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Universal design: Visualising diversity, two low hanging fruits

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Abstract

To plan, design and build with diversity in mind is a complex process. While goals such as inclusion, participation and social sustainability may be present in the vision for a future product, service or environment, studies show that the initial vision isn't always realized in the end result. There are still far too many products, services and environments that are hard to access or use for parts of the population. In this text we focus on comparatively simple, lightweight, tools – "low hanging fruits". Such tools are already available, there are personas, context cards, but also checklists and guidelines. Inspired by the existing work, we have developed one deck of cards, intended to serve as thought support by visualizing population diversity. In order to obtain a similar effect in digital environments (egin digital twins and other 3D environments used in planning and development) we have also developed 3D models (vehicles, devices and humans) that can be put in the digital environment, and serve as a reminder to the users of the digital environment of population diversity.

Introduction

Today, Universal design is a global concept. A key part of designing universally, is that human diversity is explicitly considered throughout the design process. Through universal design, a wide range of people, including persons with disabilities, are able to

participate in society on an equal footing. The goal is to design environments, products and services, to work for as large a portion of the population as possible, without requiring special solutions or adaptations. For architecture, universal design strives to maximize the number of persons able to access an environment irrespective of ability, age or gender (Hamraie, 2013). The concept was initially defined by seven principles (Center for Universal Design, n.d.), but has evolved since then. In the UN Convention on the Rights of Persons with Disabilities, universal design was promoted as a way to ensure persons with disabilities could participate in society on equal terms. In Sweden, universal design was put forward as one of four cornerstones of the Swedish disability policy in 2017. The concept has also been discussed actively among architects, planners, politicians etc. in the Nordic countries (Bendixen & Benktzon, 2015). In Norway, the concept is implemented in the laws around the built environment, and also in laws concerning discrimination, with the goal of making society accessible for all (Lund & Bringa, 2016).

While the concept of universal design has been around for some time, we argue that there is still quite some work to be done on how to work with universal design in practice, throughout a planning and building process. In earlier studies, we have investigated what universal design means, how it is expressed (against a background of current practices and trends in city planning in Sweden), and what the critical factors are for how an inclusive built environment can be designed and realized, Figure 1 (Müller, 2023). We have also seen that visions for inclusion and universal design expressed early in the process, are not always reflected in the final product, the actual built environment (Müller et al., 2022). Although designing for human diversity is a complex task, one low-hanging fruit is to work with tools for

visualization. Existing such tools are personas (Schulz & Skeide Fuglerud, 2012), context cards (Magnusson et al., 2012), as well as existing checklists, standards and guidelines. Exercises fostering empathy (Lorentzen & Hedvall, 2018), simulations, eg of visual impairments, (Jones & Ometto, 2018) as well as virtual reality environments (van Leeuwen et al., 2018) are other tools that have been used.

