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Involving user perspectives in architectural design through scenarios: Lessons learned with students designing a co-working space

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Abstract
In architecture, the growing complexity of design processes increases the distance between design and use contexts, which makes it challenging to take into account user experience in design. This situation is reflected in architectural education, where students typically design for hypothetical clients and users. Initiatives to introduce user perspectives in architectural design have pointed out the value of narrative approaches as well as challenges to its integration in the design process. This paper sets out to explore the potential of scenarios, a technique from related design disciplines to iteratively and explicitly involve user perspectives, for architectural design.

A scenario-based design approach was tested in a master-level architectural design studio on co-working space. In a concept generation workshop, students received current use scenarios based on empirical research on co-working spaces. In a consultation session, students assessed their design by walking through the building in the users' shoes. For the final presentation, they represented a typical day on the site for one of the users. Observations were made during these sessions, students' design entries were collected and their feedback was obtained through an online survey.

Students appreciated the user perspectives extending their own experience and preferences. The approach supported programming and concept generation, resulted in a larger diversity of spaces in their design, especially in terms of atmospheres, while opening up more potential, especially with regard to circulation areas, and supported consistency in the design proposal and presentation. The design studio test suggests that this narrative method is largely suited to communicate user experience and allows for a future-oriented exploration of a new building programme like co-working. Future research should further look into ways to visualise use activities in relation to spatial qualities in the scenarios, as well as ways to integrate user research and user participation with the scenario-based design approach.

Keywords
Architectural Design, Co-working, Design Education, Scenarios, User Experience.

1. Introduction

Understanding user experience in design is considered crucial for innovation (Koskinen, Mattelmäki, & Battarbee, 2003), but also challenging, especially when users differ considerably from designers (Imrie, 2003). In architecture, the growing complexity of design processes

increases the distance between design and use contexts. Architects are typically expected to come up with novel concepts, without having direct access to those they are designing for. Clients often do not coincide with users, and in many design competitions, even contact with the client is limited (Verhulst, Elsen, & Heylighen, 2016). This situation is reflected in architectural education, where students typically design for hypothetical clients and users.

With the focus of design having transitioned in the past decades from the object to its users, their contexts and experiences (Wright & McCarthy, 2010), related design disciplines (e.g., product design, interaction design) have developed techniques to explore user perspectives in design. It is hypothesised that these techniques, although they are largely undiscovered by architects, have value for architecture as well. The skill to involve user perspectives is deemed necessary for communication with the growing number of stakeholders in professional practice (Parnell, 2003) and, in line with the potential demonstrated in related design disciplines, for human-centred innovation in design (Koskinen, et al. 2003).

Architectural design education has been criticised for its minimal attention to building users (Parnell, 2003). Several initiatives have aimed to counter this and provide students with a connection to users to improve their knowledge about and empathy with users. This could include arranging direct contact with relevant users (e.g., former cancer patients or therapists in the context of designing a cancer care facility (Annemans, Van der Linden, Karanastasi, & Heylighen, 2015)), challenging students to find and consider potential users themselves (Gerards & De Bleeckere, 2014), or even teaming up students with user/experts in the context of inclusive design (Karanastasi & Heylighen, 2012). Direct contact with potential users is found beneficial to students' adoption of a human-centred design approach (Zoltowski, Oakes, & Cardella, 2012), but establishing proper co-design processes in (the often short timeframe of) design studios is not straightforward.

As an alternative to this, there are initiatives that introduce an indirect contact with users. In interior architecture, there have been several initiatives to introduce narrative approaches, which involve stories from users' perspectives as a tool for exploring design ideas and guiding decisions, to the design studio (Carmel-Gilfilen & Portillo, 2016; Danko, Meneely, & Portillo, 2006; Ganoe, 1999; Gerards & De Bleeckere, 2014). Danko et al. (2006) found that such a narrative method heightens empathy with users, enhances multi-sensory conceptualisation and visualisation, and facilitates holistic thinking in interior design students, which all contributes to humanising design thinking. Side notes can be made, however, on the right balance between the often text-based storytelling and the prevailing visual design methods: whereas working with large amounts of text can be a challenge for design students (Danko et al., 2006), a limited use of scenarios in a merely functional sense (e.g., in programmatic writing (Stevens, Petermans, & Vanrie, 2016)) might run the risk of a superficial application. Based on previous initiatives, the challenge for architectural education seems to be to find a way to integrate a narrative approach into the design process that is focussed on spatial qualities and compatible with prevailing design methods and media.

