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LONG PAPER

Universal design, inclusive design, accessible design, design for all: different concepts—one goal? On the concept of accessibility—historical, methodological and philosophical aspects

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Abstract Accessibility and equal opportunities for all in the digital age have become increasingly important over the last decade. In one form or another, the concept of accessibility is being considered to a greater or smaller extent in most projects that develop interactive systems. However, the concept varies among different professions, cultures and interest groups. Design for all, universal access and inclusive design are all different names of approaches that largely focus on increasing the accessibility of the interactive system for the widest possible range of use. But, in what way do all these concepts differ and what is the underlying philosophy in all of these concepts? This paper aims at investigating the various concepts used for accessibility, its methodological and historical development and some philosophical aspects of the concept. It can be concluded that there is little or no consensus regarding the definition and use of the concept, and consequently, there is a risk of bringing less accessibility to the target audience. Particularly in international standardization the lack of consensus is striking. Based on this discussion, the authors argue for a much more thorough definition of the concept and discuss what effects it may have on measurability, conformance with standards and the overall usability for the widest possible range of target users.

Keywords Accessibility · Usability · Disability · Design for all · Universal access · Inclusive design

1 Introduction

Currently, there is no consensus on formulating the concept of accessibility in different areas, not even within the ISO standardization community. Accessibility is a quality concept that is interpreted differently depending on the design approach used for the development. The authors' experience is that this lack of consensus on the definition of the concept may hinder the adoption of accessibility on a wider scale, thus possibly limiting the potential benefits. These benefits could manifest themselves on many levels, such as individual, business and society levels. Economic benefits, as an example, may be found on an individual level as increased income for someone who otherwise would not be able to work, had it not been for an adequate level of accessibility at the workplace. On a business level, companies offering products or services developed to meet the highest levels of accessibility may find an opportunity to offer this product to an even broader market, and probably also see new forms of use of their product. Society, on the other hand, will see economic benefits through having a larger percentage of the population work and a corresponding decrease in people being dependent on social security. This will therefore also have a positive impact on social sustainability and promote quality of life for the target audience. The quality of life may be increased

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for individuals who otherwise would not have been able to enter the workforce simply because of the lacking accessibility. The quality of the work environment and product quality even on the system development processes may be improved by making use of processes considering increased accessibility. Society itself can see its ethical ideals better upheld by catering for a broader variation of characteristics and capabilities in the design of technological support.

As an example, the region of Västra Götaland in Sweden has expressed a mantra: "What is essential for some specific users for them to be able to use a product, often makes it more efficient to use for most people", a claim that has also been made by recent accessibility research [1]. In the light of this, they have taken a policy decision to invest in identifying and acting for increased accessibility relating to activities in their public domain, something that also includes their websites. This is in line with the results from the Forrester report commissioned by Microsoft in 2003; 60 % of the adult workforce is likely or very likely to benefit from the use of accessible technology [2]. One example of this was that, when a commercial website was re-launched in a new version taking accessibility issues into consideration by applying WCAG 1.0, not only was it easier to use for individuals with disabilities, but also, as a side effect, the maintenance costs were reduced by 66 % and the load time of the page was reduced by 75 %. There was also a 30 % increase in the natural search engine traffic [3]. Making accessible ICT products and services is thus of a much wider importance than only for individuals with a disability.[1] The benefits can be experienced by most stakeholders.

The following sections will outline the purpose and justification for analysing the concept of accessibility. After that, the paper will go through the various concepts used in different design approaches, followed by a discussion on some historical traces of the notion of accessibility, sediments from long before the concept was ever used in practice and long before the invention of ICT. Moreover, different policies and international agreements developed to promote accessibility and an overview of how different ISO standards define accessibility are presented. Then, a philosophical analysis of accessibility from a post-structuralist perspective, a theoretical standpoint that considered valuable for a deeper understanding of accessibility, is made. Finally, all of these positions are put together, and conclusions that can be drawn with respect to defining accessibility and what consequences an agreed upon definition could potentially have, are presented.

2 Purpose and justification

A political stance on this subject has already been made by important entities such as the United Nations, the European Commission, USA, Japan, China and many more. In many countries, non-discrimination laws that require a certain level of accessibility are actually in place. Therefore, the question is not so much about whether it is necessary to achieve accessibility, but more about how to achieve it.

A major challenge, however, is that the term accessibility is used in so many different contexts where it may mean different things. Even in the same context, the term may be ambiguous. Various schools of thought (e.g. design for all, universal design, inclusive design and universal access), standardization bodies (e.g. ISO, ETSI) and companies or organizations (e.g. Panasonic) either use the term accessibility without thoroughly defining it or use other concepts to cover more or less the same area. Different schools of thought may take the term accessibility to have a slightly different meaning explicitly or in a more subtle way, or give different weight to certain aspects of the concept. The strategies of reaching more accessible end products are also slightly different between the different schools of thought, and therefore, one of the aims of the present work is to analyse what can be learned from the different schools of thought, based on their methodologies, attitudes or from their philosophical and ethical perspective.

Considering this conceptual plurality and ambiguity, one might question whether such a concept is at all useful. Perhaps, it only contributes to linguistic and theoretical debates without ever helping to improve the lives of individual people. However, since the concept has become well established in a broad variety of political and societal bodies, it is argued that it is still valid as a focal point for addressing issues concerning people's access to technology and society. By facilitating a better understanding of how the term is used in different contexts as well as a more widespread awareness of the historical, ethical and philosophical aspects of accessibility, an attempt will be made to deconstruct the area. It is also argued that a clearer definition will promote awareness, facilitate discussion, enable implementation and promote the development of better methods for increasing accessibility.

[1] The term disability is perhaps not the best one to use here. The word seems to suggest that disability is a static quality that certain people possess throughout life in all situations. Such an interpretation does not fully recognize one of the core convictions of this paper, i.e. that all people's abilities change over time and in different contexts. However, since the word disability has been so extensively used and accepted by international organizations, national legislation in a vast number of countries, civic organizations and the industry, the authors have chosen to accept that vocabulary in this article.

3 Approaches and design thinking

The population in the industrialized world is ageing, and as the population gets older, the number of people with functional difficulties is consequently also growing [4]. The needs of these growing groups are large, and this is particularly relevant to consider in the ICT area, where the support potential that ICT may have is enormous, but also the quality requirements are high [5]. In the last decade, meeting these needs has become an important goal on the political agenda and there is a growing recognition of the needs of better integrating elderly people and people with disabilities in society. The increasing awareness of these groups and their needs have attracted the interest of developers and designers to enable them to obtain an increased independence in terms of societal help and support for performing everyday tasks.[2] Even if the interest for designing for people with some form of disability was there already, the shifting of basic values in society has been very important, as the following will show.

The following chapter provides a short description of some design approaches or groups of design thinking that, according to the authors' point of view, have played an important role and inspired many in the area of designing for accessibility.

3.1 Barrier-free design

In the 1950s, a process of change in public policies and design practices started in the US. Due to a number of people returning to the US with injuries after the Vietnam War, the US President's Committee on Employment of the Handicapped, the Veterans Administration and others worked on national standards for "barrier-free" buildings, targeted at making buildings accessible by handicapped soldiers and others with similar conditions. The goal was to offer education and employment opportunities, as an alternative to institutionalized health care. In 1961, the American National Standard Institute published its first version of "ANSI A117.1—Making Buildings Accessible to and Usable by the Physically Handicapped" [6].

One of the effects of this was the tremendous development of assistive technologies with the purpose of increasing disabled individuals' possibility to participate in everyday life. Examples are most frequent in the area of building and home equipment, such as the one hand blender, remote controls, and wider doors in trains.

3.2 Design for all

Today, the concept of design for all is much more applied and related to than other concepts. The main goal of the design for all movement was that products are designed for an all-encompassing customer base and that a product is made to be usable by the widest possible range of people. This does not, however, automatically imply that there is such a thing as a single solution that suits all [7].

