Human Factors and Ergonomics in Design, Vol. 210, 2026, 228–234
https://doi.org/10.54941/ahfe1007444

Revealing Hierarchical Evaluation Structures in Office Chair Usage Using the Evaluation Grid Method

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ABSTRACT

Diversification of office workstyles has increased the need to understand how users evaluate office chairs in real work contexts. This study explored users' hierarchical evaluation structures for five office chairs with different characteristics using the Evaluation Grid Method (EGM). Five office staffs who regularly use office chairs were recruited in this study (mean age = 38.6 years, SD = 8.93). Over five weeks, each participant used one provided chair from Monday to Wednesday and returned to their usual chair on Thursday and Friday; the weekly chair order was randomized. After the usage period, individual EGM interviews were conducted by at least two researchers, who recorded responses and constructed evaluation structure diagrams in real time, then confirmed the completed structure with each participant. Each participant ranked the five chairs and proceeded through stepwise comparisons with laddering to elicit links between concrete attributes and higher-level values. Participant-level maps were integrated by retaining items shared by more than one participant and merging semantically similar items. The integrated map highlighted pathways connecting lightweight/compact attributes with perceived ease of movement and social communication, and pathways linking fit- and posture-related perceptions with reduced fatigue and sustained work and concentration. These findings illustrate how users translate chair attributes into workplace-relevant values and can inform user-centered chair design requirements.

Keywords: Office chair, Evaluation Grid Method (EGM), Laddering interview, Evaluation structure

INTRODUCTION

Recent diversification of office environments, including flexible workstyles and increased within-office mobility, has heightened expectations for office furniture that supports not only task efficiency but also psychological comfort. Within this context, office chairs occupy a central position because they shape seated posture, perceived physical load, and the overall experience of desk-based work.

In response to these demands, the office-chair industry has continued to develop multifunctional and ergonomically advanced products. However, evidence suggests that high adjustability does not automatically translate into effective use. Field studies indicate that office workers may know only a

Received February 2, 2026; Revised April 7, 2026; Accepted April 27, 2026; Available online July 20, 2026

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subset of the adjustable functions available on their chairs and may use even fewer, with cognitive barriers (e.g., limited understanding of how to adjust or why it matters) playing a substantial role in non-use (Underwood and Sims, 2019). Earlier ergonomics work has also highlighted that "ergonomic chairs" can differ greatly in control layouts and adjustability features, implying that interaction with chair controls can be complex and potentially discouraging in real usage (Helander, Zhang and Michel, 1995).

A further challenge is that chair evaluation and ergonomic assessment research has often emphasized quantitative measurements and standardised assessment approaches. A recent systematic review of sitting and working furniture ergonomics (Bai, Kamarudin and Alli, 2024) reports a strong reliance on quantitative methods and highlights gaps related to evaluation diversity and contextual factors, motivating complementary qualitative approaches that can capture how users form judgments in everyday use. It suggest that office-chair design should be informed not only by biomechanics or laboratory comfort metrics, but also by a clear understanding of how users interpret and prioritise chair-related experiences and translate them into value judgments during real work.

To address this need, the present study applies the Evaluation Grid Method (EGM), a semi-structured interview technique designed to elicit hierarchical preference structures from concrete attributes to more abstract evaluation concepts (Sanui, 1996; Sanui and Maruyama, 1997). By applying EGM after extended, real-world chair use, this research aims to clarify how workers connect chair-related experiences to higher-level evaluations. The elicited structures are visualised as participant-level evaluation structure diagrams, which are subsequently synthesised into an overall integrated value map. Such qualitative structuring is expected to support better alignment between designers' assumptions and end-users' evaluation perspectives, thereby informing future office-chair design requirements.

METHOD

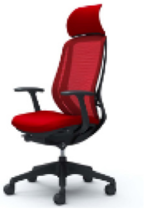
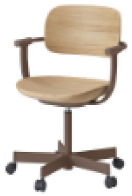
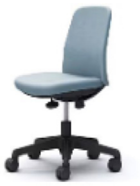
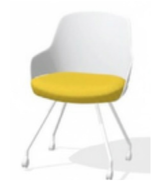
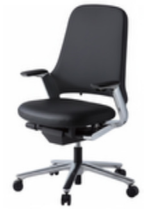
Participants

Five female administrative staff members at Osaka Metropolitan University who routinely use office chairs as part of their daily work participated in this study (mean age = 38.6 years, SD = 8.93). The study protocol was approved by the Ethics Committee of the Graduate School of Human Life and Ecology, Osaka Metropolitan University. Written informed consent was obtained from all participants prior to participation.

