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USER-CENTRED DESIGN THINKING

Application of UCDT theories to workplace management

Minyoung Kwon and Hilde Remøy*

1 Background

The term 'User-centred design (UCD)' is defined by Norman and Draper (1986). This theory was first introduced to the area of human-computer interaction. The first application in this area focused on the usability of computer design, aiming at supporting a minimum effort by users to learn how to use a product with high efficiency. The philosophy of this theory comes not from a humanistic desire, but from a desire to gain optimal functioning of the human-machine system, as defined by Endsley et al. (2003). The UCD is against subjective assumptions, and it requires proof that the design decisions are significant. Recently, the theory has been widely used in various fields, such as in the field of industrial design and ergonomics, with a strong concept of user evaluation. The traditional way of designing is based on designers' ideas and their design process, for example, reflecting the designer's ambition and considering users from the designer's point of view. On the contrary, the UCD places users at the centre of the design, and designers reflect on users' needs and interests in the design (Abras et al., 2004). As a result, UCD leads to improved safety, effectiveness, user acceptance, and satisfaction (Berns, 2004; Chammas et al., 2015).

UCDT can be seen as a basic method for a user-centred management strategy. There are several examples of how it has been applied to different fields. Berns (2004) explained the applied UCD process by using an example where UCD was used for developing an IT-portal for the Swedish Net University. The UCD method was used to collect the various interests and demands of different user groups from a pilot study that was conducted. A questionnaire was focused on the type of users, needs, and the user satisfaction. The results contributed to guarantee the functionality and quality of the portal. Kautonen and Nieminen (2018) applied the UCDT approach to digital library management. The study presented an examination of the performance management in digital library services in terms of public services provided by organisations. The study aimed at suggesting a model which engages people and different stakeholders for the library management. They emphasised the benefits of UCD approach, which are mainly to capture divergent views of design performance from stakeholders. In other

*Corresponding author: M.Kwon@tudelft.nl

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fields, such as ergonomics, the UCD is used to develop technical devices. Martin et al. (2012) state the importance of applying the UCD principles in medical devices. The study developed a prototype focusing on device, safety and effectiveness in order to design devices adequately. This study included a brainstorming session with the device development team members from different disciplines to collect ideas from different perspectives. After, the results of the brainstorming session were used for potential user interviews regarding the prototype devices.

User involvement is seen as an essential factor in the UCD process. However, the scope of user involvement varies, and it depends on the scheme of approach and research fields. According to Johnson (1998), the active involvement of users throughout the design process is a vital issue to understand their needs and interests and to overcome the limitations of the products. On the other hand, Rekha Devi et al. (2012) stated that users' actual involvement is not necessary in the UCD, but designers need to consider users' feedback in the design process. The definitions of Carr (1997) can explain the reason why there are different interpretations of user involvement in the UCD theory. According to their clarification, there are differences between user design and user-centred design:

> In the former, users are engaged in the actual creation of their own systems in negotiation with leaders and designers. In the latter, users are considered central to the design specification; however, design control remains firmly in the hands of professional designers, and approval power remains with leadership.
>
> *(Carr, 1997, p. 10)*

The UCD aims to optimise usability, instead of forcing the users to change their behaviour to fit the use of a product (Grott, 2019), and to provide good user experience (Sharp et al., 2015). User experience includes the motivations and emotions of users (Triberti & Brivio, 2020). UCD analyses the following aspects:

- What are the needs of the users?
- What are the limitations of the design?
- What are the preferences of the users?
- What are the expectations of the users?
- How to create user-centred design solutions?

With consideration of these aspects, designers evaluate the final design based on feedback from users after use. ISO 13407 is an international standard providing guidance on human-centred design activities. According to the description of ISO 13407 by Jokela et al. (2003), there are four stages of UCD activities before conducting the analysis. First, researchers need to identify who are the users, to specify the context such as the environment of use, and to understand the tasks of the users. The second step is to identify the user and organisational requirements. The third step is to incorporate interaction design and usability into design solutions. Lastly, researchers evaluate designs against requirements.

The concept of 'Design thinking (DT)' is broader than that of UCD. DT is an approach to problem-solving and creating solutions, focusing on developing a feasible design (Vagal et al., 2019). It is aimed at innovation and ideation to come up with new ideas to solve problems or challenges. DT is also a methodology guiding a constant interaction between the designer and the targeted users. The DT process is illustrated in Figure 16.1. In this process, researchers investigate what is happening by observing and interviewing users during the observation stage. This stage is about understanding the users' needs. After the observation, the researchers gather

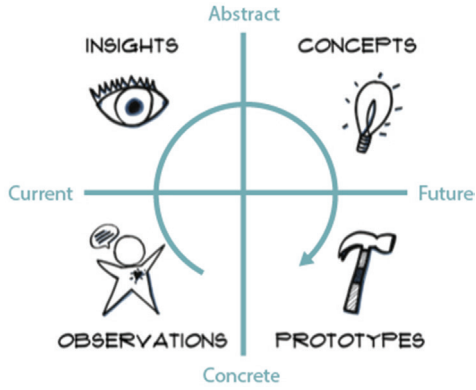

Figure 16.1 Design thinking process (Stanford et al., 2017)

information and data and focus on defining the problems and generating research questions. In the concept stage, the insights are used to draw an abstract concept by linking the ideas to real user needs. Based on the selected concepts, prototypes are created that users can react to. The main issue in this stage is that the prototypes should be quickly modified for user tests.