There are several definitions of the term design for all. The European Institute for Design and Disability (EIDD)[3] has defined design for all as *"design for human diversity, social inclusion and equality"* [8], which probably is the most widely spread definition. EIDD is a European platform for design for all. Members of this organization are national organizations, corporate and individual members now in sixteen European countries. During the annual general meeting of 2004 in Stockholm, a declaration was adopted, namely *"The Stockholm Declaration"*. Parts of this declaration are cited below.

> Across Europe, human diversity in age, culture and ability is greater than ever. We now survive illness and injury and live with disability as never before. Although today's world is a complex place, it is one of our own making, one in which we therefore have the possibility – and the responsibility – to base our designs on the principle of inclusion.
>
> Design for all is design for human diversity, social inclusion and equality. This holistic and innovative approach constitutes a creative and ethical challenge for all planners, designers, entrepreneurs, administrators and political leaders.
>
> Design for all aims to enable all people to have equal opportunities to participate in every aspect of society. To achieve this, the built environment, everyday objects, services, culture and information – in short, everything that is designed and made by people to be used by people – must be accessible, convenient for everyone in society to use and responsive to evolving human diversity.
>
> The practice of design for all makes conscious use of the analysis of human needs and aspirations and requires the involvement of end users at every stage in the design process.
>
> The European Institute for Design and Disability therefore calls on the European institutions, national, regional and local governments and professionals,

[2] This indicates that accessibility is not an area for state intervention only. Instead, accessibility is an area with a broad variety of stakeholders, e.g. the individual with a disability, the designer, the person leading the procurement process and the state regulations. The roles and responsibilities of these different stakeholders are a complex issue that lies outside the scope of this article. However, the authors recognize the importance of this aspect and view it as a potential topic for future work.

[3] In 2006, European Institute for Design and Disability (EIDD) changed its name to Design for All Europe.

businesses and social actors to take all appropriate measures to implement design for all in their policies and actions [8].

EIDD also situates the design for all vision within a discourse on sustainability, using Jon Hawkes' four-pillar definition [9], in which sustainability is defined as a composite concept entailing cultural as well as ecological, economical and social aspects.

Another definition was suggested by the European Commission Information Society in their original call in 2001, but unfortunately no longer available, which defines accessibility on the basis of its outcome. "This will only come as a result of designing mainstream products and services to be accessible by as broad a range of users as possible. This approach is termed design for all and consists of three principal strategies:

- Design of IST products, services and applications which are demonstrably suitable for most of the potential users without any modifications.
- Design of products which are easily adaptable to different users (e.g. by incorporating adaptable or customisable user interfaces).
- Design of products which have standardized interfaces, capable of being accessed by specialized user interaction devices".

The concept design for all has also attracted some attention on a national level. For example, the Swedish government set the goal that all of Sweden should be accessible for all people in the year 2010 [10]. In this goal, the focus was on using the term design for all, which means that no one should be excluded because of their disabilities or functional difficulties. This goal is argued to be a part of the government's vision of a democratic society, thus situating the concept within a discourse on democracy in which not only rational, political argumentation, but also the multitude and variety of people's practical participation in society is seen as important aspects of a democratic system. Furthermore, the government's proposition contextualizes this goal as part of a broad vision of developing a sustainable society, described in Hawkes' terms as a four-pillar concept [9]. By relating accessibility to sustainability, the proposition taps into the vision of the United Nations' Convention on the Rights of Persons with Disabilities, which emphasizes the importance of the inclusion of people with disabilities into society, not only for the individuals concerned, but also for society at large [11]. Thus, design for all is seen as core to sustainable development.

3.3 Universal design

Universal design is a design term which was coined by Ronald L. Mace, a highly influential architect, product designer and educator. He stated the term universal design as a concept of designing products and environments for the needs of people, regardless of their age, ability or status in life [12].

Universal design has its roots in the Barrier-free design and accessible design approaches, and according to more recent research, the term Universal design can be used interchangeable with the term design for all [7]. Mace argues that what can be barrier free for one person can be a barrier for someone else. Even specialists have problems with the design issue because of its complexity. To just remove the barrier is not enough, the designer must address the issue from a broader angle.

The universal design definition is "*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*" [13].

One of the most frequently cited explanations of the concept of universal design is the seven principles that are used to further elaborate on the concept [13];

- *Equitable Use* The design is useful and marketable to people with diverse abilities.
- *Flexibility in Use* The design accommodates a wide range of individual preferences and abilities.
- *Simple and Intuitive Use* Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills or current concentration level.
- *Perceptible Information* The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- *Tolerance for Error* The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- *Low Physical Effort* The design can be used efficiently and comfortably and with a minimum of fatigue.
- *Size and Space for Approach and Use* Appropriate size and space are provided for approach, reach, manipulation and use regardless of the user's body size, posture or mobility.

One example of the attempts to design according to these principles is Toyota that has applied the concept of universal design, to make their cars ready for adaptation already from the start. If the buyer would like to make some changes in the driving environment, such as changing the accelerator from using it with the foot to using it with the hand, a standard gizmo can be bought and easily installed. They have made most of the controls in the car replaceable. This means that if a user wishes to change the steering, it is easy to replace the steering wheel with something else as long it is following the Toyota standard. This way the increased accessibility potential comes with a

minimum of extra costs, something that makes the design more equitable.

3.4 Inclusive design

This term is mostly used in the UK where it is also described in the British Standard on Managing Inclusive Design [14]. There are a couple of different definitions of inclusive design. One of them has sprung from the normalization thinking that the design of buildings should be as inclusive as possible for as many as possible.

Inclusive design bears similarities to universal design and design for all, but with the requirement to also include the concept of "reasonable" in the definition. One of the definitions of inclusive design reads:

> The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible on a global basis, in a wide variety of situations and to the greatest extent possible without the need for special adaptation or specialized design. [14].

The phrase "reasonably possible" expresses one of the main differences from other approaches, since "reasonably" seems to suggest that the inclusion of people with disabilities can be disregarded if considered too difficult to achieve or too costly, whereas, for example, the United Nations' Convention on the Rights of Persons with Disabilities claims these rights to be absolute and unconditional [12].

Another definition of inclusive design has been adopted in the area of design education:

> Principally, it should be acknowledged that "inclusive design" is not a fixed set of design criteria, but a constantly evolving philosophy. The goal of creating beautiful and functional environments that can be used equally by everyone, irrespective of age, gender or disability requires that the design process must be constantly expanding to accommodate a diverse range of users, as we develop greater understanding of their requirements, desires and expectations. [15]

This is a more pragmatic definition that was developed during a round table discussion at the Disability Rights Commission's Discussion on Inclusive Design in November 2001 [15].

One of the leading design research groups in the UK at the University of Cambridge and its design group has had a focus on designing mainstream products instead of products for marginalized groups. They have also made an effort to make tools that companies can easily use in product development. One of these tools is the *"Inclusive design toolkit"*.[4]

3.5 User-sensitive inclusive design/design for dynamic diversity

Another suggestion of a methodological approach to User-Centred Design (UCD) was made by a research group in Dundee based on their view of the nature of the design for all and inclusive design approaches. They claim that the goals argued for in these approaches are not realistic goals for all products and could actually even be counterproductive.

If UCD is to be used in a situation where people with disabilities are included in the user group, this must mean changes in the methodology. The suggestion is User-Sensitive Inclusive Design (USID) as an extension of UCD. The word "centred" is replaced by "sensitive" because of the wide variety of functionality and characteristics of user groups (including users with disabilities and especially users with communication difficulties), which makes it very hard to get a small representative sample in the user group but also to design products that are accessible for all potential users. The use of "inclusive" indicates an attempt for a more realistic view on which groups can be included in the user group [16].

The Design for Dynamic Diversity is discussed in the context of designing accessible interfaces for older people, in general taking into account the fact that as people become older their abilities change. Elderly people are in a process of reduction in their cognitive, physical and sensory functions in an individualized way, which means that when designing for this group, the designers have to take the dynamic diversity into account [16].