This paper sets out to explore the potential of scenarios (Carroll, 2000) to involve user perspectives in the context of design studios in architectural education. Scenarios, as originally developed in Human-Computer Interaction, are narratives about user-product interactions that are used to explicitly and iteratively explore user experience in design (Carroll, 2000; van der Bijl-Brouwer & van der Voort, 2013). A scenario can be considered a sketch of a user's experience. As they evolve through the design process, scenarios can provide support from programming to designing detailed interactions and even visualising the design through users'

eyes. This potential is expected to be useful for enhancing a focus on user experience in situations where the distance between users and designers is large, such as is often the case in the complex projects in architectural design (education).

The paper reports on the testing of a scenario-based design approach in a five-week master-level architectural design studio on co-working space. The aim of this test is to explore the way in which scenarios can be constructed, applied and represented in architectural design. The next section outlines the aim of the studio, the information on co-working that was provided, the different scenario-based design activities that were implemented, and the data collected for analysis. Next, the findings section provides insight into the students' design processes and results throughout the different stages, based on observations by the facilitator and tutors, design materials, and students' feedback. The paper concludes with the potential and challenges of the approach and outlines directions for future research.

2. Case & methods

2.1. Studio context

A scenario-based design approach was introduced in a five-week master-level architectural design studio at KU Leuven in Belgium. The studio was tutored by the second and third author, who are practicing architects, and was spread over 11 afternoon design sessions. Twenty-six students took part in the studio, including eleven male and fifteen female, twenty local and six Erasmus exchange students. The students took on the assignment to design a co-working space on an industrial heritage site in Leuven that is being redeveloped into a creative hub for small companies and organisations in the cultural and creative sector. The building they were assigned concerns the Orshoven Mills, a 19th-century listed building with a wooden structure and brick walls (Figure 1).

In line with the city's actual plans for the building, the assignment encompassed the design of office space for five small companies (on a conceptual level) and a co-working space that had to be further elaborated as the main element of the design. The studio concerned an individual interior design exercise within a master's programme of architectural engineering. In light of this focus, the students were expected to determine the atmosphere and materiality of their design and detail a particular piece of furniture or part of the interior (e.g., a staircase, reception desk, lighting fixture).

Figure. 1. Exterior and interior of the Orshoven Mills. (© Evelien Roelands)

2.2. Input co-working

As modes of working are transforming with a focus on innovation, creativity and flexibility, so do

people's needs regarding their workspaces. Co-working is an upcoming phenomenon where people seek the presence of others in a shared workspace, aimed at promoting cross-fertilization. The built environment is attributed a key role in promoting creativity by stimulating social interaction (Trappeniers, 2015). The underlying theory is that creativity is characterised by cognitive processes linked to divergent thinking (Guilford, 1950), which is stimulated by, amongst others, weak tie social interaction (Granovetter, 1973; Perry-Smith, 2006). Hence, a physical environment that stimulates this type of social interaction is assumed to support creativity.

Given the diversity among co-workers, students might benefit from insight into different co-working initiatives. Input for the studio was based on research conducted in the context of a master's thesis in the same educational programme and guided and supervised by the first and last author (Trappeniers, 2015). A literature study into the spatial aspects of creative workspaces yielded four types of space that support weak tie interactions: interstitial spaces (Peltoniemi, 2014), compact spaces (Peltoniemi, 2014), multi-spaces (Boutellier, Ullman, Schreiber, & Naef, 2008), and spaces that can balance privacy needs (Sailer, 2011). In a second part of the thesis, empirical research was conducted in four different co-working settings in order to further understand the activities in these types of spaces. The research generated insights into co-workers' experiences and the role of the built environment therein through interviews with a photo assignment, observations and architectural analysis. The fieldwork settings included two locations of Bar d'Office, a subscription-based co-working network with facilities in different cities, and an office space and shared workspace ("incubator") at De Hoorn, a creative business centre in a former brewery near the project location in Leuven. The original research data formed the basis for creating four current use scenarios as input for the design studio. For each activity-space combination, a persona (a vivid user profile (Cooper, 2004; Nielsen, 2013)) based on the different participants was drawn up by the first author and a typical workday was described through a story using original quotes from the interviews, pictures and a floorplan of the particular co-working initiative. This story provided insight into co-workers' motivations, concrete activities and challenges, in relation to their current workspace. Table 1 gives an overview of the scenarios, with the link between social (i.e., an activity) and physical environments (i.e., a corresponding type of space) that was highlighted. Figure 2 gives an example of one of these scenarios that were provided to the students of the design studio.