User-centred design thinking (UCDT) combines the efforts of UCD and DT. UCDT has been developed as an approach to tackle challenges. UCDT considers the needs of users and satisfying users' needs in physical and psychological ways, but it is also about finding solutions to develop policy, services, etc. Research starts with collecting feedback from representative users. The feedback is then used to make design decisions before the initial design is prototyped (Still & Crane, 2017). The design is revised until the outcome meets the users' cognitive needs and requirements.

2 Applicability to workplace studies

Studying users' experiences can help to investigate the bilateral influences between user behaviour and the environment of places. The UCDT theory, focusing on user experience, can identify the environment-behaviour relationship (Hillier & Leaman, 1973). The application of UCDT offers benefits for overall workplace management by establishing shared goals between central management and users of a space. This approach helps to formulate users' needs and to develop management directions in workplaces, thereby assisting employees in performing more effectively. During this process, it is essential to make a balance between the different aims of those two parts.

Workplace research often has an issue with the 'research-practice gap'. In general, UCDT allows researchers to examine how effective the management plan or the research outcomes are in achieving the researchers' goals. It also can find a gap or a flaw that might happen in practice. For this reason, UCDT is more than just a tool that would have been applied for the start of user-centred studies. In addition, this theory can also be implemented for a research validation because the study is executed in the real world with actual users. Implementing UCDT can ensure that a new plan for workplace design or management will maintain positive user experience and satisfaction.

The UCDT might, therefore, be a useful approach to workplace research and management as follows:

- Understanding users is a major part of both UCD and workplace research.
- UCDT helps to set a clear target and goals for both users and central management.
- UCDT decreases the complexity of the user-centred research process.
- UCDT also includes consideration of commercial values.
- Feedback from office users can contribute to supply-side decisions.
- UCDT is a practical approach because one can stop guessing and make decisions based on actual users' feedback.

2.1 Application of user-centred design thinking theory in the workplace research

The user-centred approach has already been applied to the built environment. Jacqueline C. Vischer constructed a well-known theory in this field. Vischer (2008) defined user-centred theory in the built environment, stating that users' behaviour in a building is influenced not only by the space they use but also by users' intentions, attitudes, feelings, expectations, and social context. The two key concepts in her theory are users' experience and user-building relationship, which may help to fill the gap between theoretical and practical knowledge. According to Vischer (2008), users' feedback regarding functional comfort is not given only by the physical comfort; instead, comprehensive factors affect user comfort. Figure 16.2 shows an analytic framework to assess the users' experience in the workplace. In workplace research, there are three types of users: individuals, groups/teams, and organisations. In addition, physical, functional, and psychological comfort should be included for user evaluation of the built environment performance.

A recent study by Kwon (2020) classified physical and psychological factors to be dealt with in work environment studies. Although the classification was developed based on the analytical framework by Vischer (2008), the classification deals with work-environment factors that influence user satisfaction regardless of types of users. It means that the employees are considered as individuals, but not in a group or organisational level. The UCDT was implemented in the way of investigating employees' needs. There are three-step influences. The fundamental class for comfort in the workplace is physical comfort, the second class of comfort is functional, and the last class is psychological comfort. The influential factors for physical comfort are essential

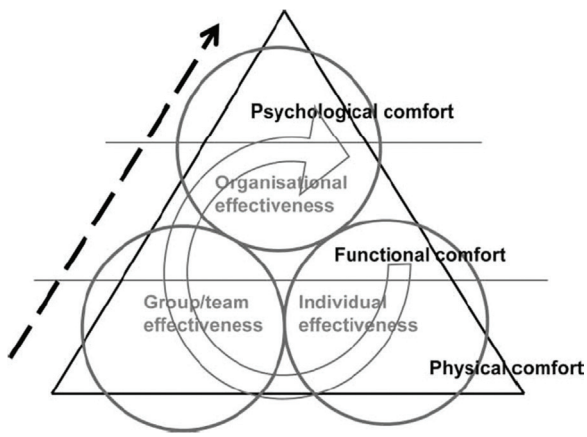

Figure 16.2 Analytic framework for assessing the user's experience (Vischer, 2008)