3.6 Accessible design

Accessible design is defined in ISO's guide 71 as "design focused on principles of extending standard design to persons with some type of performance limitation to maximize the number of potential customers who can readily use a product, building or service, which may be achieved by

- designing products, services and environments that are readily usable by most users without any modification,
- making products or services adaptable to different users (adapting user interfaces) and
- having standardized interfaces to be compatible with special products for persons with disabilities" [17].

Therefore, it *"widens the scope of users as far as possible"* and *"is not limited to the 5th to 95th percentiles of working populations"*. Accessible design provides ergonomic data on the limited abilities of elderly and persons

[4] http://www.inclusivedesigntoolkit.com/betterdesign2/.

with sensory, physical or cognitive disabilities, aiming at including the widest possible range of user abilities.

The term accessible design was derived from the ADA (American Disability Act) standard for accessible design, which was first published in 1991 with its latest revision dating to September 2010. Its general message is that "*No individual shall be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of any place of public accommodation by any private entity who owns, leases (or leases to), or operates a place of public accommodation*" [[18]: Sect 12182].

3.7 Universal access

Universal access sometimes refers to a broader perspective of the possibilities for everyone to use the product or service even with assistive technologies, if necessary. This thought has had a strong position in the area of design in Asia, especially in Japan.

Another interpretation of universal access is that it is a social shaping approach in terms of the philosophy of technology [16].

In the area of human–computer interaction (HCI), universal access has been defined in a slightly different way, not only as the result of a design process but also as a way of thinking. It is described as a "*conscious and systematic effort to proactively apply principles, methods, and tools of universal design, in order to develop information society technologies that are accessible and usable by all citizens, including the very young and the elderly, as well as people with different types of disabilities, thus avoiding the need for* a posteriori *adaptations or specialized design*" [19]. Thus, within the tradition of universal access, accessibility does not concern people with physical or cognitive disabilities only, but is an aspect of increasing importance for society at large [20].

3.8 Cooperative design

In the Scandinavian culture, collaboration and participation on equal terms are inherent characteristics. There is a tradition of making agreements with workers on changing modes of operation or changing work routines. This way of working has spread as collaborative or participative design approaches. Particularly, when it comes to the involvement of users with special requirements, such an approach may be very fruitful and give completely new insights into the process, thus contributing to increased accessibility.

Cooperative Design [21], or as known by many, participatory design [22], is a design process involving much more than just the active involvement of users in the process. It entails full cooperation between the users and the development team, who share their respective knowledge and experiences by designing together. In UTOPIA, graphical workers participated actively in the design process with their knowledge and experiences on the same terms as the development team [23]. This can be described as using a democratic approach as a facilitator—"One man one voice". This so-called Scandinavian tradition was probably inspired by a tradition of a strong labour union. In the above project, the graphical workers were deeply involved in the labour union.

In the project "KidStory", the challenge was to investigate how to get hold of the children's points of view in the design [24]. It is very hard for children to get hold of adults' world of thinking and vice versa but using practical methods where all have the opportunity to visualize their ideas, an understanding between individuals from different contexts can evolve [23].

A further development of this method was to additionally involve users with some form of disability in the Cooperative Design workshop resulting in short video prototypes of the solutions, offering valuable information to be used in the process of further developing a product. In this way, accessibility issues were automatically included within the method by inviting participants from the widest range possible from all stakeholders in the area [20].

3.9 Summarizing approaches and design thinking

The different approaches of designing for accessibility are merging and becoming increasingly difficult to distinguish from each other. For example, in a note in the recommendation from the EU Ministers' meeting of 2009, the terms "design for all", "integral accessibility", "accessible design", "inclusive design", "barrier-free design", "transgenerational design" and "accessibility for all" are regarded as converging towards the term "universal design" as it is used and defined in this text. These approaches all take the needs of a broader spectrum of people into account in the design process to ensure that mainstream equipment and services can be used by a wide range of users, including older people and those with disabilities. Awareness of the development of these different approaches that have been presented helps illuminate the challenges and the basic values underlying the general approach towards increased accessibility.

4 Chronological traces

In order to further illustrate the complexity of the concept of accessibility and its changing character, the following section will discuss some chronological traces of how accessibility has been understood historically. The focus in

this section is on events that have resulted in extensions of the rights for an increasing part of the population in order to further include them in society as equals. This section describes a change in focus over time, from a perspective where individual characteristics and capabilities determined what the individual could (and should) do, to a perspective where everyone is supposed to be able to do everything by adapting the tools used.[5]

4.1 From hunters to Vikings

From an historical perspective, accessibility and even human rights have only just recently become an issue. When humans were hunters, the individuals' ability to contribute to the group was essential. Individuals who were born with a disability or who became injured had difficulties being a full member of the group.

Moving on to ancient Greece, a similar emphasis on relating people's roles and tasks to their characteristics and capabilities is noted. Society was built upon the perception that some people are born to lead (master) and others are born to work (slaves), which meant that every individual had his/her specific, congenital role in society [25]. Facilitating for individuals to be able to perform tasks beyond their hereditary capacity was therefore not on the agenda in ancient Greece. Instead, the congenital, individual characteristics and capabilities determined a person's scope of activity. Within the political arena, this meant that a majority of people living in, e.g., Athens were excluded from political influence, despite of the democratic ambitions of the society. One of the most famous representatives of this line of thought was Plato, who argued that ruling the state should only be possible for those who had superior natural capacity and a comprehensive education, thereby arguing for a societal structure built upon different people having different tasks [26]. This was to some extent based on congenital characteristics and capacities.

In another of the Greek city states, Lycurgus introduced the Spartan constitution, and each citizen was given a plot, or estate, called a "kleros" [27]. The Spartans then called themselves equals, not only because they were equal in rights, but because they were also equal in wealth. This is the first known constitution that gave supreme power to an assembly composed of all citizens. This equality did not extend to everyone, but only to a select group of adult males who had successfully completed the Spartan education system. Nonetheless, public education was provided for women as well as men. This then is an early example of rights being given to a group that previously did not enjoy them (e.g. the rights of citizens to participate in the assembly, the right to receive public education).

Interestingly enough, despite the emphasis on congenital capabilities, other, more flexible perspectives on people's place in society can also be found in ancient Greece. For example, the word "idiot" referred to someone who avoided contributing to the state's affairs rather than someone with less intellectual capacity [28]. This is an early example of congenital capacity not being viewed upon as the only defining characteristic in terms of the role that an individual can play in society, and suggests that one's position and role in society is renegotiable and re-definable depending on the individuals' own aspirations.

In Scandinavia, the Vikings had a very practical view of humanity and abilities, which is shown in the poem of "Havamal". In this poem, verse 71 reads:

> The lame can ride horse, the handless drive cattle,
> the deaf one can fight and prevail,
> it is happier for the blind than for him on the bale fire,
> but no man hath care for a corpse. [29]

This illustrates a very strong connection between the diverse personal capability and the role that an individual has to play in society.

4.2 The rise of human rights

The Magna Charta in (1215) was the first document imposed on a monarch in order to constrain his authority and ensure certain rights to all citizens. One such right, which is still in existence today, is that "free men" can be punished only through the law of the land. This document is regarded to be the foundation for the British people's freedom and rights.

During the enlightenment, the idea of natural rights, an idea that can be traced back to the Stoics and that has been an important part of such diverse ideological traditions as for example Catholic Scholastics and early Protestantism, was further developed in an individual direction by theorists such as John Locke. According to this view, every human being possesses certain innate rights independent of the person's social or financial status, cultural background, education, etc. This idea constitutes the foundation for what later came to be known as the Universal Declaration of human rights.

