). Satisfaction with the thermal environment in winter received a moderate score (2,7). The satisfaction with the availability of personal control scored the lowest overall, with a rating below 2.0. This suggests that personal control in the indoor environment presents significant issues in this space.

Regarding the design concept domain (figure 8b), the satisfaction with the material and color concept scores the highest, with a score of around 3.0, followed by satisfaction with the nature with a score of 2.7 and the satisfaction with the availability visual privacy, with a score of 2.4. The lowest satisfaction in this domain relates to the availability of acoustic privacy, scoring 1.7.

In the furniture domain (figure 8c), respondents are highly satisfied with the availability of personal storage and storage space scoring 3.6 and 2.9 respectively. The condition and comfort with desk and chair present lower satisfaction scores, below 3.0. Nonetheless, the ergonomics of the desk and chair presents the lowest satisfaction score, with 1.7.

The standard deviation for the environmental satisfaction goes from 1-1.2, for design concept from 0.8-1.5, and for furniture 1.1-1-2, (p-values <0.05, Mann–Whitney U test).

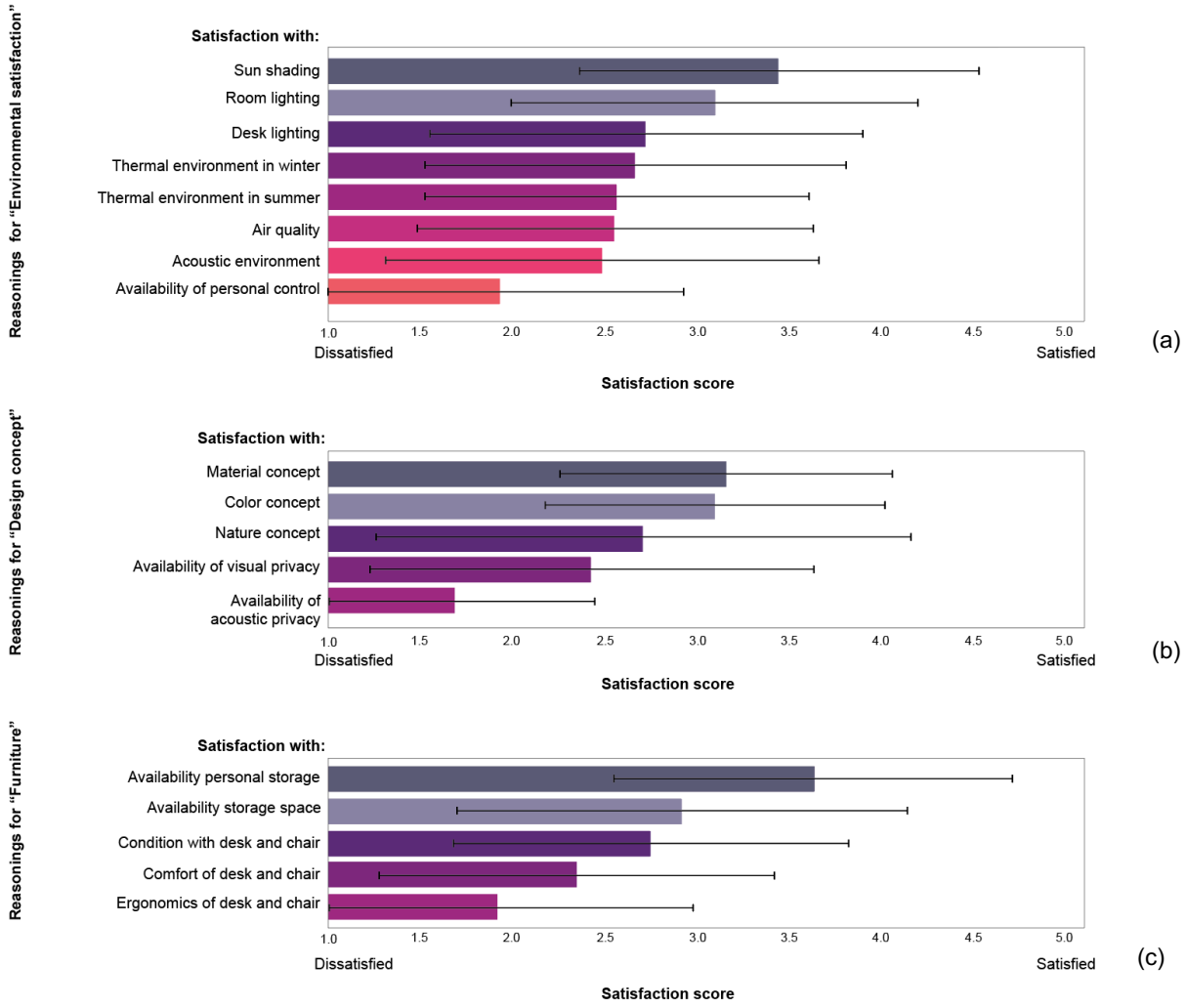

Figure 8. Level of satisfaction per reasoning across domains.

Figure 9 shows the level of satisfaction per item for open space office versus shared office space with partitions. The most significant difference is observed in the acoustic environment (Figure 9), with shared offices with partitions offering higher levels of satisfaction compared to open offices. Additionally, shared offices appear to provide more adequate personal storage than open office spaces and through their design, and visual privacy. These three items were significantly different between the open space office and the single office.

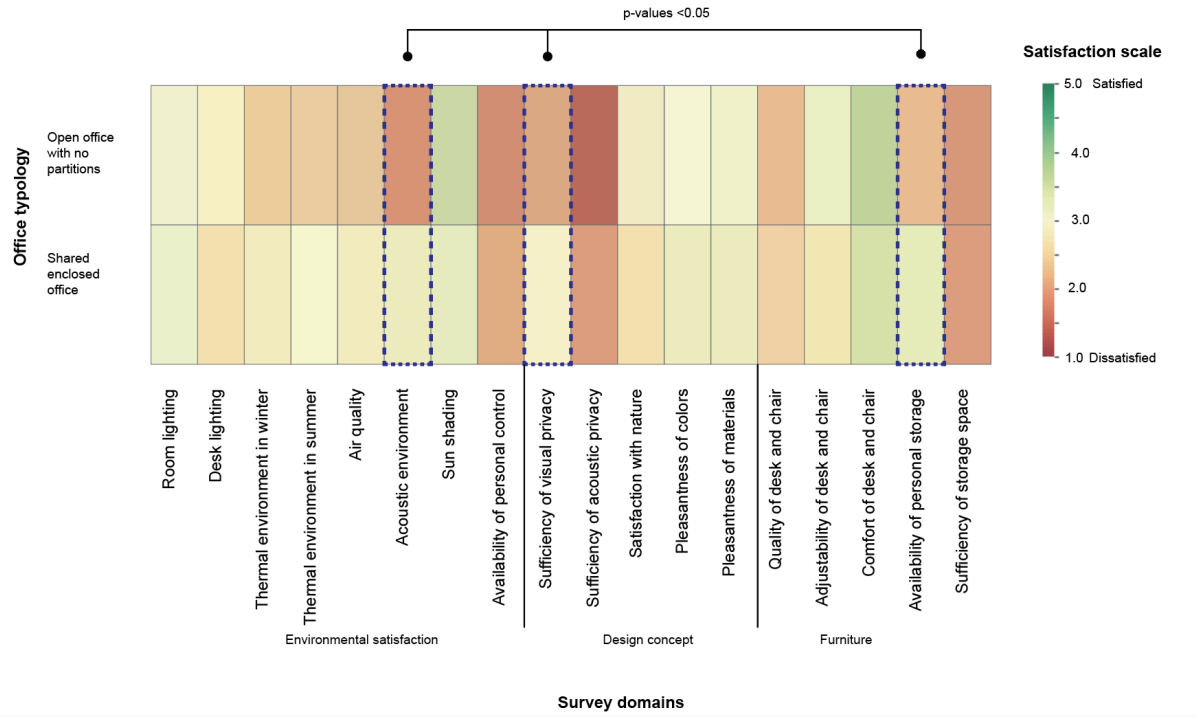

Figure 9. Satisfaction with reasoning per room type. The marked reasonings are statistically relevant (p-values <0.05, Mann–Whitney U test)