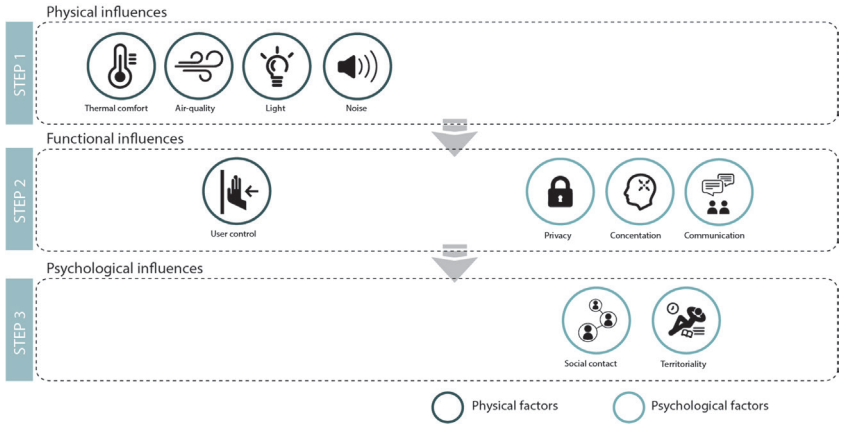

Figure 16.3 Classification of physical, functional, and psychological factors based on the dimensions of comfort

for people to be able to work in the work environment. In contrast, psychological comfort is not an essential class but can help to achieve a higher level of employee satisfaction. Figure 16.3 shows ten influential factors for user satisfaction, divided into physical, functional, and psychological factors. At the later stage of the study of Kwon (2020), these factors were tested through actual user surveys and observation methods to develop optimal office design principles for user satisfaction and comfort, taking the influence of the different factors together into account. Using this framework, researchers can decide what the important factors they should consider in office-related user studies are, and designers can decide to which extent they can set a goal to achieve user satisfaction.

3 Methodology/research approach

In workplace management, the UCDT aims to develop solutions to improve the performance of employees/occupants, thereby increasing satisfaction, productivity, wellbeing, etc. Interactions with users take various forms in both empirical and inspection methods. As Rekha Devi et al. (2012) stated, users' actual involvement is not overarching in workplace research, but researchers need users' feedback during the research process. Cognitive analysis should be implemented to understand the patterns and relationships of user perception (Klein et al., 1997).

Some researchers are keen on collecting as much data as possible on user satisfaction through a user survey. However, in some cases, it takes too much time to collect users' opinions. In UCDT, researchers do not construct subjective assumptions or hypotheses about user behaviour but statistically prove what is actually happening (Lowdermilk, 2013), which is called evidence-based research. In this type of research, both problem definitions and solution generations are contemplated simultaneously (Cross, 2006). Therefore, it is important to use the right approach to avoid collecting unnecessary data and to conduct surveys and analyses more efficiently.

The need-finding methodology is at the core of UCDT (Lai et al., 2010). Need-finding is not searching for solutions but looking for needs. This allows us to sense intangible relations and patterns of experience and helps to define latent user needs. Users' needs and requirements can be identified by investigating user experience. Sanders (1992) defined the level of needs expression:

- Observable needs: can be observed by the research.
- Explicit needs: can be expressed verbally by the user.
- Tacit needs: cannot be expressed verbally by the user.
- Latent needs: is subconscious and inexpressible by the user.

Wallisch et al. (2019) stated that statistical data collection, surveys, and conjoint analysis are suitable to gather explicit needs from users. Lead-user methods (Hemetsberger & Godula, 2007) and diaries are appropriate to collect tacit or latent needs from users.

Kwon (2020) applied a user-focused research approach to evaluate user experience/satisfaction in workplaces (see Figure 16.4). In the first phase, researchers set a goal and collect data based on what they want to find out through the field study. The field study can be conducted by empirical methods (e.g., survey, interviews, focus group, and contextual inquiry), or inspection methods (e.g., walkthrough and heuristic evaluation[1]). The objective of these methods is to become familiar with user needs and preferences. This phase is the foundation for creating core requirements for UCDT research. The second phase is to understand users. In general, applied ethnography and lead user methods are used to identify user needs and user involvement (Dell'Era & Landoni, 2014). Applied ethnography means the practice of observing users in the context of use (Sanders, 2002); and the lead user method gets direct input from lead users through inquiring about the product and service needs of lead users (Urban & Von Hippel, 1988). Lead users, also called early adopters, are experiencing needs ahead of targeted markets. Unlike other fields using UCDT approach, identifying user groups before starting any study is very difficult in the workplace study. After collecting the data, the types of users can be classified based on user profiles and characteristics such as studies done by Mettler and Wulf (2019), Despenic et al. (2017), and Matthews et al. (2011). The third phase is to define interactions