Study Design

Five office chairs with different characteristics (Figure 1) were selected for the study. A five-week, within-participant design was used so that each participant experienced all five chairs. The order of chair assignment across weeks was randomized.

Table1: Five office chairs chosen in this study.

Name (Maker)	Chair 1	Chair 2	Chair 3	Chair 4	Chair 5
	Sylphy (OKAMURA)	vertebra03 (ITOKI)	Lives (OKAMURA)	Liite (KOKUYO)	LEONIS (ITOKI)
					
Types	Task chair	Task chair	Task chair	Light chair	Executive chair
Surface's material	Mesh	Wooden	Fabric	Fabric	Leather
Height of backrest	High	Low	Mid-high	Low	Mid-high
Locking feature	Synchronized locking	Sliding synchronized locking	Synchronized locking	Not equipped	Synchronized locking
Armrest	Adjustable armrest	Fixed armrest	Not equipped	Not equipped	Fixed armrest
Lumbar support	Equipped	Not equipped	Not equipped	Not equipped	Not equipped
Colour	Vivid	Natural	Orthodox	Multi-colour	Black/Steel
Design style	High-tech	Nordic	Minimal	Minimal	High-tech
Appearance	Heavy	Slim/Compact	Slim/Compact	Slim/Compact	Heavy

Procedure

Each participant used one provided chair from Monday to Wednesday and returned to their usual chair on Thursday and Friday. The usual chair was the same model for all five participants, which reduced the possibility that differences in baseline chair conditions influenced the evaluations. This schedule was repeated across five weeks. Participants performed their routine desk work as usual and were instructed to use the chair under their usual working conditions. They were also asked not to add any external accessories (e.g., seat cushions or lumbar pads) during the evaluation period.

After completion of the five-week usage period, individual semi-structured interviews were conducted and analysed using the Evaluation Grid Method (EGM) to examine participants' perceptions, discomforts, and decision-making criteria. EGM is a laddering-based interview approach that elicits a hierarchical evaluation structure by linking concrete/physical attributes to higher-level value concepts. In this study, evaluation structures were elicited from the perspective of "How do you feel while using this chair?"

To support objectivity, at least two researchers conducted the interview simultaneously and recorded participants' responses. During the interview, the researchers constructed the evaluation structure diagram in real time and subsequently confirmed the completed diagram with each participant to ensure that it accurately reflected the participant's intended meaning.

At the start of the EGM session, each participant ranked the five chairs from best to worst based on overall evaluation. Elicitation then proceeded through structured, stepwise comparisons beginning from the lower-ranked options. Participants first compared the two lowest-ranked chairs (rank 4 vs rank 5) and were asked: "Why do you think rank 4 is better than rank 5?" Follow-up laddering questions were used to elicit (i) the value brought by the stated advantage (e.g., "What kind of value has this advantage brought to you?") and (ii) the concrete/physical attributes that supported that advantage (e.g., "What kind of physical attributes made you think of this advantage?").

After completing the comparison of ranks 4 and 5, the lower-ranked set was treated as a single reference group for subsequent comparisons. Specifically, the participant compared rank 3 against the combined group {4,5}, then rank 2 against {3,4,5}, and finally rank 1 against {2,3,4,5}. Outputs across these successive comparisons were integrated into one participant-level evaluation structure diagram summarizing the participant's hierarchical evaluation structure across all five chairs.

Results & Discussion

When integrating participant-level evaluation structure diagrams, the resulting network can become overly complex and difficult to interpret if all elicited items and linkages are retained. Therefore, we simplified the diagram prior to interpretation. Specifically, the five participant-level diagrams were first merged into a single integrated diagram, and only evaluation items that appeared in more than one participant's diagram (frequency > 1) were retained. This simplification reduced visual complexity while preserving common evaluation terms across participants. In the resulting diagram, higher-order value concepts are placed on the left side and lower-order (more concrete/physical) concepts are placed on the right side. The node layout was arranged to avoid label overlap; thus, the absolute positions and distances between nodes do not carry quantitative meaning. The results of simplified evaluation structure diagram is shown in Figure 1.

