This is an Accepted Manuscript of the following chapter:

Aarhaug, Jørgen. ***Universal design as a way of thinking about mobility***

In

B. Müller and G. Meyer (eds.), Towards User-Centric Transport in Europe, Lecture Notes in Mobility., 2019, 75-86.

ISSN 2196-5552 (electronic)
The chapter has been published in final form by Springer at
http://doi.org/10.1007/978-3-319-99756-8_6

Universal design as a way of thinking about mobility

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Abstract

The concept of universal design in reference to a strategy to counter social exclusion was first coined by the architect Ronald Mace. He defined Universal design (UD) as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design". This paper will look into the use of UD as a policy objective for transport policy, using Norwegian experience as an example. UD was adopted as one of the four major policy objectives in Norwegian transport policy in 2009. However, from 2018 onwards UD is no longer a main policy objective. This experience with UD as a policy objective is used as an empirical backdrop for a more principal discussion on the usefulness of UD in transport and mobility. I conclude by pointing at UD as a useful vision, but difficult policy objective.

1 Introduction

With changing structures of work and family life, mobility has become an increasingly important precondition of the fully functioning citizen. The last decades have seen an interest in how mobility restrictions can be a cause of social exclusion (Cass et al., 2005; Preston and Rajé, 2007; Preston, 2009; Priya and Uteng, 2009) in which individuals cannot fully participate in the normal activities of society even though they would like to (Burchard et al., 1999). The concept of universal design (UD), when used in the context of transport, is a way of thinking about these issues mostly as an alternative and complement to 'accessibility'. Here, the difference can be interpreted as accessibility with a focus on solutions created for individuals with impairments, while universal design is a focus on providing a solution by which impairments become irrelevant; in other words, that the main solution is usable by as many people as possible. An example; tactile tiles and braille writing, are not considered universal design. As these elements are useful in the case of people with reduced vision but not for many others. A walkway with clear natural guidelines, where orientation is easy and where signs can be readily understood by the visually impaired and by the rest of the population, is universal design.

I start by looking briefly at the concept of universal design. I examine the term disability – as this can be seen as both a medical issue and a societal issue – and provide a link between UD and public transport. Further I discuss universal design as a concept and policy objective and discuss this drawing on Norwegian experience. I then point to upcoming issues in mobility and how these relate to universal design at a general level. My main findings are summed up in a final section.

2 The concept of universal design

The concept of universal design (UD) in reference to a strategy towards promoting social inclusion was first coined by the architect Ronald Mace, who defined it as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (1997). The term is used primarily in the United States, Scandinavia and Japan, whereas the expression 'design for all' is used with a similar meaning elsewhere (Audirac, 2008). The term is used in the UN convention on the rights of persons with disabilities, with the definition: "the design of products, environments, *programs and services* to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed" (UN, 2006)[1]. The concept has been superimposed on transport from the built environment, where concepts similar to universal design can draw on history back to the 1970s. According to Story et al. (1998), early efforts to render environments accessible were frequently dependent on segregated measures that were "more expensive and usually ugly" compared to universal design, which includes accessibility for all in early design phases.

The objective of universal design is an environment where people with disabilities can function as natural members of society, and a guiding notion is that accessibility solutions benefit everyone, not just people with disabilities. Rebstock (2017) states that an accessible environment is essential for 10 percent of the population, necessary for between 20 and 40 percent, and comfortable for 100 percent of the population. It is therefore often included in the broader social inclusion paradigm or, as Audirac (2008:4) states: "UD is a philosophy of design that not only subscribes to the ideals of accessible and barrier-free design and assistive technology, it also professes to be a broader paradigm of design that celebrates diversity and is inclusive of all users regardless of age or ability". The relationship between UD and other design philosophies is illustrated in figure 1.

[1] Authors emphasize.