The United States Declaration of Independence of 1776 is another example of rights being bestowed upon citizens. The first ten amendments, collectively known as the Bill of Rights, guarantee certain freedoms to its citizens [30]. This was followed by the French Declaration of Human Rights

[5] The authors have chosen to focus on events from their own cultural heritage, aware of the risk of a western, European bias, however, arguing that similar ideas and a similar historical development can be found in other cultures as well. Aiming for an all-encompassing, global historical perspective would, however, unavoidably be too big a task to grasp within this article; therefore, this particular cultural perspective has been chosen.

which states that all men are born equal and have equal rights, a statement that has political consequences in terms of the idea that all power emanates from the people, thereby promoting a participatory aspect of civic government.

In 1945, the United Nations was constituted, and in 1948, the General Assembly adopted the Universal Declaration of Human Rights [31], which emphasizes the equality of all mankind.

4.3 Accessibility thinking starts

As has been shown in the section discussing Barrier-Free Design, something happened in the 1950s that started a process of change in public policies and design practices. It began with the US military involvement in Vietnam, which unfortunately led to a number of people returning to the US with disabilities due to inflicted injuries [32]. The US President's Committee on Employment of the Handicapped, the Veterans Administration and others worked on national standards for barrier-free buildings, in a move towards making buildings accessible by the handicapped soldiers and others with the same conditions. The goal was to offer opportunities in education and employment rather than institutionalized health care. Thus, the term Barrier-Free Design was introduced to describe the act of creating barrier-free buildings. During the following years in the 1960s, the American national accessibility standard published the report "Making Buildings Accessible to and Usable by the Physically Handicapped" and in 1968 the Architectural Barriers Act with the principles around barrier-free design in the area of buildings was adopted as American law [6, 33]. The accessibility discourse during this period is therefore still mostly focused on physical issues.

In the 1970s, the term User-Centric Design evolved from Cooperative Design (Scandinavian tradition of ICT design) [23].

The Trace R&D Center at the College of Engineering, University of Wisconsin-Madison, was formed in 1971 to address the communication needs of people who are non-speaking and have severe disabilities. This centre played an important role in the developing of accessibility technologies for people with disabilities.

4.4 Accessibility established in national legislation

In USA, the Rehabilitation Act of 1973 was adopted which prohibits discrimination on the basis of disability [32]. Then, in 1986, the original section 508 was added as an amendment directed at electronic and information technologies. Twelve years later, the Congress amended the Rehabilitation Act to require the Federal agencies to make their electronics and information technologies accessible to people with disabilities. According to Section 508, barriers need to be eliminated in order to make these new technologies available for people with disabilities.

The American Disabilities Act (ADA) (PL101-336) was passed in 1990 (revised 2008 in PL 110-325) with the intention to protect people from discrimination due to disability [18]. Equal opportunities for participation in programs, services and activities were addressed from a Federal perspective.

In 1991, an action research group, which initiated the Inclusive Design research program at the Royal College of Art in London, UK, was founded. They played an important role in combining design with groups that previously were excluded from using products, services and environments.

The official start of the Web accessibility Initiative of W3C was in 1997. Their director Tim Berners-Lee said in conjunction with the discussion in favour for the new direction that *"Worldwide, there are more than 750 million people with disabilities. As we move towards a highly connected world, it is critical that the Web be usable by anyone, regardless of individual capabilities and disabilities"* [34]. The initiative aimed at creating a set of guidelines, the Web Content Accessibility Guidelines (WCAG) explaining how to make Web content more accessible to people with disabilities.

In Sweden, a national action plan entitled *"From patient to citizen: A National Action Plan for Disability Policy"* was adopted in 2000. The central theme is that society should be designed so that all citizens have equal opportunities [10]. The focus is on identifying and removing obstacles to full participation in society for people with disabilities in order to prevent discrimination against people with disabilities and making it possible for children, young people and adults with disabilities to live independent lives based on their own choices.

The first publication of the Universal Access Handbook in 2001, entitled *"User Interfaces for all: Concepts, Methods and Tools"*, was dedicated to design for all in human–computer interaction [35]. The same year the ISO Guide 71 was introduced, formulating guidelines for developers to address the needs of older persons and persons with disabilities [17].

In their Stockholm Declaration from 2004, EIDD (EIDD—Design for All Europe) defined design for all as design for human diversity, social inclusion and equality [8]. This holistic and innovative approach constitutes a creative and ethical challenge for planners, designers and entrepreneurs as well as for administrators and political leaders.

In 2005, the Enterprise and Industry Directorate-General of the European Commission presented phase one of a

mandated work to the European standardization bodies CEN, CENELEC and ETIS: MANDATE 376 [36]. The first phase of MANDATE 376, which is about E-accessibility in public procurement of ICT products and services, ended in 2010, and the reports from CEN/CENELEC and ETIS are publicly available. The second phase of MANDATE 376 started early in 2011, and the results are to be presented in the form of an ETSI, CEN/CENELEC standard and a toolkit to make it easier to promote accessibility needs in public procurement.

The UN Convention on the Rights of Persons with Disabilities was adopted in 2006, and the possibility to ratification opened in 2007 [11]. As of March 2013, 169 member states have ratified the declaration [37]. As a result of this convention, many countries have adopted anti-discrimination acts targeting discrimination due to disability.

In Sweden, governmental authorities have created a public framework for contract procurement in which principles and priorities regarding usability, ergonomics and especially accessibility for people with disabilities are defined. The same year, Handisam, the Swedish Agency for Disability Policy Coordination, published guidelines to help all public authorities in Sweden to become more accessible for people with disabilities [38]. The guidelines focus mostly on buildings and the environment but also discuss ICT in terms of how authorities should plan and conduct their work in order to become more accessible.

In December 2008, W3C published the WCAG 2.0, stating four principles to provide better Web accessibility: perceivable, operable, understandable and robust [1].

In CEN, the technical specification for "Packaging—Ease of opening—Criteria and test methods for evaluating consumer packaging" (CEN TS 15945, 2011) was adopted in 2011 [39]. This is the first CEN document where a usability method is using a stratified test group of elderly to make a statement about overall use. A focus on what is necessary for some has proven to make it easier for a larger group.

4.5 Summarizing the chronological traces

This chapter has briefly described a shift in focus, from a perspective where the individual is seen as an asset that should contribute to society by performing work that is suitable for the individual's physical characteristics, to a perspective where the individual is seen as someone who should have the right to participate in all parts of society irrespectively of his/her physical abilities. The design approaches developed over the last 50–60 years can be seen as reflecting this development and increasingly adopting the vision of accessibility as a broad inclusive concept not limited to discussions on functional disability, but also concerning diversity and cultural and contextual aspects.

5 Collaborations, conventions and standards to achieve increased accessibility

Having described how differently accessibility has been interpreted, historically as well as in current/more recent design approaches, the following section focuses on the political arena. How has accessibility been understood in international collaborations, such as the UN, the WHO, the EU and the international standardization organizations?

5.1 United Nations' declaration of human rights

The Universal Declaration of Human Rights was adopted 1948 by the United Nations General Assembly to become the foundation of international human rights laws [31]. This declaration has become the starting point for a rich body of legally binding international human rights treaties and human rights development work worldwide.

Throughout its 30 articles, the declaration stipulates a number of rights that should be granted to all people regardless of distinguishing characteristics such as nationality, gender, age and religion, thus establishing the core values of the declaration as universal. According to the declaration, all people are born free and equal in dignity and rights and should therefore be protected against discrimination and granted the right to work, participate in societal activities, enjoy culture and arts and engage in political debate, to name but a few of the rights mentioned in the declaration.

The Universal Declaration of Human Rights is a political document rather than a legal one and has been followed by conventions that are legally binding for the countries that have ratified them. Some of the conventions that followed upon the declaration are listed below:

- Genocide Convention (1948).
- Convention on the Elimination of All Forms of Racial Discrimination (1965).
- Covenant on Economic, Social and Cultural Rights (1966).
- Convention on Civil and Political Rights (1966).
- Convention against All Forms of Discrimination against Women (1979).
- Convention about the Rights of the Child (1989).
- Convention for Protection of All Migrant Workers and their Families (1990).
- Convention about the Rights of Persons with Disabilities (2006).