3.2 Continuous Feedback

We collected a total of 168 responses over a three-week period (see Figure 10). The graph indicates a general trend of declining participation in the questionnaire, with three noticeable peaks: the first on the initial day of the questionnaire (Monday, June 19, 2023), second peak occurred a week later (Monday, June 26, 2023), and the third towards the end of the data collection phase (Thursday, July 6, 2023). Analyzing the distribution of responses by day of the week, Monday received the highest percentage of responses (35.1%), followed by Tuesday (25.0%), Thursday (20.2%), Wednesday (14.3%), and Friday (7.1%). This distribution was statistically significant ($p < 0.001$, Chi-Square). However, when examining the mean satisfaction scores, no significant differences were observed across the different days.

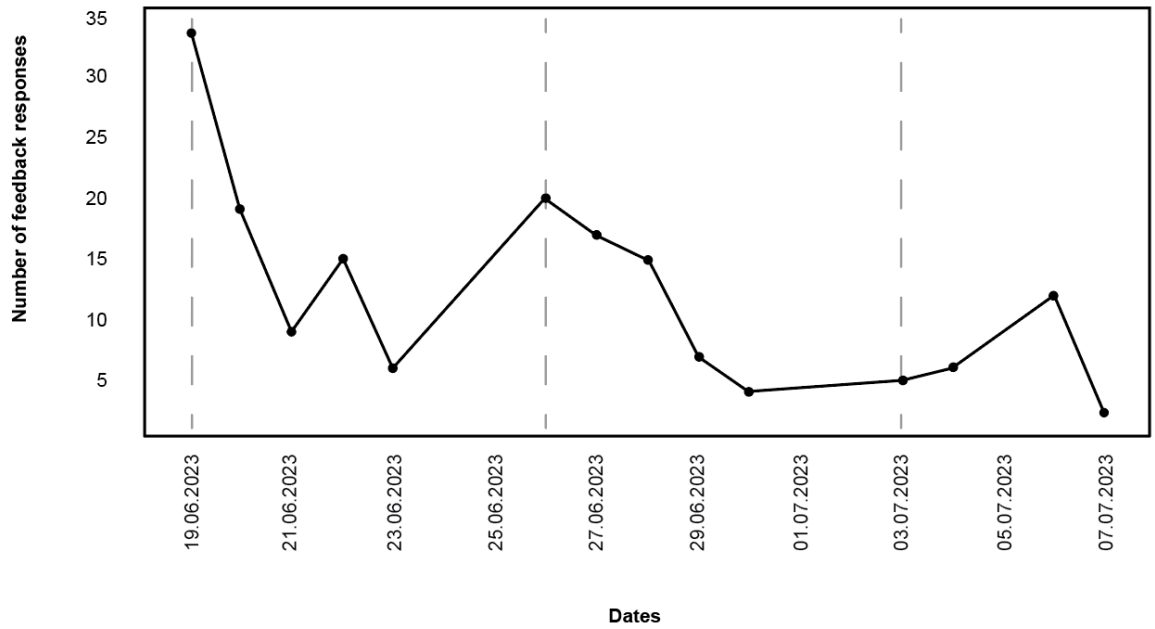

Figure 10. Number of continuous feedback responses over the three weeks' time.

Figure 11 shows the total amount of feedback per domain and room. Despite several rooms had similar levels of occupancy, a total of two spaces received the highest amount of feedback: the open space "office 04", a south-facing open-office space accommodating up to 12 employees, and the "Work Café 01", a north-facing social space where employees can work, have spontaneous encounters or take a break. This area is accessible to all employees. Overall, the domains received a similar number of feedback from occupants. Only availability of storage space and privacy had a slightly lower amount of feedback.

Meeting rooms received the least amount of feedback. Office 01 and Office 02, both single offices, also showed a low degree of engagement.