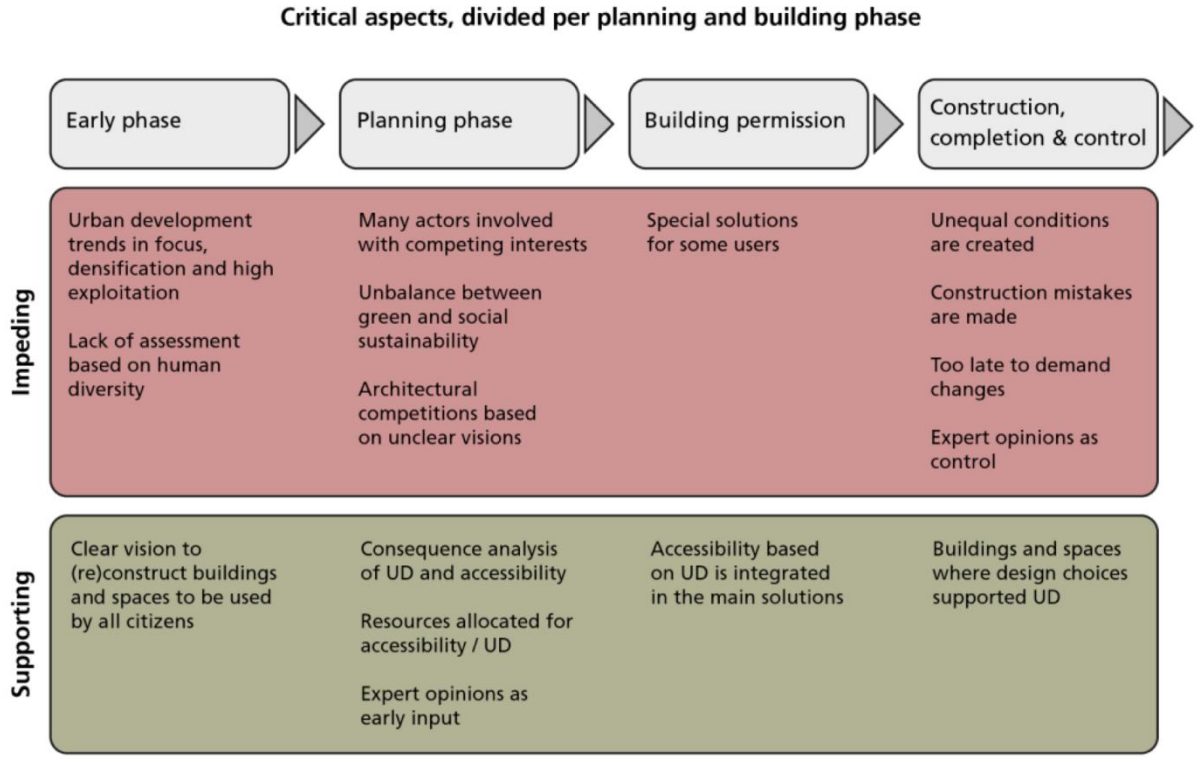

Figure 1. Critical aspects, supporting and impeding the implementation of a UD approach in the different phases of urban development (L. Müller).

As we had observed how visions for universal design had a tendency to disappear along the process (Müller et al., 2022), one area we decided to work on, was simple tools for illustrating population diversity, to serve as reminders of the human diversity in the population all along the process. In this paper we describe two such

tools, a deck of design cards, "variation cards", a variation of personas, inspired by the previously developed context cards (Magnusson et al., 2012), as well as a set of with models/avatars for VR environments.

Vision Cards - Design cards for imagining variation

Our previous experience of the context cards (Magnusson et al., 2012), had shown this type of card deck to be a flexible and useful visualization tool. We had the opportunity, in a project on including Universal design in public procurement, funded by the Swedish innovation agency VINNOVA, to run an online workshop together with 15 persons from local disability organizations (representing the deaf community as well as persons with visual, cognitive and mobility impairments), on what they considered as important in the built environment. The task discussed at the workshop was what factors were important in procurements of hotels & restaurants, but the results turned out to be applicable in a wider context, and we decided to use our results as a basis for developing a small deck of cards aimed at visualizing the human diversity when it comes to abilities.

The workshop materials were analysed and summarized, and complemented with information obtained after the workshop from an organization for persons with allergies. After some initial sketching, we decided on a design where each card focused on trying to give sense of *variation* rather than on individuals, representing a wider group of abilities, with four photos selected to obtain an illustrative range of different persons and abilities. The groups decided on were mobility, vision, cognition and perception, hearing, language and allergy. Each card should contain both general information and more concrete points to think about. There would be one introduction card

explaining universal design, but also one "joker" card aimed at reminding designers/users of the risk of using yourself as an implicit reference. Effort was put into making the cards easy to read, with appropriate contrasts and font sizes, and an accessible pdf was put online in order to make the material more accessible. The cards were designed in Swedish (Variationskort För UniversellUt formning | Certec, n.d.), translated in Figure 2, which shows the back and front of the vision and ability to move cards.

Figure 2 Front and back of the vision card (left) and the ability to move card (right).

These cards have not been formally evaluated, but have been disseminated at events and presentations, and have also been found useful in courses at Lund University. Recently they were used in a Swedish municipality as support when developing guidelines and support documents for the planning of new buildings/constructions. They were also, together with other materials, awarded an innovation price by the Procura+ European network for public procurement. The basic design of the card is flexible, and it would be easy to add more cards to get an even better visualization of human diversity.

Visualising Diversity - 3D models or avatars

Three-dimensional models and environments are commonly used when visualizing future buildings and cityscapes (Billger et al., 2017). As is pointed out in (Billger et al., 2017), a challenge is to avoid misrepresentation. One type of potential misrepresentation regards the population – who is visible, and who becomes invisible (Sandström et al., 2024)? In a current project, we noticed the lack of humandiversity in the digital 3D representations/models of humans (avatars), in in the development of a virtual 3D model, a so called digital twin, of Gothenburg city. The virtual environment we were shown, at a meeting with the developers demonstrated what could be done in the digital twin, was populated solely with young men in white T-shirts.