Table 1. Current use scenarios highlighted the link between the social and physical environment in existing co-working initiatives.

Persona	Highlighted activity	Type of space	Co-working location
Suzy, *literary translator*	Chance encountering	Interstitial space	Bar d'Office Antwerp
Thomas, *consultant*	Forced encountering	Compact space	Bar d'Office Leuven
Marcus, *urban designer*	Taking a distance	Multi-space	De Hoorn (office)
John, *web designer*	Isolating	Private space	De Hoorn (incubator)

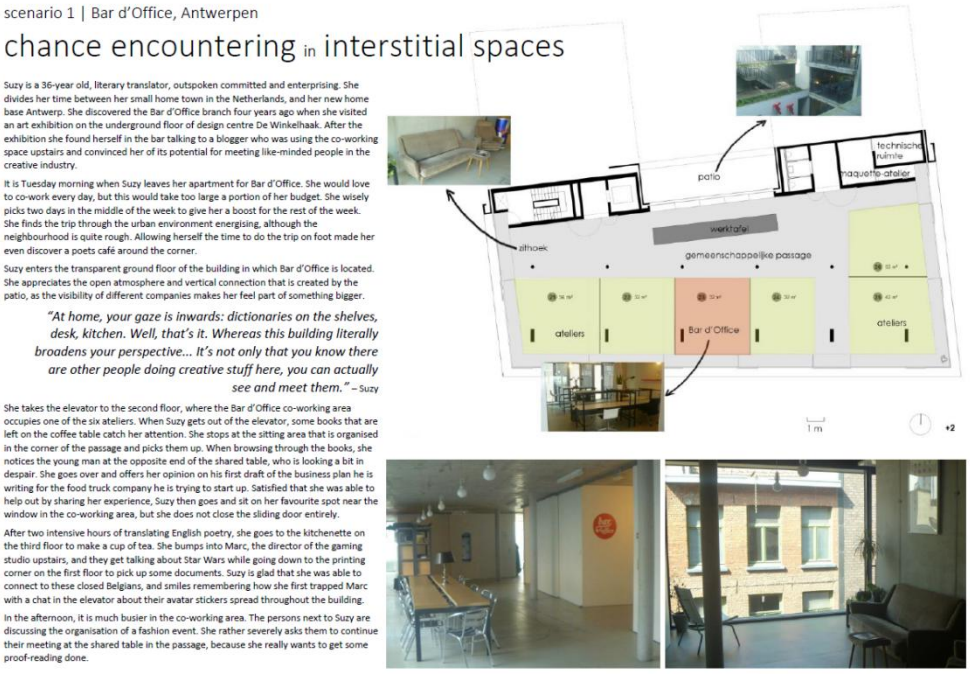

Figure. 2. Example of one of the current use scenarios, narrating a typical workday of Suzy, a literary translator, including quotes, pictures, and a floorplan. (© Valerie Van der Linden, with images by Eline Trappeniers)

2.3. Scenario-based design set-up

In a workshop session aimed at concept generation, which was scheduled in the first design week and facilitated by the first author, students received a short introduction on co-working and scenario-based design and were subsequently presented the four current use scenarios described above. This material fuelled a brainstorm to generate future use concepts for the Orshoven Mills site, based on an analysis of the site and identification of the potential users and activities to be supported by the design. The students were challenged to accommodate the four personas in their design, and explore their future activities inspired by the current use scenarios.

In a subsequent session, which was scheduled mid-way the design studio, students assessed their design by walking through the building in the users' shoes, in an individual consultation with the first author. Based on their floor plans, they confronted their design with the needs and activities of the personas, resulting in interaction scenarios on a more detailed level.