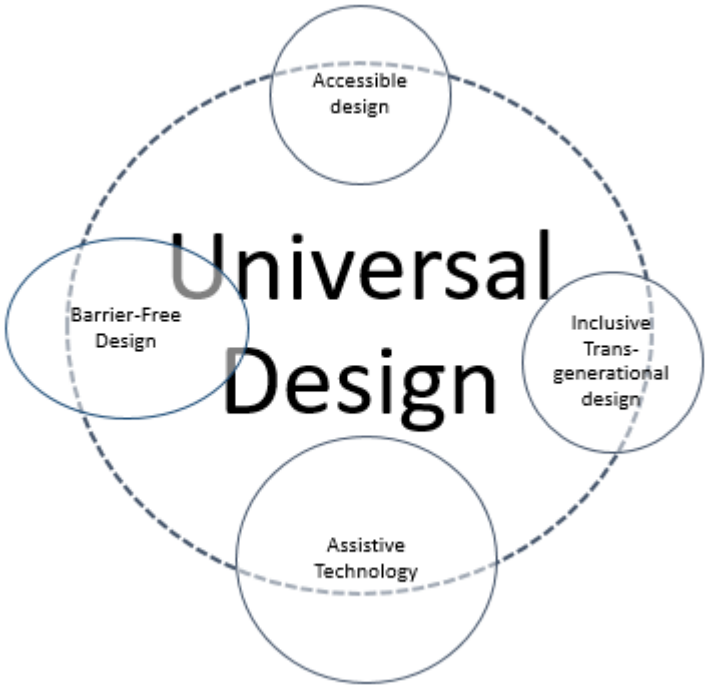

Fig 1. Universal design in relation to other design philosophies (Audirac, 2008).

Accessible design promotes equal opportunity of access to mobility and services for people with disabilities. Inclusive Transgenerational design is products and services designed for the widest possible audience, irrespective of age and ability. This includes improving the quality of life of people of all ages and abilities. Assistive technology is rehabilitative engineering that enables people with disabilities to carry out more tasks with their physical, sensory and/or cognitive abilities enhanced. Barrier-free design is retrofitting buildings, facilities or services to accommodate physically impaired people (Audirac, 2008). All of these concepts are, at least in part, included in the larger universal design or "design for all" concept.

2.1 The concept of disability

Although universal design is targeted at 'everyone', it is widely promoted and used by organizations fighting for the interests of people with mobility impairments or disabilities. This links universal design with another challenging concept, namely disability. The classic conception of disability is often referred to as the "medical model" (Shakespeare, 2006), according to which disability is caused by impairment and is a characteristic of the individual. It has to be cured or ameliorated (Hanson, 2004). By contrast, the social model of disability suggests disability is a social construction produced in the interplay between the individual and society (Shakespeare, 2006).

If one chooses to use the term “disability” within the social model, it may not necessarily be a permanent feature of the individual; passengers travelling with a pram or heavy baggage might be seen as transitorily disabled. A society where attitudes, standards and technologies are adapted only to the needs of the young and healthy thus produces a large number of disabled people, whereas one where solutions are adapted to the abilities and requirements of a larger group will produce fewer. The proponents of this model concede that there is a medical reality underlying disability, but emphasize that society contributes to marginalizing the disabled through its implicit endorsement of a certain norm. This approach draws attention to how physical design may create barriers to participation. From this perspective, poorly designed public transport may produce disability through preventing certain groups from using the public transport system, and thus from full participation in society.

In a quantitative study, Aarhaug and Gregersen (2016), found that people with disabilities not only travel less, but are also more affected by adverse weather conditions when travelling than the rest of the population. This illustrates that the disabled are more affected by hostile environments than the rest of the population. In extension, it points towards universal design as being important in facilitating their inclusion in society.

2.2 Applying universal design to transport

In applying the general concepts of universal design to the mobility and transport sector, public transport becomes a key issue, particularly access to it. Private-car-based transport is not universal and therefore is problematic from a universal design point of view. The use of a private car is exclusive. It is not shared. Large sections of the population in a car-based society are excluded from mobility as they cannot access private car transport. From a user perspective, the private car may be overly expensive, requiring a license or skills that are not suitable for the potential user’s mobility needs.