For accessibility issues, the Convention on the Rights of Persons with Disabilities has become the one most referred to, although many of the other conventions mentioned contribute important additional requirements and rights.

5.2 United Nations' convention on the rights of persons with disabilities

Although preexisting human rights conventions offer considerable potential to promote and protect the rights of persons with disabilities, this potential was not being tapped. The United Nations' Convention on the Rights of Persons with Disabilities was created as a response to this fact. Persons with disabilities continued being denied their human rights and were kept on the margins of society in all parts of the world—in developing countries as well as in countries such as Sweden, Denmark, England and USA. The convention articulates the legal obligations of states "*to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity*" [[11]: Article 1].

The convention constitutes a paradigm shift in attitude and approach to people with disabilities. People with disabilities should not be viewed as passive objects, receivers of charity, medical treatment and social protection, but as active subjects with the right to decide for themselves and to actively participate as members of society. These hereditary rights of people with disabilities are argued for, not only from the perspective of individuals currently being excluded from society, but also from the perspective of society at large, i.e. including people with disabilities is an important step towards developing a sustainable society. The concept of sustainability is not clearly defined in the convention. However, it implicitly relates to Hawkes' broad four-pillar understanding of the concept sustainability, by discussing "*accessibility to the physical, social, economic and cultural environment*" [11: Preamble]. Furthermore, the convention emphasizes that accessibility to these societal environments should not be conditioned by the individual's proximity to urban areas with high concentration of, e.g. cultural institutions, but should also be available in rural areas.

This convention gives universal recognition to the dignity of persons with disabilities, and the General principles are:

- The respect for inherent dignity, individual autonomy including the freedom to make one's own choices, and independence of persons.
- Non-discrimination.
- Full and effective participation and inclusion in society.
- Respect for difference and acceptance of persons with disabilities as part of human diversity and humanity.
- Equality of opportunity.
- Accessibility.
- Equality between men and women.
- Respect for the evolving capacities of children with disabilities and respect for the right of children with disabilities to preserve their identities.

According to the convention, fundamental principles of international human rights laws apply to all people, whether or not they are disabled. It also includes a discussion about direct and indirect discrimination.

According to the convention, reasonable accommodation must be made for persons with disability in order to ensure equal accessibility. Reasonable accommodation of the convention means "*necessary and appropriate modification and adjustments not imposing a disproportionate or undue burden, where needed in a particular case, to ensure persons with disabilities the enjoyment or exercise on an equal basis with others of all human rights and fundamental freedoms*" [11: Article 2].

Accessibility is not defined in the convention document, and neither is the term disability. What is described in this convention is more or less the obligation of universal access for all people, including individuals with disabilities.

5.3 WHO's international classification of functioning

The International Classification of Functioning, Disability and Health (ICF) is a taxonomy that describes aspects of human health and some health-relevant components of well-being [40]. This is a classification system of functionality, disability and health in a broad perspective and can be used as a communication platform to describe individuals' health state in a quality of life perspective for all people, not only for those with disabilities. This model has had a strong impact on the discussion on how to support disabled people in the best possible way in general life, but not always of benefit when it comes to improving ICT use.

The framework is around the body (function and structure), activity, participation and context. The contextual factors are divided into environmental and personal. The personal factors are not included in the ICF, but the classification relates to these factors (Fig. 1).

Based on ICF, one can distinguish a social model of disability in contrast to the prevailing medical disability model. The medical disability model is built on a diagnosis of the individual. The social disability model views the individual in relation to the social environment, and the following will describe the essence of it.

A lack of body function or a mental disturbance can for an individual make things difficult in certain contexts. An

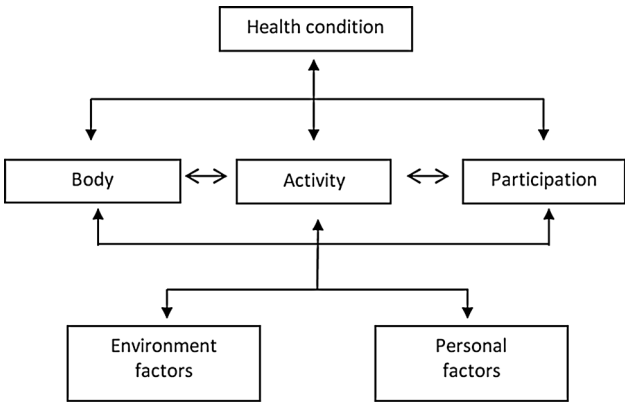

Fig. 1 The WHO ICF classification of functioning, overall structure [40]

individual may in that context be disabled. If the environments, services and products are well thought-out, on the basis of a design for all perspective, it increases the possible use for people with functional difficulties. A disability always occurs in relation to something or somebody and in a specific context. Thus, disability is an umbrella term stemming from functional reductions, structural discrepancies, activity restrictions or limitations to participate in a certain context.

When analysing ICF, it is interesting to observe the use of disability as a multidimensional concept where the limitation in the interaction between people and their physical and social environment is not defined simply as results of the disabilities. In a design context, this description fits very well with User-Centred Design where contextual factors such as environment, users (and their ability, knowledge, culture, etc.) and organizations are considered in relation to the activity that should be occurring, in relation to the goals.

5.4 European Union

The aim to include everyone in the use of new ICT based technology is a major area of political striving in Europe. In 2006, a thematic EU-ministerial meeting, "ICT for an inclusive society" in Riga, resulted in the Ministerial Declaration on eInclusion [41]. In paragraph four of this Riga Declaration, eInclusion is defined:

> eInclusion means both inclusive ICT and the use of ICT to achieve wider inclusion objectives. It focuses on participation of all individuals and communities in all aspects of the information society. eInclusion policy, therefore, aims at reducing gaps in ICT usage and promoting the use of ICT to overcome exclusion and improve economic performance, employment opportunities, quality of life, social participation and cohesion. [41]

The term eInclusion is widely used in the political context in the EU. Some texts use the term Digital Inclusion to refer to basically the same area, though eInclusion is used when referring to specific policies. Within the European Union, the term is used to describe activities relating to the achievement of a sustainable, inclusive information society. eInclusion means to create a sustainable and digital social cohesion and to bring the possibilities of the Internet and other communication technologies to all people, which includes those individuals who are disadvantaged due to such things as education, age, gender, disabilities, ethnicity, living in remote rural regions, etc. The policies around eInclusion address issues in the field of active ageing, geographical digital divide, accessibility, digital literacy and competences, cultural diversity and inclusive e-Government. One of the three pillars of the 2010 policy initiative at the EU level is managed by the Directorate-General for Information Society and Media of the European Commission. In the work of developing policies, knowledge base, research & technology development and deployment, and best practices, dissemination of eInclusion is a very important issue.

In the EU, the term design for all is also used, though it is mainly used the same way that universal design or inclusive design is used in other forums and is mostly described as availability of adequate assistive technology.

On EU level, there has been an initiative to make Europe more accessible, not only in the area of information technology but also in other areas. The strategy is to involve European standardization bodies in this work by putting out Mandates. Mandate 376 is aimed at accessibility in European public procurement of products and services in the domain of ICT [36]. The work begun in 2011, and one of the aims is to harmonize with other similar efforts in the world, e.g. there is a close relation to the USA work to update section 508 in the Rehabilitation Act [42].

The aim of the working groups is to make one CEN standard for the conformity assessment and an ETSI Technical Report (TR) that will be the basis for an online toolkit for public procurement. It is aiming to help procurers to identify the requirements for their purchase but also to help manufacturers interested in offering products or services to public entities to meet the demands from the procurer.