For the final presentation, the students were asked to visualise a typical day on the site for one of the personas, so as to present their design from the perspective of a potential user. They were free to choose a representation method, which could involve both text and visuals.

2.4. Data collection and analysis

The students' final design materials were collected for analysis (with specific attention to the presented scenario), along with observational notes of the workshop session, the consultation session, and the final presentations. Students' first comments on the approach were collected after the workshop session. At the start of the next semester, an online survey was set up to gather students' feedback. Questions gauged students' experience with the overall approach as well as the concrete components, and their perceived effect on their design process as well as outcome. The survey was anonymous and obtained a response rate of 38%. Answers were analysed thematically and in relation with the other collected data. The findings below are

illustrated with quotes from the survey that have been translated to English by the authors if necessary and with images from the students' final design entries.

3. Findings

The majority of the students appreciated the user perspectives extending their own experience and preferences. They reported that the approach supported concept generation, resulted in a larger diversity of spaces in their design and opened up more potential in the design. This potential will be described in more detail below. Most students successfully applied the scenario-based design approach, but there was also a small number of students who were less invested. Some of the (weaker) students seemed to perceive the scenarios as an extra task to be completed in the end rather than an iterative approach, and were deterred from its advantages. More remarkably, one of the students did not even agree with the aim of stimulating chance encounters and when his concept was confronted with the diversity of persona's perspectives during the consultation session, he had to conclude: "my building is not for shy people" – at least a reflection that would hopefully provide insight at a later stage.

3.1. Input & brainstorm: programming

The input provided help and inspiration for the students to think about user experience, which had not been on their radar before. As one student commented: "The advantage is that you get an idea of the kind of people who will walk around in the building you're designing and the kind of ways in which they'd like to use the building" (student 9). The concrete examples of co-working spaces that serve as reference projects, the way in which people experience these spaces as well as the way in which flows are being created seemed to give most students a head start to designing.

The students started with extracting issues they wanted to respond to in their design, and reported that this supported concept generation: "I started with underlining what were, in my eyes, the most important wishes of the different people in the scenarios and based my first concepts on these issues" (student 1).

The input generated general understandings of functions and their spatial requirements, which helped students in identifying and locating programme units in the existing building. One student testifies: "The presentation of the different scenarios was very useful and has been a great help in determining the spaces and atmospheres in my design" (student 8). Examples of ideas that came up during the brainstorm include locating spaces to meet people in light areas near the façade, and creating boxes in the space with different atmospheres.

Also ideas about organising circulations were nourished by the reference projects. For instance, the narrow and long corridor of Bar d'Office in Leuven was found inappropriate and yielded alternative design proposals such as a wider corridor near the façade that would be able to accommodate other functions. The vertical connection of the void in Bar d'Office in Antwerp, which was highly valued by the persona of Suzy, on the other hand, inspired students to organise the circulation around a vertical space. These examples of equipping the circulation area with opportunities to encounter others (see, e.g., Figure 3) illustrates how concepts were generated based on issues that were important to the co-workers in the current-use scenarios. As one student explained, for instance: "The main concept of having people encountering each other on their walk through the building has been influenced largely by the scenarios" (student 4).

Figure. 3. Collage of the co-working space's entrance area with reception desk, lockers and seating area, showing how different functions are interwoven with the circulation area and clustered around a central void. (© Charlotte Sannen)

3.2. Consultation: concretisation and diversification

The first session helped students in identifying different programme units they puzzled into the building's framework. Yet, when working out the floorplans, many of them faced the question of what these square metres that were attributed to co-working concretely had to offer to its users. Walking through the plans in the personas' shoes in the consultation session mid-way the studio generated insights that helped define the spaces and their atmospheres. Students appreciated the user perspectives extending their own experience and preferences: "Before, you'd think about use from your own user experience: 'if I were to work there, I'd like/find this and that'. Now you were forced to have the building 'tested' by a character with different points of view" (student 10).