Within public transport, UD can be many different things. Some examples include having real time information on an easy to read format, as opposed to having only printed schedules (figure 2.), having a snow and ice removed from bus-stops frequently as opposed to a low level of winter maintenance (figure 3) and having level access to vehicles as opposed to having stairs (figure 4).

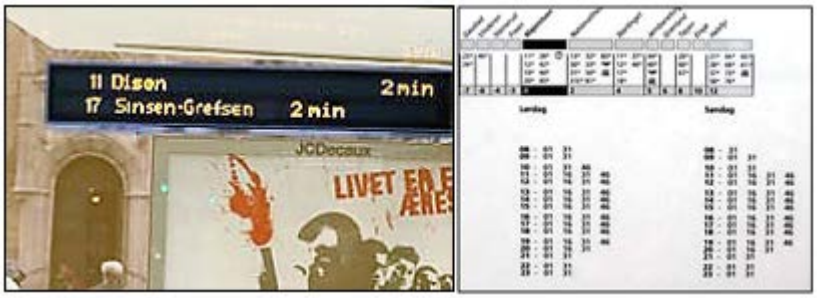

Fig. 2. Real-time information display and printed public transport schedule. Illustration Thomas Tveter.

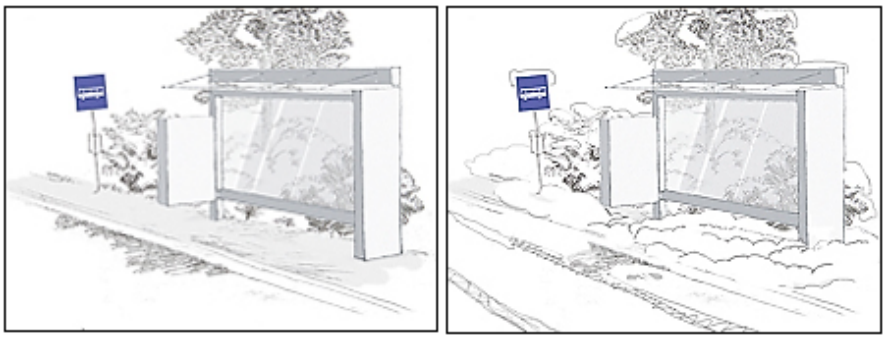

Fig. 3. Snow removal on a bus stop. Illustration Thomas Tveter.

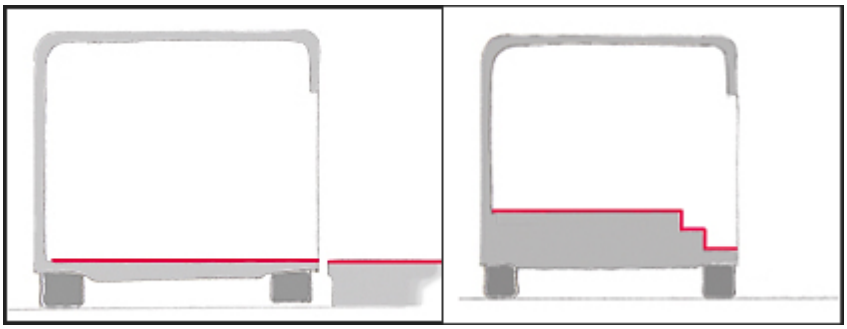

Fig. 4. Level access to public transport vehicles. Illustration Thomas Tveter.

Figures 2 - 4 illustrate some of the public transport infrastructure measures included under the universal design umbrella. Other examples and illustrations are available in NPRA (2014)[2].