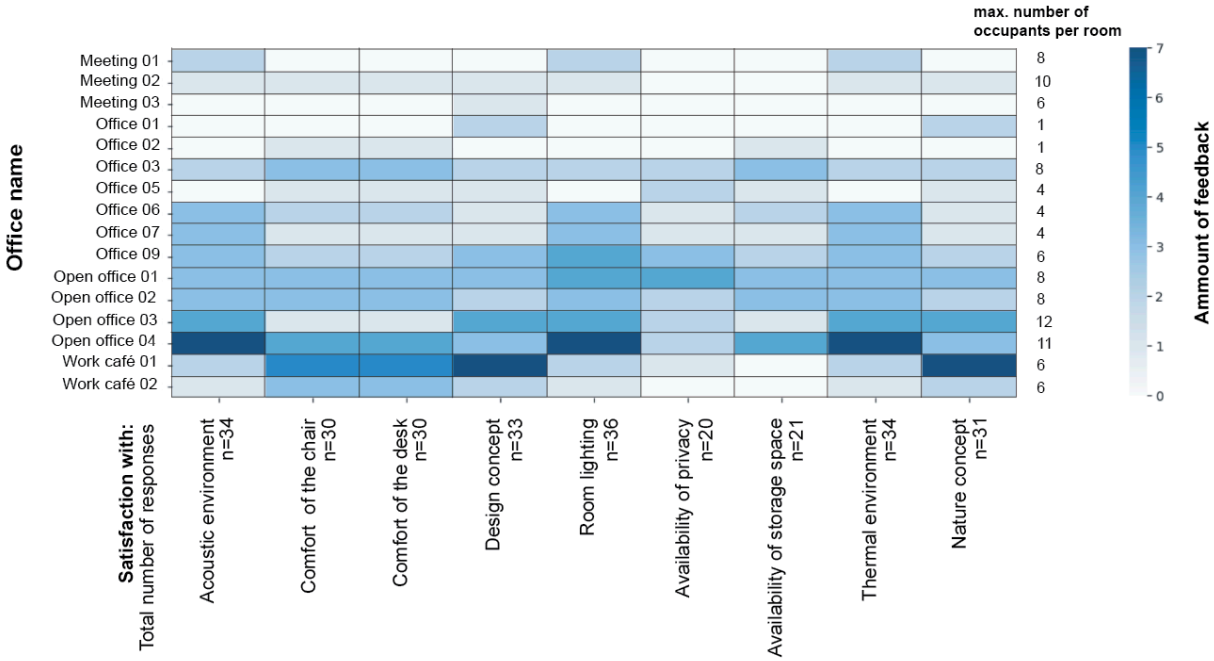

Figure 11. Number of feedback responses per office room and questionnaire item. The darker the colors, the highest number of feedback was collected. Only rooms with feedback are reported.

As represented in figure 12, the heatmap highlights variability in occupant satisfaction ratings across different office spaces and items. Most offices tend to have lower satisfaction, with few achieving higher satisfaction scores for particular items. The distinct color differences help to pinpoint areas where satisfaction is higher or lower across different office environments. The graph shows the offices with at least one feedback in any of the items. Thus, office 04 and 08 do not appear on the graph, since no feedback was collected in these two spaces.

Work Café 01, which received the highest amount of feedback, also shows the lowest satisfaction scores for privacy and storage options. However, as this is a social space intended for spontaneous working sessions, these factors may not be as relevant for a design intervention. In contrast, the open offices (especially open office 02) report higher levels of dissatisfaction with respect to acoustics, room lighting, availability of privacy and the thermal environment, which are crucial considerations for future improvements.