They reported that this approach resulted in a larger diversity of spaces in their design: "It certainly diversified the design. If I'd started designing without the scenarios, it would be more concentrated on what I'd like if I were to work there, because then that's the only information you've got" (student 7). This diversification was especially noticeable in terms of atmospheres. As one student reported: "It made me design different kinds of spaces with different kinds of atmospheres instead of just one global atmosphere for the entire building" (student 8).
This confrontation with users' perspectives also opened up more potential in the design. One student recalled: "I didn't know which function could possibly take place on a certain spot, but because of the scenario-related questions, I did hit upon possibilities that weren't present yet in my design" (student 7). This was especially the case with circulation areas that had been easily overlooked before, but were now found to be a vehicle to integrate functionality (as shown by the concept in the previous section). Finally, the sensitised attention to user experience and the reflection on the detailed user-building interactions, seemed to enable some students to work out concrete interior design solutions that take into consideration, e.g., acoustic and visual privacy (Figure 4).

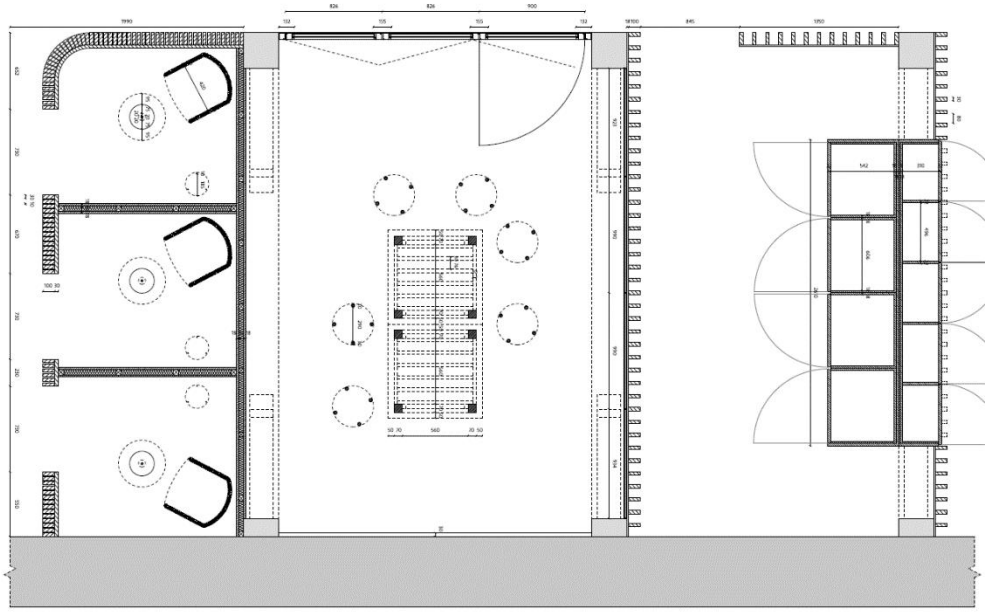

Figure. 4. Detailed fragment of a box with individual cells (e.g., for phone calls), a meeting room and copy corner, which were designed with attention to (varying levels of) acoustic and visual privacy. (© Kimberly Peeters)

3.3. Presentation: consistency

As part of the final design entry, students were asked to visualise a scenario from the perspective of one of the personas to present their design from this perspective. Most students used the scenario as an opportunity to present their design as a whole, with the narrative aspect, explored in image and text, enhancing consistency. The examples below show a large diversity in visualisations, with some students showing great creativity in representing a scenario. The adoption of traditional architectural representation forms (e.g., floorplans, axonometric perspectives) into a narrative with various amounts of text illustrates the variety of potential ways of representing scenarios with attention to spatial aspects.

Figure 5 shows, for instance, a conceptual scenography of a user's journey through the building, with a sketch of the main co-working elements.