5.5 Example of implementing conventions on a national level

Most of the countries that have ratified the convention on Rights of Persons with Disabilities have also implemented some form of legislation of non-discrimination. As an illustration of how these ratifications can effect national legislation and public policies, some examples from

Sweden will be given. The Swedish government has set the goal that all of Sweden should be accessible for all people in the year 2010 [10]. This goal is focusing on the term design for all, meaning that no one should be excluded on the basis of their disabilities or functional difficulties. This goal is argued to be a part of the government's vision of a democratic society, thus situating the text within a discourse on democracy in which not only rational, political argumentation, but also the multitude and variety of people's practical participation in society are seen as important aspects of a democratic system. Furthermore, by contextualizing this goal as part of a broad vision of developing a sustainable society, the proposition also taps into the vision of the United Nations' Convention on the Rights of Persons with Disabilities, which emphasizes the importance of the inclusion of people with disabilities into society, not only for the individuals concerned, but for society at large [6]. Thus, design for all is seen as core to sustainable development.

Swedish legislation has a special law that prohibits discrimination in any form or situation [43]. This law aims generally to strengthen the individuals' legal rights and at the same time give individuals that have been violated/offended a possibility to get redress and economic compensation for the damage suffered.

The Swedish governmental focus on design for all has made the market take steps in this direction. Public policies are more important than legislation as a driving force for accessibility in Sweden [66]. The Swedish Administrative Development Agency (Verva) has developed guidelines for procurement in the direction of usability [8]. Kammarkollegiet has also made a framework for contract procurement where usability issues are prioritized, especially usability issues relating to accessibility for people with disabilities. Verva states: "*Increased attention will be given to usability, ergonomics, and accessibility for the disabled…*" [44].

This is an example of how international conventions have been implemented at a national level, thereby not only achieving an increased focus on accessibility, but also linking this topic to the need for sustainable development and a thriving democracy.

5.6 Use of the term "accessibility" in standards

The three big international standardization organizations ISO,[6] IEC[7] and ITU[8] issued a statement during a workshop in Geneva in 2010 of an intent to cooperate around accessibility issues with the aim of making it easier for standard developers to include accessibility in their work processes [45]. These three standardization organizations have different focuses: IEC is about electronics, ITU is about broadcast in general, and ISO is more general.

In IEC, standardization efforts concern such things as telephone and communication protocols, whereas in ITU, the efforts cover, for example, digital TV boxes and their protocols. ISO has a broader view and in the ICT area more of an ergonomic perspective. ISO provides definitions both of accessibility and the related term usability.

Already in 2001 ISO adopted Guide 71 [17], guidelines intended to help standards developers to integrate accessibility considerations in every applicable standard. The same document was also adapted by CEN as a European standard. In 2011, Guide 71 opened for revision. To back up the guide with deeper knowledge, there is a technical report on the impact that human limitation may have [59].

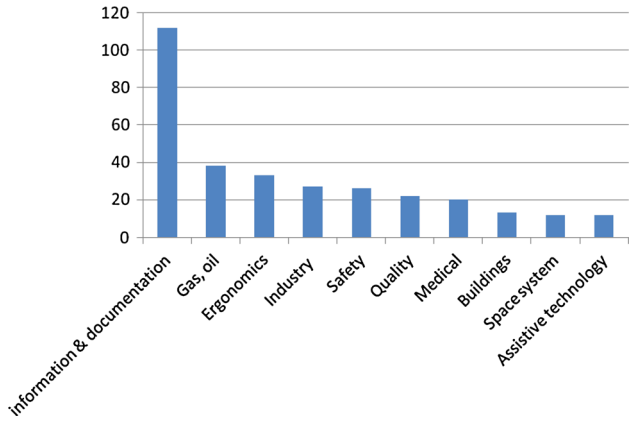

Fig. 2 Standardization areas where the term "accessibility" is used

5.6.1 Accessibility in ISO standards

In ISO's 18 000 standards, technical reports and technical specifications, the term accessibility occurs in over 3,000 instances in over 400 documents. In the majority of documents, there is no definition or link to a definition of the term accessibility. In the following diagram, the areas where the term accessibility was most frequently used (those with more than 2 different standards) are presented (Fig. 2).

In the area "information and documentation", there are several different interpretations of accessibility. The most common is the accessibility of file headers or headers in the FAT system. Other standards in the group are about programming language and the accessibility of certain functions or even hardware. There are a numerous standards that are using the term accessibility in the context of human diversity.

[6] ISO is the International Organization for Standardization.

[7] IEC is the International Electrotechnical Commission.

[8] ITU is the United Nations specialized agency for information and communication technologies.

Another way of analysing the ISO standards was to use their concept and definitions database from which a basic categorizing was conducted. When searching for the word accessibility in that database, there were 23 posts. The 7 main groups of definitions elaborated based on these posts were as follows:

(A) availability of and ease of access
(B) measure of the ease to approach
(C) successful access to information and use of information technology by people who have disabilities
(D) ease of reaching and using a service or facility
(E) biometric possibility for everyone, regardless of physical capability or technological readiness, such as people with disabilities, to access and use biometric technologies and services
(F) usability of a product, service, environment or facility by people with the widest range of capabilities
(G) ability of a space to be entered with ease

Of the posts in the concept, database category F was most frequently used (12 out of 23 posts). These occurrences were within the area of ergonomics and human–system interaction. However, the frequent occurrence of the term "accessibility" does not necessarily mean that there is a common understanding of the term. In the area of "information documents", accessibility occurs 112 times, and in most cases, the term is used without any definition. It is thus up to the reader to define the term.

The most frequently used definition of accessibility is found in ISO 26 800 (ergonomics—general approach, principles and concepts) and before that in the ISO 9241 series, described below. This definition was officially used in 13 other standards, mainly in the area of ergonomics and ICT:

> extent to which products, systems, services, environments and facilities are able to be used by people from a population with the widest range of characteristics and capabilities to achieve specified goals in a specified context of use [46].

This definition relies on the definition of usability from ISO 9241-11:1998:

> extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use [47].

In general, this definition can be interpreted as usability being about product quality in relation to users and accessibility being about how wide the user group is allowed to be in terms of characteristics and capabilities. It is interesting to notice that in the context of ISO definitions, there is no direct reference to people with disabilities; instead, the definition of accessibility is formulated in a design for all manner.

5.6.2 W3C and the WAI

W3C is a consortium with a mission to lead the World Wide Web to its full potential. They work with developing protocols and guidelines to ensure a long time growth of the Web. One of their leading principles is Web for All which is described as a social value which enables human communication, commerce and the opportunity to share knowledge through the Web. To make the benefits of the Web available to all people is one of W3C's primary goals. Explicitly, it is not only people with a disability that is the target group for Web accessibility but also groups such as elderly, people in rural areas and people in developing countries [48]. According to W3C, it is essential to provide equal access and equal opportunity to people with diverse abilities.

To do so, they have started the Web Accessibility Initiative (WAI) in which workgroups developed a framework to guide Web developers in the creation of an accessible Web. This group developed the Web Content Accessibility Guideline (WCAG), which currently exists in version 2.0 [49]. These guidelines are widely adopted as a standard, against which the accessibility of a webpage can be measured.

5.7 Summarizing collaborations, conventions and standards

On a political level, the term accessibility has become something that is not only of importance for people with disabilities. The Universal Declaration of Human Rights has clearly stated that all people should have the same right to participate in society, regardless of their human characteristics, thus widening the scope for the question of accessibility. ISO, in the area of ergonomics, has also stated a definition of accessibility where there is no reference to disability. The World Health Organization is moving in a similar direction by including contextual aspects and a quality of life perspective when considering assistive technologies to help the individual. From this perspective, one can argue that accessibility is a fundamental human right that concerns us all, regardless of physical ability or disability.

6 A philosophical perspective: post-structuralist challenges to the work on accessibility

At the core of the work on accessibility lies the question of the relation between uniformity and diversity, between

standards and exceptions. Few other philosophical schools have emphasized otherness, diversity and pluralism as much as post-structuralism. It is therefore interesting to investigate whether and how this theoretical tradition can contribute to the work on accessibility.