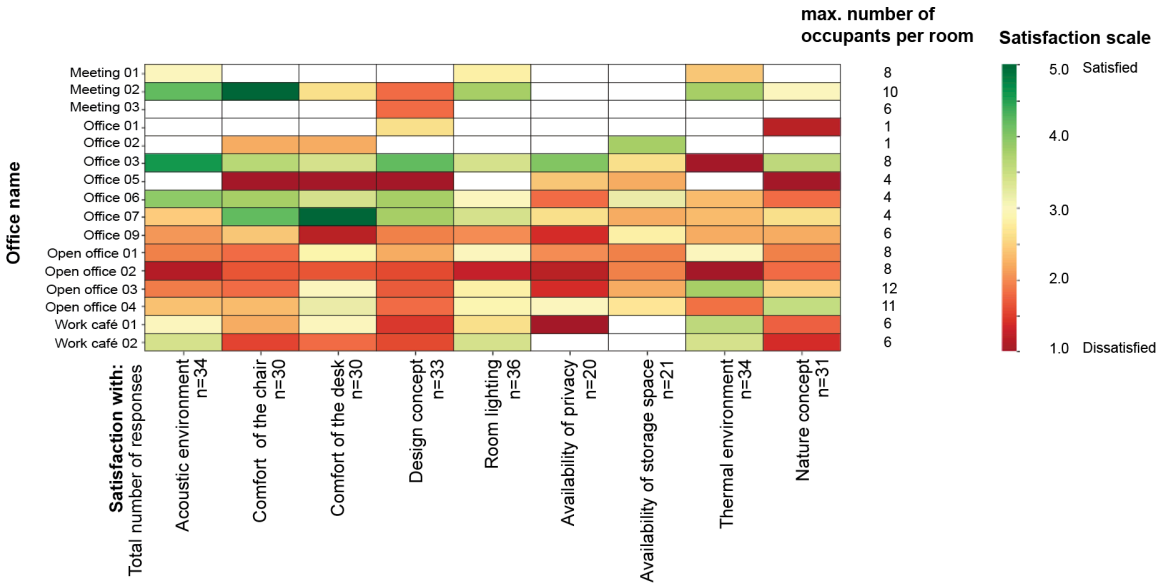

Figure 12 represents the item mean satisfaction scores across the different office rooms (listed on the y-axis) and specific items (shown on the x-axis). The color scale, ranging from red to green, indicates the mean level of satisfaction, with red colors representing lower satisfaction (1 = dissatisfied) and green colors representing higher satisfaction (5 = satisfied).