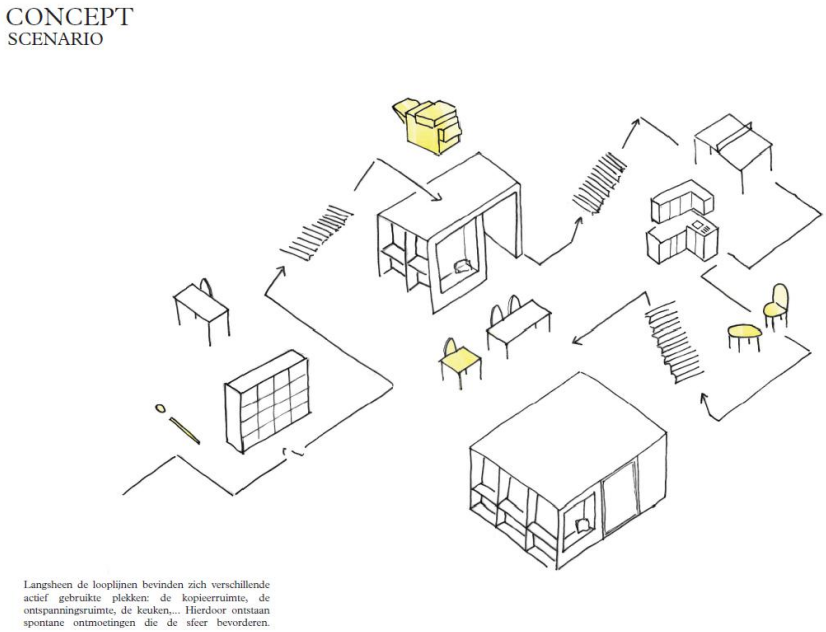

Figure. 5. Future use scenario visualised as a conceptual scenography. The sketch was accompanied by a short note indicating that the actively used spaces along the route stimulate interactions. (© Tijmen Bruyndonckx)

At the complete other end of the spectrum, Figure 6 gives the example of a very realistic visualisation based on a series of renders with short captions that narrate a persona's journey.

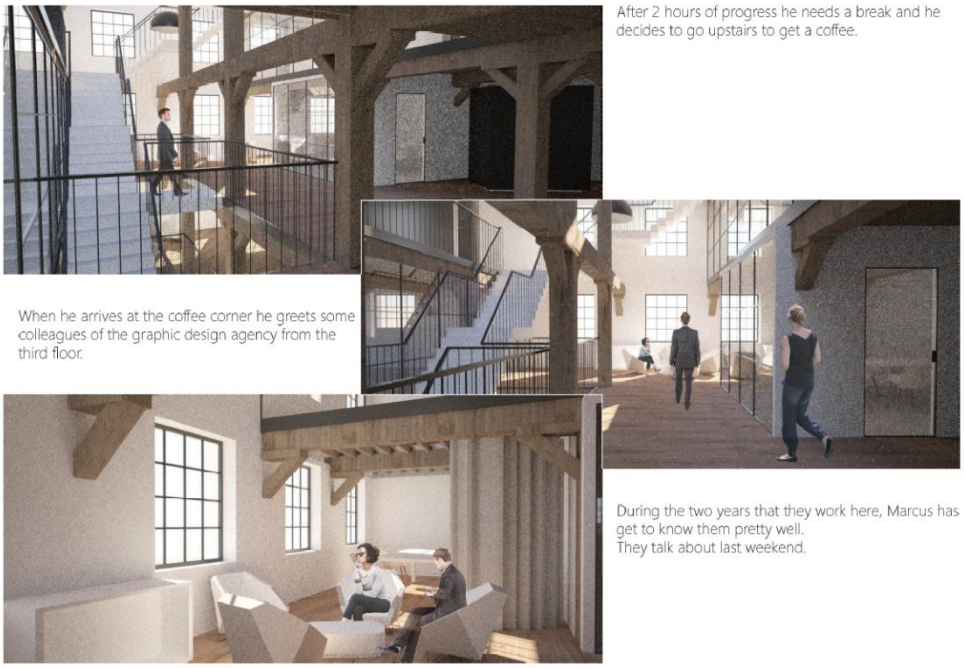

Figure. 6. Extract of a future use scenario, visualised as a storyboard with realistic renders. Each render was accompanied by a short line of the story about the persona's (Marcus) day at the site, highlighting his (motivated) activities in the different places in the building. (© Victor Verburgh)

Most examples linked together important places in the building and represented the journey on plans or a section, and combined this with a short story. Figure 7, for instance, combines plans

with detailed scenes of co-working elements, which demonstrates the consistency in the design.