Post-structuralism as such is a heterogeneous philosophical tradition consisting of a variety of thinkers and theories, with applications in a broad range of academic disciplines, such as psychology [50], marketing [51], sociology [52], literature [53] and HCI [54, 55]. It is by no means an easy task to define post-structuralism, though for our purpose in this paper, a full definition is not necessary. Instead, it is important to focus on a few post-structuralist theories that are considered valuable for the discussion on accessibility. For this purpose, theories formulated by two of the most cited post-structuralists, namely Michel Foucault and Jacques Derrida, have been selected.

The following section will first summarize Michel Foucault's theory of the construction of the concept of normality and its consequences for the debate on accessibility. Jacques Derrida's theory of différance and its potential to constitute a theoretical foundation for an alternative perspective on accessibility will then be described.

6.1 Michel Foucault's theory on the construction of the concept of normality

6.1.1 Discourse and control procedures

According to Michel Foucault, every society is characterized by a fear of the discourse [56]. This fear (logofobia) is based on the experience of randomness and materiality found in discourse, which contradicts the traditional quest for eternal, unified, transcendental truths characterizing thinking in western societies. Discourse and discourse production therefore threatens parts of the society, and in order to protect society against these threats, society creates a number of procedures to control discourse production.

One such procedure is the prohibition, by which societal institutions (e.g. the king, the police or the church) exclude certain discourses and decide what is allowed to be uttered. These prohibitions are clearly visible in codes of conduct relating, for example, to sexuality and politics, and functions by preventing a certain discourse from being produced in the first place.

Another control procedure used to repress a threatening discourse is to make sure that not just anybody is allowed to participate in discourse production. Using rituals describing how someone should act within a certain discourse, people are being excluded from the possibility of formulating and actively participating in discourse production. These ritual filters are most clearly visible in religious, legal, therapeutic and political discourse.

When a number of such control procedures create a pattern at a specific point in history, a discursive praxis has appeared, and this praxis fundamentally influences human beings creating text, speech or other discursive objects [57].

An important point that Foucault makes is, however, that control procedures used to repress discourse production are not the only kind of control procedures [58]. Some control procedures are, on the contrary, actually used to increase discourse production, which Foucault illustrates by describing the development of the penal system in France.

6.1.2 The penal system and the concept of normality

In his book "Discipline And Punish—The Birth of the Prison", Foucault describes how the French monarchs up until the eighteenth century maintained societal order by laws that sanctioned harsh bodily punishment [58]. By arranging public executions by torture, something Foucault calls "spectacle of the scaffold", the monarchs discouraged people from committing similar crimes, thereby maintaining power. During the late eighteenth century and early nineteenth century, these public executions started being questioned by philosophers, lawyers and members of the parliament, who argued that these kinds of cruel punishments, resulting in excessive physical agony for the condemned, "revolt humanity" and that they should therefore be subjected to reform. However, according to Foucault, this is not the only reason for the questioning of public torture and execution in France during this period. He argues that another reason is a general re-disposition of structural power where the goal is not to punish less or to punish more humanely, but to punish in a way that more efficiently brings positive results to society. The method used to reach this goal is to prevent people from relapsing into criminal activity by changing the person's character rather than by punishing him/her physically. Thus, there is a change in focus from frightening people to changing people, from silencing people to urging them to speak (but speak in a certain way), from punishing the body to educating the mind/soul.

In order to succeed in correcting people's attitude by the expansion of discursive control procedures, there is an increased need for knowledge about humans in general and criminals in particular, which results in prisons and other institutions (e.g. industry, schools, religious organizations) being organized with the aim of observing people and collecting information on human behaviour. This surveillance results in a rapidly growing amount of information on human character and action, which is then used in order to

identify, categorize and classify human characteristics in a Linnaean fashion, thus constructing the image of what a normal human being should be like. According to Foucault, the notion of normality is not something that is "out there" to observe or find, but instead a constructive result of the massive amount of information collected during this period, a construction mainly achieved by defining its opposites, that which deviates from it. Thus, normality as such is always dependent on its opposite (i.e. abnormality). By defining and classifying that which is abnormal, society constitutes and maintains a notion of the normal citizen. This concept of normality is then used as measurement for deciding when a crime has been committed and what a criminal is. Thus, criminals are no longer viewed as having committed a moral transgression, but rather as having deviated from normality.

The notion of normality is, however, not only used within the penal system, but many other societal institutions during this period adopt, develop and organize their business according to this concept. For example, in schools, control procedures not only limit what a student should not do, but also prescribe what the student should do in order to pass the exams. Within industry, control procedures not only limit the time an employee is allowed to spend on having his lunch, but also prescribe how the employee should behave and perform throughout the day in order to be a good employee. Society at large comes to use normality/"the good example" as means to control and organize operations.

This illustrates Foucault's point that the discursive control procedures are not only repressive, but also productive. They function, not only to limit people's access to discourse, but to encourage people to participate in discourse production, as long as it is performed within the boundaries of society's discursive formations (in this case, the concept of normality). Thus, there is an ongoing process in which society expands its discursive control by allowing people access to discourse production, since discourse changes and shapes the person producing it.

Foucault's description of the development of the penal system during the late eighteenth century and early nineteenth century raises two questions in relation to the debate on accessibility. First, given Foucault's suggestion that society organizes and stabilizes itself through the expansion of discursive control by allowing access to discourse production, can the call for accessibility be understood as a way of including more people into this productive, disciplinary discursive power? Second, given Foucault's suggestion that the notion of normality is constructed by defining that which deviates from it, is the call for accessibility a way of constructing the notion of a normal ICT user and to secure its dominant position in society by defining that which deviates from it? These questions will be revisited later in the paper.

6.2 Jacques Derrida's theory on différance

By summarizing some of Michel Foucault's theories, some challenges related to the concept of accessibility have been identified. It is now time to turn to Jacques Derrida to see whether his theory of différance can offer some suggestions as to how to work with the concept of accessibility going forward, taking into account the challenges found in Foucault's description.

6.2.1 The metaphysics of presence

According to Jacques Derrida, the western philosophical tradition has always been characterized by an emphasis on full, unmediated presence as a supreme value back to which everything else can be traced [59, 60]. Since this presence is described as unmediated, it is assumed to exist in and by itself alone, i.e. an essence independent on other entities, beings or ideas. In other words, the essence is considered original in the sense that it exists prior to the sensorial observations of human beings, and furthermore, prior to any constructive or descriptive process performed by any entity external to the original essence. According to Derrida, the metaphysics of presence is structured according to a binary logic, i.e. it is structure in opposite pairs where one term is identified as relating to the original essence, whereas the other term is described as deviating from this essence [61]. For example, he mentions binary pairs such as soul–body, presence–absence, immediacy–mediation and singularity–pluralism where the first term is described as desirable because it is being identified with the essence constituting the foundation for everything, whereas the other term is considered threatening to philosophy, morality and society since it deviates from the essence.

The theory of the original essence has taken different shapes during history [62]. For example, one can see it in Plato's theory of forms, where he describes how the concepts constitute the utter reality, the ontological foundation and that which is desirable as opposed to the material world, which is a deviation from the original identity/essence. Within the Christian church, this theory was later reshaped and related to the Christian God. During the Middle Ages, the scholastics argued for an understanding of God as origin of all things (*causa sui*), the essence by which all things have been created and which exists independently of all other entities [59]. Later, during the seventeenth century, when the enlightenment emphasized human reason, the western tradition is once more reshaped into the theory about the strong subject being the foundation of the metaphysical essence. It is in the free, unmediated and experiencing subject that we can find the original essence.

6.2.2 Derrida's critique of the metaphysics of presence

According to Derrida, however, there are flaws in the metaphysics of presence [52, 59]. He argues that linguistics of the late twentieth century has brought new insights into the functionality of signs and that these insights contradict the theory of an original essence. In the structuralism of the 1960s, the constructive dynamics of language was investigated, and linguists argued that language is not just a tool describing an external reality, but rather is a tool for actively constructing the reality we experience. It was argued that language has an organizing function that shapes the chaotic sensory impressions into an understandable structure, which means that language is not only descriptive but also creative, which in turn has consequences for the thought of an independent essence. If language creates reality, the thought of an essence existing independently of language (and therefore people using the language) is, according to Derrida, difficult to maintain.