Figure 1 shows the integrated evaluation structure diagram derived from five participants across five chair conditions. This structure could be divided into 3 pathways. The first pathway suggests that users' higher-level workplace experiences are closely tied to concrete chair attributes through intermediate evaluations. Notably, a socially oriented attribute ('It makes me feel easy to talk to the people next to me') was connected to mobility-related perceptions ('It makes me feel easy to move', 'It makes me feel light'), which in turn were linked to physical design elements such as 'lightweight materials' and 'compactness'. This pathway implies that 'ease of communication' may not be evaluated as a purely interpersonal factor but may be supported by physical attributes that feel effortless to move in a office environment.

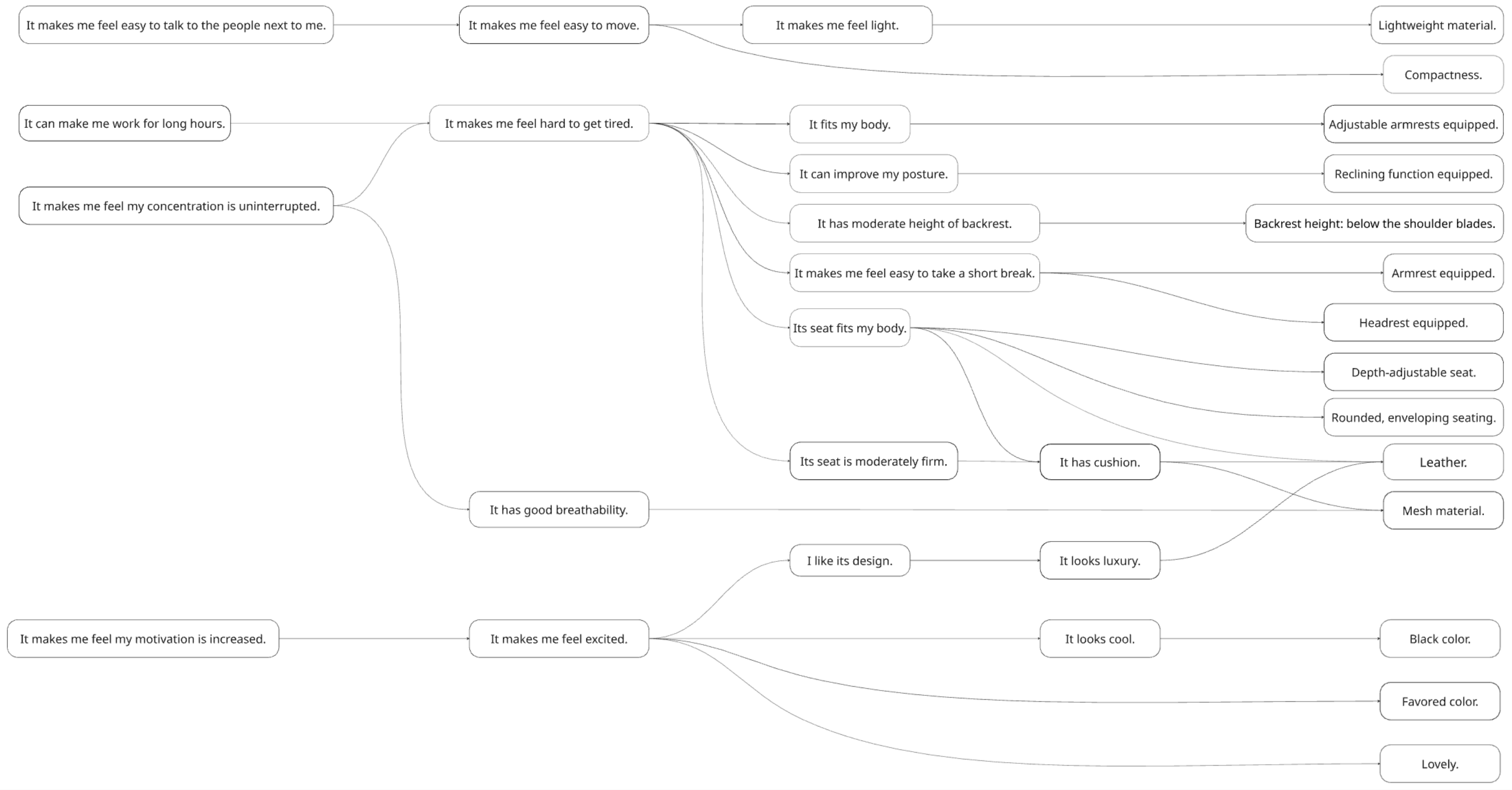


Figure 1: Integrated evaluation structure diagram derived from five participants across five chair conditions.
(left: higher-order concept (abstract psychological value); right: lower-order concept (concrete physical attribute)).