3 Transport and universal design as social inclusion

According to Nordbakke and Schwanen (2015) access to transport services is a precondition to being a functioning member of society. This forms part of the conceptual link between universal design and transport. Providing mobility for disabled persons is not a marginal problem. Also, it is a challenge expected to grow as time goes by. Although there are many difficulties in measuring the prevalence of disability in society, estimates tend to be in the region of one in five

[2] https://www.vegvesen.no/_attachment/118984/binary/963983

adults having a form of disability or another. Thompson (2017) summarizes and discusses different estimates of disability prevalence finding global estimates ranging between 15 and 20 percent. Higher among older people. Nordbakke and Skollerud (2016) uses survey data that identify 19 percent of the Norwegian population above 18 years of age as having a form of disability. Disability is correlated with age, and as the population in Europe and the Western world in general is ageing the challenges will increase. This is the case even if the older population is healthier than ever, as ageing often implies reduced functional capabilities. According to Eurostat (2013), those aged 65+ will account for 29.5 % of the EU's population by 2060 compared to 17.5 % in 2011, whilst the share of those aged 80+ will almost triple between 2011 and 2060.

Disability is not a static situation. Increasing numbers of people with disabilities can be linked to the mobility options that are available, not only their health status. Disability is not the only issue, the geographic and economic limitations of public transport in low density areas are expensive and so 'forced car ownership' becomes an issue, too. Delbosc and Currie (2011) point to the high levels of car reliance in city suburbs as resulting in social exclusion. Even though their empirical study was conducted in suburban Melbourne in Australia, which is extremely car-reliant, their findings are transferable to many European settings. Car-reliance has a bearing on both work and leisure activities, particularly the latter. People who, for whatever reason, do not have full access to a car and live in car-reliant areas do not participate in as many activities as they would like to. This highlights one of the issues of a private-car-based transport system. What happens with people who for one reason or another – means, age or disability – do not have their own car? Delbosc and Currie's (2011) answer is that they are less able to participate meaningfully in society.

From a universal design perspective, the car as a dominant mode of transport cannot be universal design as it is not available to everyone. Cars are for the most part privately owned and operated and as a consequence public transport is often an object of study when linking the idea of universal design with transport. Provision of public transport is motivated by a set of different criteria. In the US, in particular, it is seen as a way of providing mobility for those who cannot afford to pay for these services themselves. In Europe, public transport is often more focused on providing transport volumes, or as an environmentally friendly and area-efficient form of transport, i.e. public transport in Europe often has a wider user group than is the case in the US. In all settings, public transport will provide better accessibility for the population if the majority find it attractive to use. The concept of universal design in transport is therefore linked to access to public transport.

Universal design as a concept is linked to rendering impairments irrelevant. Not all disabilities are relevant when it comes to public transport. Still, an increasing number of older people indicate that accessibility to public transport is an important issue. With populations ageing, there is reason to believe that an increasing number of people will have difficulty using public transport in the future. In many Western countries, the share of the population aged above 65 is

now approaching 15 percent (Crews Zavotka, 2006) and in Norway this has already been passed, with the figure expected to rise substantially (Folkehelseinstituttet, 2013).

Universal design or accessibility for all is a feature of public transport legislation in many countries, with government and transport providers often obliged to make public transport available to most groups of passengers. According to Øksenholt and Aarhaug (2018) the non-discrimination aspects of universal design is mostly addressed within EU legislation. This does not in itself guarantee accessibility, however, since implementation is often patchy (Arsenjeva 2017).

4 Experience with universal design as a policy objective

Research on the concepts of universal design and its implications for mobility and transport is limited. Universal design can be seen as being different things from different points of view. To look closer at the merits of universal design it can be useful to divide the analyses in three levels; strategic, what do we want to achieve?; tactical what product can help us achieve the aims?; and operational how do we produce that product?, following Anthony (1998) adopted for the transport sector by Van de Velde (2004).

At a strategic level, the vision of a universally designed society is a target to work towards, and creating a society that is designed according to universal design principles is an ambitious objective.