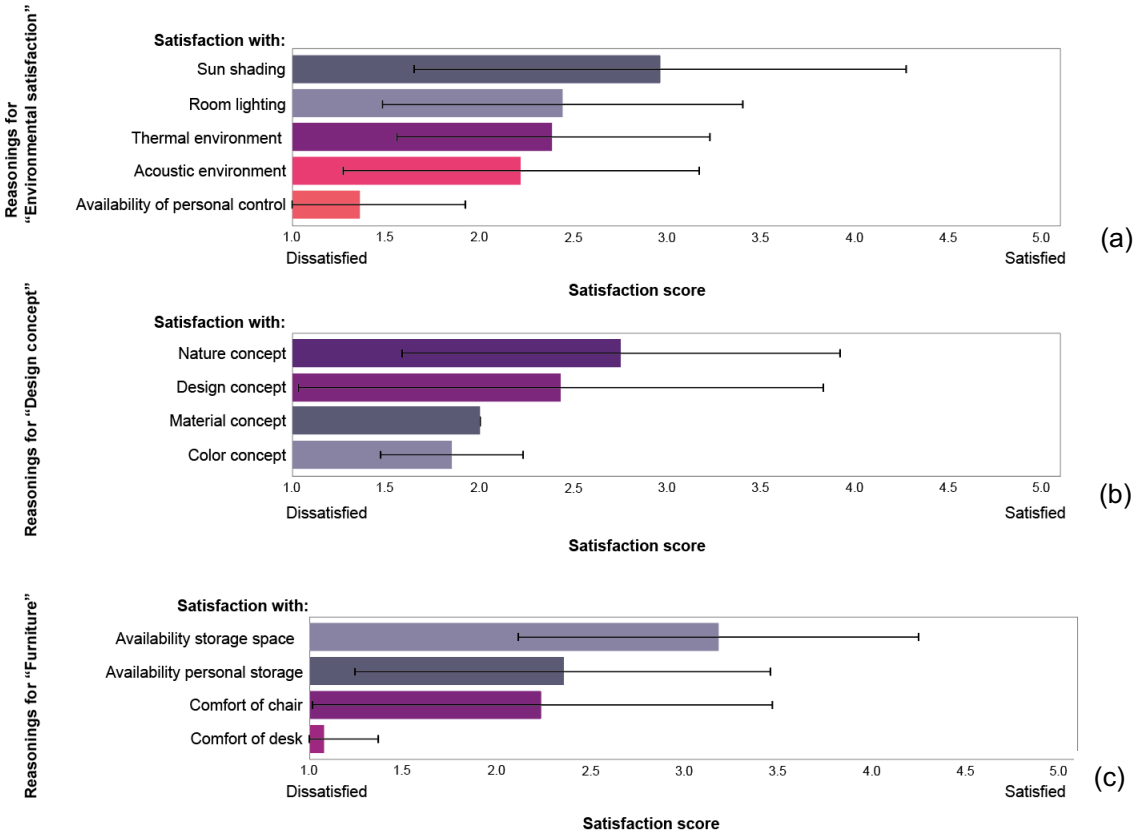

Figure 13 illustrates the rationale ("reasoning") behind satisfaction ratings across the domains of environmental satisfaction, design concept and furniture,

revealing a general trend of dissatisfaction in all domains. The highest satisfaction is reported for the availability of storage space, while the lowest is for the satisfaction with the comfort of the desk and the availability of personal control.

Discussion

The participation rate of the one-time questionnaire was higher than the participation rate of the continuous questionnaire, which achieved a maximum number of 35 responses at the beginning (approx.. 50% of the occupants). The high participation rate of the one-time questionnaire (93.33%) may be attributed to the fact that, although the questionnaire takes longer to complete (15 minutes on average), participants were aware that they would only need to respond once. In addition, this questionnaire was distributed at the beginning of the study, where occupants were new to the overall data campaign. The limited amount of time for the questionnaire completion, which was available only during one day, could also have encouraged occupants to participate, because of the deadline for its completion.

The results of the continuous feedback survey show that meeting rooms had low engagement rates. This may be attributed to their infrequent use and the fact that, when occupied, they typically serve a specific purpose for a limited duration. Also, office 01 and 02 and 08 (all single offices) reported no feedback, probably since these spaces don’t use flexible desking, so the respondents could be easily identified.

Both from the continuous method and the one-time survey, the overall satisfaction levels are generally low. The greatest dissatisfaction is observed in open office spaces, particularly concerning the satisfaction with the adjustability of desks and chairs, the satisfaction with the availability of acoustic privacy, the acoustic environment (12) and the availability of personal control.

Contrary to expectations, rooms located in the northern part of the building (work café 01 and 02, open offices 01 and 04, single office 08, and shared office 09), which receive less natural light, did not receive the lowest ratings for occupant satisfaction with lighting in the continuous feedback survey. This finding aligns with the results of the one-time survey, where satisfaction with lighting received the second-highest ratings, following satisfaction with sun shading.

Additionally, results from the continuous feedback questionnaire indicated a slightly lower level of dissatisfaction with the acoustic environment compared to the one-time questionnaire. However, acoustic satisfaction scores consistently remained below the midpoint of 2.5 across both methods, demonstrating alignment between the two surveys. This low satisfaction with acoustics is also reflected in the low ratings for the overall design concept of the office space in the one time survey, where acoustic privacy identified as a primary factor influencing these perceptions.

Click or tap here to enter text.Despite the lower engagement, the continuous questionnaire provides additional dynamic and temporal insights by capturing feedback over time, allowing for the analysis of changes in perception in time. Additionally, it offers insights into how frequently participants engage with the questionnaire and when they are most active, with this research showing the highest engagement on Mondays, followed by Thursdays. This latter may be dependent on the weekly occupancy of the office spaces.

In the continuous questionnaire, participation levels vary: Some participants respond multiple times, providing more data points, while others contribute less frequently, particularly on areas they may not frequently use or show interest in (like the meeting rooms, which were barely rated). In this study, it was not possible to track feedback from the same individual, which could have offered more detailed insights into each participant's level of engagement.

The results of this research acknowledge the decline in engagement with the continuous questionnaire tool and the low overall participation rate with it (less than 20%). With higher engagement, this method could yield more detailed information on occupant satisfaction, resulting in a richer dataset for each office room. It is recommended to implement strategies to maintain participant engagement in continuous longitudinal questionnaires to encourage consistent feedback.