Figure. 7. Future use scenario visualised as a journey on the different floor plans with the most important co-working places highlighted (below) and visualised together in a sequence (above). The scenes were accompanied by an introduction on the persona (Suzy) and the way in which the design caters for her needs, while the floorplan was accompanied by a story narrating a typical day for Suzy on the site. (© Charlotte Sannen)

A different way of representing a typical day at work is shown in Figure 8, which consists of a timeline and a layered axonometric that does not only show the persona's route but also his interaction with fellow co-workers. With a minimum of text, this example gives a very comprehensive representation of the project.

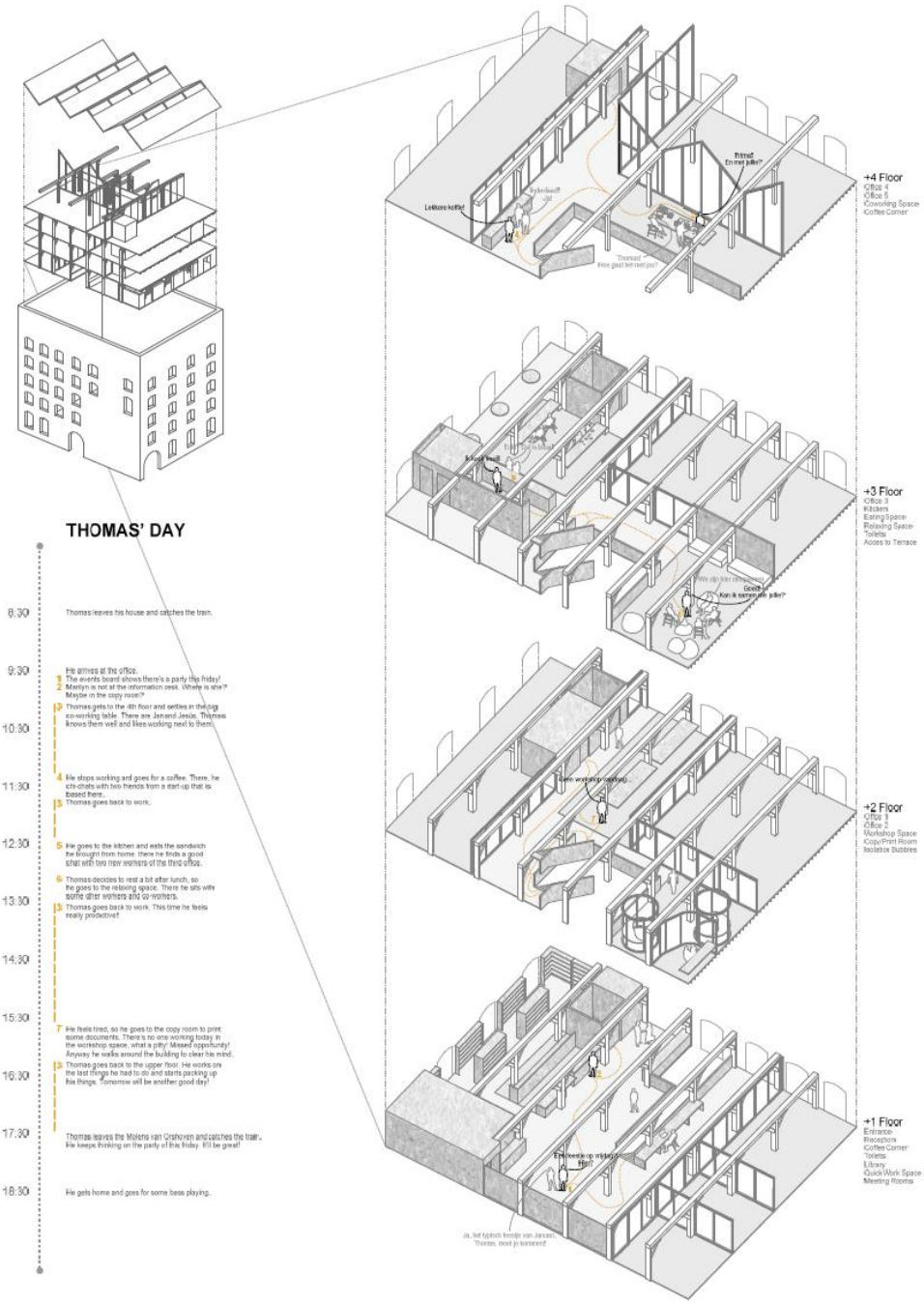

Figure. 8. Future use scenario visualised as a journey on axonometric layers of the building with an accompanying timeline briefly describing the persona's (Thomas) activities and experiences throughout the day. (© Jesús Villar Quintana)