On a tactical level, universal design can be used in setting priorities between different groups. In terms of public transport this would be to give priority to making more parts of the city accessible, and in planning new developments in a way that makes them accessible to all.

On an operational level, universal design helps form guidelines for design of features in the transport network; that can be low-floor vehicles, high kerbs and a sufficient number of seats and resting places. Universal design of these different levels with different objectives is difficult to evaluate.

In the Norwegian case, universal design was one of the four major objectives of the national transport plan for the period 2010-2019. This was set as a strategic objective. However, in the current national transport plan (2014-2023), experience has shown that the results have fallen short of the objectives. Out of a planned improvement of 100 transport nodes only about 25 were improved and out of 6500 bus stops along national roads, only 480 were improved. The reason given is that universal design is a relatively new field, that the ambitions were too optimistic, and that UD-standard has proved to be more difficult to implement than expected. Also, measures to implement universal design have turned out to be more expensive than expected (meld.st 26 2013:32-33). Not stated in the document is

the critical fact that although universal design is a national ambition, most of the features that need to be improved, such as bus-stops, are within the regional government's area of responsibility. Consequently, even if the national government had managed to operationalize universal design within all its areas of responsibility, it would still fall short of the policy objectives. This illustrates one of the challenges with universal design as a strategic policy objective. It is ambitious; it includes many different areas of responsibility and it is difficult to reach within a set timeframe.

At the tactical level, Herriot (2011) observed that implementation of universal design is sketchy, while pointing out that one reason could be user consultation frequently taking place at too late a stage in the design process. Even if efforts are made to make systems accessible, this does not in itself guarantee that the measures work as intended. Tennøy et al. (2015) finds problems related to; mandatory consultations with disabled, where the disabled are not, qualified to give advice on mobility impairments in general, only impairments due to their own disability. A wheel chair user is not automatically qualified to give advice related to the issues faced by sight impaired and vice versa. Handbooks and manuals that are not practical enough and real-life considerations make implementation of universal design difficult. Skartland and Skollerud (2017) using a case study looking at user involvement related to implementation of UD in transport infrastructure investments find that although the mandatory user involvement was perceived as a positive factor by both the user groups, project owners and entrepreneurs, there are still issues related to lack of competence among user representatives. In particular, the issues related to user representatives not understanding fully the implications of different impairments. In other words, having a disability does not make you an expert of all types of disabilities. Mandatory user involvement helps in making terminals and other infrastructure more universally designed, but it does not solve all issues.

Still, universal design has been more successful at a tactical level, compared with at strategic level. Studies by Fearnley et al. (2010) and by Odeck et al. (2010) indicate that accessibility measures used within the universal design framework have positive side effects. They facilitate travelling in the case of passengers with prams or heavy baggage, thus contribute significantly to a positive valuation of universal design elements. In fact, Fearnley et al. (2010) and Odeck et al. (2010) found that the measures studied for creating universal design had a higher benefit-cost ratio compared to most other public transport investment opportunities. That said, although the valuation of these measures is high, it has not translated into a significant demand effect (Fearnley et al., 2015). In extension, universal design measures have proved to be cost-efficient investments in public transport. They increase welfare, but they do not result in more passengers – at least not by themselves.

At the operational level, universal design is useful in that the concept provides a framework from which guidelines can be formulated and, by extension, a design of the physical infrastructure. It is also useful in that it is user-centric, focusing on the travel chain, door-to-door, rather than on the responsibilities of each party.

On an operational level, despite the fact that large sums of money are spent on making transport systems more accessible and well-designed, very little research has been done on how universal design and accessibility measures work for people with disabilities, or indeed for passengers in general (Øksenholt and Aarhaug, 2018). Of several studies on this subject, one by Øksenholt and Aarhaug (2018) points to challenging issues with the operationalization of universal design. They look at how people with different disabilities respond to the challenges faced by public transport users, and conclude that public transport, even though it has reached a high level of universal design in the case area (Oslo), is not practical for many of their respondents. Respondents who are not able to use public transport have impairments that either make things difficult or are difficult for the untrained observer to observe, and therefore do not provide the level of service intended. Also, several of the respondents had "better options", e.g. a personalized private car or supported access to taxis over the discomforts of public transport.