The continuous questionnaire appears to offer richer insights into trends and patterns. By capturing multiple responses, it enables a more nuanced analysis of correlations and satisfaction trends over time, as well as between specific rooms. The variability in responses across different rooms and timeframes provides a deeper understanding of occupant satisfaction with the office environment.

Furthermore, continuous feedback allows participants to provide targeted feedback about specific locations (e.g., individual rooms) and categories (e.g., room climate, furniture). As some participants engage more frequently, their feedback becomes more detailed for certain areas or categories.

In open office 04, most of the feedback pertains to environmental satisfaction, specifically regarding temperature, lighting, and acoustics. Respondents highlighted dissatisfaction with personal control over temperature, lighting quality, and acoustic privacy. Similarly, in work café 01—a space intended for informal work and social interactions—most feedback focuses on the design of the space, with particular emphasis on satisfaction with colors and natural elements. Work café 01 received the second-highest volume of feedback, indicating frequent use and suggesting that particular attention to its design may be warranted. However, it should be noted that these observations lack statistical significance due to limited data.

Limitations

Limitations of this study include the fact that the questionnaire results cannot be generalized, as they are based on a specific group of employees within a single office setting. Additionally, the questionnaire tool focused only on three example domains. Future research should incorporate a wider range of items and domains that, according to existing literature, influence occupant satisfaction in office spaces. Expanding the questionnaire to include additional domains and applying it in diverse contexts would provide a broader perspective and may yield different results. Furthermore, the continuous questionnaire data collection was limited to three weeks; extending this period in future studies is recommended to capture more comprehensive insights. The low response rate in the continuous feedback system also suggests the need to implement participant engagement strategies to maintain motivation and encourage consistent feedback.

Conclusions:

We analyzed satisfaction levels across three domains using pre-occupancy evaluations (PrOEs) from a single floor in an office building. Data were collected from two questionnaires administered at different intervals: a one-time questionnaire and a continuous feedback questionnaire.

Overall, occupant satisfaction scores low throughout all domains, in both surveys.

In the one-time questionnaire, open space office layouts exhibited lower satisfaction ratings compared to single office spaces. Environmental satisfaction, particularly acoustic privacy, was the lowest-rated domain, while ergonomic factors related to chairs and desks, as well as the availability of personal control, also received low scores. This trend was also visible in the continuous survey, where the lowest occupant satisfaction was in the “open office 02” which is congruently, an open office space with no partitions.

None of the other open offices received occupant scores above However, this survey also shows dissatisfaction in office 05, especially in 4 out of 9 reasonings asked. It is also the room with the highest dissatisfaction with the nature concept, the comfort of desk and chair and the design concept of the office room within the 16 rooms rated.

Secondly, the continuous feedback questionnaire indicated a slightly lower level of dissatisfaction with the acoustic environment than the one-time questionnaire. Nonetheless, scores for acoustic satisfaction remained below the midpoint of 2.5 in both questionnaires, reflecting a consistent concern across both questionnaire methods.

Third, satisfaction with desk and chair comfort varied between the two questionnaires. When combined into a single question in the one-time questionnaire, satisfaction scored above 2.0. However, when asked separately in the continuous survey, it became evident that dissatisfaction centered primarily on the desk, with this item scoring below 1.5.

Satisfaction levels for sun shading, room lighting, storage space, personal storage, and nature concepts were consistent across both questionnaires. However, perceptions differed for other items: thermal environment (above 2.5 in the one-time questionnaire, below 2.5 in the continuous questionnaire), color concept (3.0 in the one-time questionnaire, below 2.0 in continuous feedback), and material concept (above 3.0 in the one-time questionnaire, 2.0 in continuous feedback).

This research highlights that acoustic privacy and personal control are persistent issues, with consistently low satisfaction scores across domains. In contrast, elements such as sun shading, storage availability, and natural design features show high satisfaction, indicating they align well with user expectations. Improving areas related to acoustic privacy, furniture ergonomics, and personal control could significantly enhance overall occupant satisfaction.

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