4. Discussion & conclusion

The design studio test suggests that scenarios have the potential to enhance the focus on user experience in architectural design by having (student) designers iteratively take the users' perspective. The studio test produced interesting insights, but was of course limited in time and scope. Given the short time frame of the studio, no explorations were feasible with students collecting user input themselves, for instance. The current use scenarios and corresponding personas to consider in the design were drawn up by the first author based on empirical research. This eliminated the process of determining which issues and users to focus on, which

could have been useful for the student architects, e.g., in light of their future collaboration with clients (Parnell, 2003). With more time available, it would also be more beneficial to have the students not focussing on only one persona (for the final presentation) but have them critically investigating the effect of taking into account (the confrontation of) different personas.

With the general lack of concrete users in architectural design studios, students are (even) more remote from users than professional architects, as they cannot make an appeal to a client for user-related requirements and information and have generally less personal experience. The narrative format seemed particularly suited to communicate user experience (see also Carmel-Gilfilen & Portillo, 2016; Danko et al., 2006; Gerards & De Bleeckere, 2014). Whereas previous studies demonstrated the potential of a narrative approach but raised questions about its integration in architectural design, this study looked into tried and tested techniques from related design disciplines that serve similar aims, and tried to translate them to the particularities of architectural design. More precisely, the current use scenarios show that including a conceptual layer supports the discussion of reference projects, which are part of architects' typical inquiry repertoire. Next, the walkthrough exercise (on the floorplans) provided an opportunity to investigate concrete architectural features, and could be further elaborated as an (iterative) assessment technique. Finally, the representations in image and text show potential ways of communicating architectural qualities from a user perspective.

The scenario-based approach was probably fairly easily adopted since it makes explicit an activity that architects already do intuitively (i.e., navigating through the building when designing) (Van der Linden, Dong, & Heylighen, 2016). As a result, the scenarios allowed for a future-oriented exploration of a new building programme such as co-working. The successful application of the scenarios for taking into account user experience in design indicates, in contrast to Danko et al. (2006)'s reserve with scenarios, that well-crafted scenarios can resonate the qualities of stories if they contain rich information (Nielsen, 2013).

One of the strategies to enrich scenarios is by coupling them to personas as a driver for the plot (Grudin & Pruitt, 2002; Nielsen, 2013), as we did in this studio test. Even though the students taking part in the survey reported on the value of the personas offered, the level of empathy that the personas were able to generate in the students was hard to track in this study. A potential pitfall of insufficient engagement with the personas (because of determinism or a lack of critical attitude) includes that the scenarios present a 'rosy story', where the character is used in a functional way to confirm (weak) design ideas (Fulton Suri & Marsh, 2000). Resulting from too much determinism or a lack of critical attitude, this might create a false sense of justification of the design decisions. Guiding students in applying scenarios in a 'correct', critical way (e.g., in an introduction session on the techniques and through consultation sessions) deserves further attention. Especially in the context of architecture, applying scenario-based design as a critical design tool might help students to reflect on the diversity, contingencies and dynamics of future use situations (van der Bijl-Brouwer & van der Voort, 2013).

With the focus of the studio on experience and atmosphere, the explicit introduction of user perspectives did not seem far-fetched. The application in other types of projects, however, deserves further attention. Whereas co-working represented a specific programme that aroused an information need in the student designers, it might be more challenging to provide meaningful scenarios in projects with more general programmes and users.

In general, the scenarios seemed to complement students' experience, offer a way to discuss reference projects and to express experiential aspects of the design, yet more tests are needed

to further tailor the approach. Future research should further look into ways to visualise use activities in relation to spatial qualities in the scenarios, as well as ways to integrate user research and user participation with the scenario-based design approach. Such a scenario-based design approach can equip students better to deal with the transitions in projects (e.g., including new functions such as co-working) as well as processes (e.g., the complexity of stakeholders and distancing of designers from users) and make them attentive and reflective professionals.

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