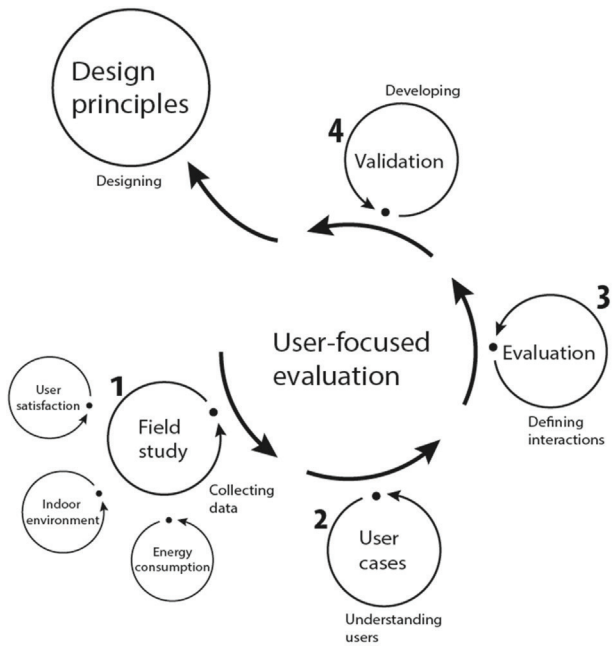

Figure 16.4 User-focused evaluation research approach (Kwon, 2020)

between the workplace environment and users. The evaluation/analysis phase discovers new users' needs or flaws in the current condition. In the validation process, workplace management, guidelines, or services will be developed.

Traditional workplace management has considered users without actual understanding of user experience. Although the UCDT theory in this chapter does not include users in the management and design process directly, it reflects users' experiences and feedback to workplace management. Moreover, the approach does help not only to collect users' feedback but also to figure out latent user needs.

4 Limitations

Although the original approach of the UCDT theory has not been applied to the field of workplace research, the fundamental concept has been integrated into this field as a methodological approach for user studies. There are advantages of UCDT theory, such as that researchers can achieve a deeper understanding of the psychological, organisational, and social factors of workplace satisfaction.

However, there are also possible limitations:

- Selecting representative users.
- Privacy during code of user behaviour.
- The scale of the test environment and repeatability.
- Unsuccessful user participation.
- Different cultural backgrounds.

First, one of the major considerations for UCDT is to identify the users: the actual users, and the primary users. In general, volunteers who are willing to join the research are selected for interviews or workshops. However, it is sometimes difficult to tell if the participating users are representative for all users. This may also cause a bias in user studies. Second, privacy is always an issue in the code of conduct of research on user behaviour. As a researcher, it is essential to check human research ethics and privacy regulations. It may limit collecting specific data from users. Third, the methodological scheme may not be repeatable for every workplace research since the scheme can be modified according to what researchers want to achieve, in which condition they can collect data, and which phase they want to involve users. However, the core approach of UCDT, such as need-finding methodology, is repeatable in most workplace research.

Nonetheless, various types of methods may be applied according to the scale of the test environment or type of users. Next, it is sometimes difficult to collect a sufficient number of responses from people. Successful user participation is of prime importance in user surveys. However, inviting users for surveys can cause delays in research. Last, cultural differences between researchers and users can lead to miscommunication. Thus, as a researcher, it is important to understand the culture before conducting the experiment, and it is recommended to translate questionnaires to the own language of the respondents.

5 Theory relevance to practice

User-centred design thinking (UCDT) has been developed as an approach to tackle challenges and involve users in doing this; hence, it is already a very practice-oriented approach. The contribution of this theory to workplace management may be to provide some advice to

practitioners who seek to implement user-centred management. UCDT is not only considering the needs of users and satisfying users' needs but is also about finding solutions to develop policy, services, etc. In workplace research, research starts with collecting feedback from representative users on their current workplace, satisfaction, and preferences. Practitioners then use the feedback to make design decisions before the initial design is prototyped.

The range of workplace management research is comprehensive. Practitioners need to take overall perspectives: they need to include the environmental comfort by considering physical and functional factors, which are mainly related to the quality of building. Practitioners should basically consider the indoor environmental quality such as thermal comfort, air quality, noise, and lighting. Personal control over the indoor environment is essential to increase user satisfaction. Moreover, the psychological factors, including social interaction and ambience environment, should be included in the workplace management. Throughout the design process, the users may be consulted to improve the design. Very often, encountered challenges are related to different preferences of different (types of) users. The challenges can be met by applying UCDT, which is using a cyclical research and design process and by getting the input and feedback of the different users. In the cyclical process, the design is revised until the outcome meets the users' cognitive needs and requirements. Concluding, this UCDT approach may help practitioner readers to manage workplaces better for the users.

Note

1 Heuristic evaluation is an informal method of usability analysis where a small set of evaluators examine the interface and judge its compliance with recognised usability principles.

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