The second major pathway is about sustaining work and attention: both 'It can make me work for long hours' and 'It makes me feel my concentration is uninterrupted' converged on the evaluation 'It makes me feel hard to get tired.' This convergence indicates that users may translate several productivity-related criterion into a common fatigue-related criterion. The diagram further connects 'It makes me feel hard to get tired' to chair–body fit, posture-related evaluations, and seat/backrest features, which are then linked to specific features such as adjustability (e.g., armrests, seat depth), posture-supporting mechanisms (e.g., reclining), and backrest height characteristics. From a design-requirements perspective, this structure highlights the importance of supporting users' fatigue-related interpretations through fit and posture-relevant features, while also making these features legible through the way users actually could notice (e.g., 'It fits my body,' 'It can improve my posture').

The third pathway relates motivation to affective and aesthetic evaluations. 'It makes me feel my motivation is increased' linked to 'It makes me feel my tension is risen,' which then connected to impressions of design (e.g., 'It looks luxury,' 'It looks cool') and to concrete attributes such as material and colour. This suggests that, alongside physical comfort and function utilization, visual and material cues may contribute to motivational or affective appraisals in office-chair use.

To sum up, The integrated value map (Figure. 1) suggests that the relationship between "high functionality" and actual user adoption is not straightforward. Rather than evaluating functions directly, users interpret chair features through perceivable cues in everyday work and translate these cues into higher-level values. In the integrated map, at least three value routes were identifiable:

1. Lightweight / compact → easy to move → easy to talk to nearby coworkers
2. Fit / posture-related perceptions → hard to get tired → long hours of work and sustained concentration
3. Appearance / material and colour → a sense of excited→ motivation

These routes indicate that users do not jump from physical attributes to values in a single step; instead, they form value judgments via intermediate sensations and interpretations such as "easy to move," "hard to get tired," and "feeling excited." Therefore, future office-chair design should focus not only on adding functions, but also on enabling users to perceive and interpret those functions in ways that can be translated into value during real work. In other words, "function legibility" should be treated as a design requirement: mechanisms and support features need to be understandable and naturally lead to use, rather than remaining as unnoticed or underutilized capabilities.

Several limitations should be considered. First, the present value map represents an integrated structure derived from a small, homogeneous participant group (five female staff members from one university workplace), and therefore should be interpreted as an initial model rather than a generalizable population structure. Second, EGM reflects how participants perceive relationships between attributes and values, so the diagram should not be treated as proof of causality. Future studies can modify chair features suggested by the map (e.g., making chairs lighter/ compact or improving fit-related adjustability) and examine whether these changes consistently improve the related higher-level evaluations.

CONCLUSION

This study used the Evaluation Grid Method (EGM) to reveal how office chair users connect concrete chair attributes to higher-level workplace values after using five different chairs. The integrated evaluation structure highlighted three major pathways: (1) lightweight and compact attributes linked to perceived ease of movement and, in turn, ease of communication with nearby coworkers; (2) fit- and posture-related perceptions linked to reduced fatigue, supporting sustained work and uninterrupted concentration; (3) appearance-related impressions linked to motivation-related evaluations. These results provide a structured, user-centered basis for reconsidering office chair design requirements and for making key functions more legible to users. Future work should examine whether design interventions targeting these attribute-to-value pathways lead to consistent improvements in the corresponding higher-level evaluations.

REFERENCES

Bai, Y., Kamarudin, K.M. and Alli, H. (2024) 'A systematic review of research on sitting and working furniture ergonomic from 2012 to 2022: Analysis of assessment approaches', Heliyon, 10(7), e28384.

Helander, M.G., Zhang, L. and Michel, D. (1995) 'Ergonomics of ergonomic chairs: a study of adjustability features', Ergonomics, 38(10), pp. 2007–2029.

Sanui, J. (1996) 'Visualization of users' requirements: Introduction of the Evaluation Grid Method', in Proceedings of the 3rd Design & Decision Support Systems in Architecture & Urban Planning Conference, Vol. 1, pp. 365–374.

Sanui, J. and Maruyama, G. (1997) 'Revealing of preference structure by the Evaluation Grid Method', Advances in Human Factors and Ergonomics. Elsevier, pp. 471–474.

Underwood D, Sims R. Do office workers adjust their chairs? End-user knowledge, use and barriers to chair adjustment. Appl Ergon. 2019 May;77:100–106.