In summary, the Norwegian experience points towards mixed results in using universal design as a policy objective. It has advantages on all levels, but also challenges. Universal design is very useful in creating a direction at strategic level, but this direction has proven difficult to set as a reachable quantifiable policy objective. At a tactical level, the benefits are well documented, however implementation is sometimes not as good as it could have been. On an operational level, questions can be raised to what degrees the ten percent of the population, for whom these measures are essential, are receiving the benefiting from universal design. The studies rather suggest that implementation in public transport in Norway, so far fall short here. Looking at the Norwegian experience universal design is successful in making transport better and more accessible, but not as successful as it was hoped to be.

5 Universal design in a changing mobility setting

At present, and at global level, there are several societal trends influencing the transport sector. In particular, digitalization and digitally facilitated mobility are influencing universal design – directly, in that the use of smart phone technology is changing the user interface between the transport provider and the user, and indirectly with digitalization changing the availabilities of transport options.

In the development between 2012 and 2017, the major change has come in the form of new ride-sourcing services. These have changed the modal split in many major cities by generating new trips and taking market shares from traditional taxis and public transport (Rayle et al., 2016; Schaller, 2017). From a universal design perspective, this has been positive in many ways in that people get access to door-to-door transport at a lower cost than previously. It also means that people who were unable to use either public transport or their own vehicle now have access to transport services in a more inclusive society. However, there are also downsides. Some people are not able to use these services and are left out, particularly if they have an impairment that makes use of a private car, even as a

passenger, problematic (such as being wheelchair bound). A question remaining with crowd-based services is who it is setting the standard. The provision of the service is positive, but in a universal design perspective a precondition is that someone sets the standards and requirements to optimize use by as wide a range of individuals as possible.

A second development is Mobility-as-a-Service, or MaaS for short, which is a system assembling the products of different transport providers within one common package. The relationship between the user of transport and that person's transport provider is simplified, as everything goes through an intermediary, namely the MaaS provider. In principle, this should allow more accessibility and more universal design and it should be easier to tailor and be included in a universal design perspective, as the service providers are companies rather than private individuals.

A third development is self-driving vehicles, and although these are not yet fully in operation, potentially they will make the public transport system much more universally designed. They will offer a hybrid between a door-to-door taxi service and a scheduled public transport system at a lower cost than today's demand responsive services. However, the question remains: Who will set the standards and requirements, for the vehicles and operators? And who will design the way the system will be implemented?

6 Conclusions

The origins of universal design as a concept can be traced to the built environment and architecture. Can UD be applied to the transport sector? Universal design adds perspective, at least if we consider access to transportation a fundamental building block in today's society. Universal design can be seen in the context of enabling people with a disability to function in society. As a concept, it fits more with a disability model, where disability is a construction of society rather than a characteristic of the individual. Universal design is a holistic approach to problems associated with people whose abilities to function in society are different.

Looking at the empirical experiences from Norway, the results are mixed. The vision is clear, but difficult to reach. Many of the measures necessary in making a society universally designed are themselves good investments from a cost benefit point of view. Still, the experience so far is that efforts made to promote universal design have not radically changed the day-to-day lives of people with disabilities, even if their disabilities are minor or merely temporal. There is still a long way to go before the Norwegian society is up to universal design standard.

At a global level, present trends in new modes of transport can at least be part of the solution, but even here there are problems. To fully utilize the possibilities that these services create, new technology often requires a certain technical

knowhow. In other words, we cannot expect new technology to render society universally accessible without regulation and dedicated policy.

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Acknowledgement: Sections of this paper draws on the work of Aarhaug and Elvebakk (2015).

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