To amend this, a more diverse range of models/avatars has been developed. This includes persons of different ages and abilities, models of accessibility devices and tools (eg wheelchairs, canes, rollators, guide dogs) as well as specific vehicles (eg a van for transporting persons using wheelchairs, figure 3). Since we approach this from a perspective of universal design, where all people is the target group, we also include tools/devices such as prams, electric scooters, travel bags on wheels etc. These models/avatars will be made publicly available at the end of the project.

Figure 3. An image including both a specialised vehicle and tool/device models

Discussion

Who can at all be imagined as part of the city? In this text, we present two "lightweight" tools that are easy to apply for visualising diversity. Both tools are intended to be flexible, easy to use, as well as easy to extend. Creating 3D models that resemble the actual population of a city is an essential step towards fulfilling policies and ambitions about a society for all. Professionals at all levels working to fulfil the vibrant, rich city life need to have tools at hand that support their work with realising diversity. Avatars, cards and similar material serve a double function, where they act as trigger material as well as reminders, helping to keep diversity in mind throughout the development process.

While there have been a number of attempts in planning- and urban design projects to include a greater variety of people in visualisations, includingprojects where human diversity has been central to the

visualisations and communication of the project - three Swedish examples are (Jahnke, Magnus et al., 2019), (Jämt Jämlikt - För En Jämlik ByggdMiljö - Tengbom, n.d.), (Sandström, Ida, 2019) - such initiatives are often carried out as pilot projects with a limited timespan and often limited impact. While such projects are still important, the challenge of formalising processes, tools and materials in such a way as to make them part of mainstream urban planning, not just specific projects, remains. Simple tools, such as the ones presented in the current text, do not require extensive preparations or investments in order to be incorporated into regular planning processes.

***Figure** 4. Showing consequences. Since there isn't any ramp or elevator, the wheelchair users are stuck by the stair.*

Just as personas (Schulz & Skeide Fuglerud, 2012), the presented tools can serve as reminders, provide information and serve as thought support. Additionally, they can be used when assessing consequences. For the variation cards, this is again similar to how one would use *personas*, and takes the form of "how would our intended

design work for persons with diverse abilities". Using the developed models/avatars, it is also possible to be very concrete and both test and visualize consequences on a individual level – an example is provided in figure 4, where persons using wheelchairs get stuck on the stairs up to the park in the picture. A potential future application is to also add images or models/avatars to an augmented reality application, in order to make it possible to visualize diverse persons in real life environments.

As was identified by (Müller, 2023), there are inherent conflicts in the planning and building process. It is our hope, that easily used tools like ours, in particular the models/avatars in virtual environments, can be used to visualise consequences in such a way as to enable better resolution of such conflicts. Another problem identified in (Müller, 2023) isthat the absence of the human diversity perspective distorts the perception of the population. Our tools attemptto address this by making it easy to visualize a diverse population. In (Müller, Lilian, 2023), critical aspects in different planning and building phases are identified as is shown in Figure 1. Specifically, in the early phase, our tools mitigate the lack of assessment of human diversity and support a clear vision to (re)construct buildings and spaces to be used by all citizens. In the planning phase, they may mitigate unbalance between green and social sustainability, as well as help providing a clearer vision for architectural competitions and support consequence analysis. In the later stages of the process, they can – together with expert and user input as well as other tools – support the assessment of the project.

Given the lightweight nature of the presented tools, there are of course also weaknesses. Design cards as well as models will always involve some level of selection, and provide simplified information

that needs to be complemented by additional sources of information such as experts and stakeholders.

Conclusion

The present text introduces two lightweight visualization tools. The variation cards illustrate human diversity in the population, in a way that is easy to incorporate in activities like discussions, brainstorms, focus groups, workshops, etc. The presented models/avatars can be easily incorporated in different virtual environments used in the planning and building process. The presented tools can be used both as a support for the thoughts and inspiration, as well as for assessment and evaluation. We argue that such simple tools, which can easily be integrated in existing work processes, are important, and hope to see more such developments in the future. Having the right means is a prerequisite for doing a good job. However, the end is not about tools but about fulfilling people's fundamental rights.

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