The findings of the linguistics of the late twentieth century are, however, not the only reason for Derrida's questioning of the metaphysics of presence. He also argues that there are contradictions in the actual argumentation found in the theories of philosophers of western metaphysics. In his book "Of Grammatology", he analyses texts by thinkers he claims to be representatives of the metaphysics of presence, for example Ferdinand de Saussure, Claude Lévi-Strauss and Jean-Jacques Rousseau [59]. The latter is, according to Derrida, the most important representative of the metaphysics of presence, and it is therefore appropriate to focus this part of the study at Derrida's analysis of Rousseau.

6.2.3 Jean-Jacques Rousseau as a representative of the metaphysics of presence

According to Jean-Jacques Rousseau, before civilization, there was an original condition where people lived in harmony with nature [63]. This natural state was characterized by equality, purity and truth. People lived in physical vicinity and communicated authentically through the spoken word, which, according to the logocentric tradition that Rousseau subscribes to, means that there is nothing mediating between the signs and the essence. The spoken word is a sign that is a direct representation of the object to which it refers, which is an idea that can be traced back to Aristotle [59].

As civilization began to take shape, this original state of harmony with nature began to change, and in this change, the written word plays a crucial part. According to the logocentric tradition, writing introduces a distance between the sign and the object [59, 61]. It is argued that a spoken word is a sign referring to an object, whereas the written word is a sign referring to the spoken word that, in turn, refers to an object. Thus, the written word is always one step further away from the original essence, i.e. not in an unmediated relation to original presence. As writing introduced this distance in the relation between objects and signs, a distance was also established in society itself, and in the relationship between people. According to Rousseau, political conflict, oppression, inequality and violence are consequences of the appearance of writing. The written word makes it possible for a ruler to send his decrees throughout his country, thereby controlling and exploiting his fellow human beings. Through the development of writing, society is structured hierarchically, which leads to an organization of people in different social layers, thus introducing inequality. The change from a society organized through the spoken word to a society organized through writing is therefore a change towards decay. Writing does not contribute to developing society, improving it and raising it to a higher level, but actually corrupts the original good society existing before writing was established.

Rousseau's negative view of the possibilities of writing to formulate the metaphysical essence is, however, not unambiguous [59]. In his autobiography "Confessions", Rousseau explains that he chooses to write about his life because the distance brought to him by the technology of writing gives him an opportunity to describe himself in a manner that would be impossible, should he have described himself verbally in the presence of his audience. According to Derrida, this reveals a contradiction in the logocentrism of the metaphysics of presence. Instead of writing being something that corrupts reality, which Rousseau has claimed in the description of the decay of original society, writing is now argued to be a technique that enables a more correct description of the metaphysical presence.

6.2.4 The supplement

When Derrida analyses the different positions held in these texts, he argues that they are not incompatible opposites excluding each other so that one has to choose between them. Instead, they supplement each other. It is not until the spoken word is supplemented by writing that the metaphysical essence can be described and made present, which shakes the entire logocentric theory of the binary relationship between the spoken word and writing. Writing is thus not corrupting the essence, but rather enabling it through a process of supplementation. This has several important implications, one of which is that the essence is not present independently of other entities, but is actually in need of a mediating supplementation in order to be present. This is what Derrida calls the logic of the supplement.

Derrida shows that this logic can be found in several of Rousseau's texts. For example, he describes how Rousseau first argues that people should be striving for an original authenticity and views civilized society as a corruption of an original state, and then in the book "Émile" argues that children should be instructed in the art of becoming good people. Education, being a part of civilized society and therefore part of what corrupts nature, is thus paradoxically needed in order to re-establish this very nature, and once again, it is made clear that the very thing that metaphysical philosophy suggests is independent upon other entities, is in fact dependent on a supplement of its binary opposite. As the spoken word in the previous example is in need of supplementation by writing, it is now evident that nature is in need of supplementation by civilization.

According to Derrida, these contradictions found in Rousseau's texts reveal the fundamental problem characterizing the entire western metaphysical tradition. If one continues down the path of this tradition's quest for a *causa sui*, nothing more than a supplementary play, based on relational differences between binary opposites, can be found. This relates to one of Derrida's core themes, the core theme relating to accessibility, i.e. *différance*.

6.2.5 *Différance*

Différance is a concept that Derrida has created to signify the play between binary opposites that is found when one searches for a *causa sui*. The concept is ambiguous and has both a spatial (differ) and a temporal (defer) connotation [64, 65]. The spatial aspect of *différance* means that a sign receives its meaning through that which separates it from other signs. For example, the word "presence" does not mean anything unless understood in relation to the word "absence"; the word "good" does not mean anything unless understood in relation to the word "evil", etc. This thought is not new, but can actually be traced back to the structural linguistics of Ferdinand de Saussure. The temporal aspect then adds a chronological perspective to the differential play of signs, which means that the sign does not only receive its meaning from other signs existing at the same time, but also from the differences to the signs that have existed before and signs that will exist later in the linguistic system.

The consequence of Derrida's deconstruction of the writings of Rousseau, that he formulates in the theory of *différance*, is that the meaning of a sign never exists in itself as a present entity independent of other entities, but only as a never-ending process of supplementation where the sign is constantly waiting to be re-defined by the next sign in a future relationality. Thus, *différance* means a definite closure of the thought of a present essence towards which a sign can point [64–66].

To many post-structuralist thinkers, this resistance to the metaphysics of presence is not only in line with the theoretical argumentation, but also an admirable ethical stance, since the quest for one reality, one worldview, one single truth implies a reduction in the differences in life. Through history, this longing for uniformity, be it ontological, cultural, religious or political, has resulted in a number of structures of dominance, such as colonialism, inequality between men and women, and racism [52]. Accepting and protecting differences and diversity is therefore, by many, argued to be a vital aspect of democracy [67, 68]. Thus, resistance to essentiality can be argued to be ethical and political, not just philosophical.

6.2.6 *Différance and accessibility*

Given Derrida's suggestion that any meaning needs to be looked for in *différance* instead of in identity or essence, the question faced in trying to sort out the notion of accessibility is: should the concept of accessibility be defined by investigating the constantly changing gap between an individual human being and whatever that individual wants to achieve rather than in defining the physical or cognitive characteristics of individuals?

6.3 Summarizing the philosophical challenges

As seen in the overview of the different methods and approaches to accessibility, much of the work that has been done so far in this area has focused on defining groups with different types of disabilities and treating them as entities separate from society in general.

Based on Foucault's analysis of the construction of the concept of normality, it can be argued that much of this work can be understood as part of a process of constructing and consolidating the concept of normality within ICT, thereby creating the notion of a normal ICT user as well as a normative understanding of what ICT should look like and the role it should play in society. Normality is not a neutral concept, but one that is inseparable from societal, structural power. Thus, Foucault's analysis of the penal system can provide tools with which some of the altruistic claims surrounding the current debate on accessibility can be questioned, thereby opening up for alternative interpretations of the actual forces at work in this debate. From this discursive perspective, one could argue that policy building around accessibility is as much a question of consolidating a societal structure, as it is a question of including groups previously excluded from parts of society.

Furthermore, building on Derrida's theory of *différance*, one can argue that, as a consequence of this quest for definitions, accessibility has in the current debate become a question of identity and being rather than of function and

activity, thereby positioning it firmly within the tradition of the metaphysics of presence. The work has focused on the question "what am I" rather than the question "what role do my different, constantly changing levels of ability play in this context"?

7 Discussion

The notion of accessibility is not old. It has evolved much since the 1950s. It has been shown that there are many views and understandings of what accessibility is or should be. From a historical perspective, western society has evolved from the individual as an asset that should contribute, until today when democracy aspects empower the individual to participate on equal terms irrespectively of their specific abilities. The world of politics and international cooperation is moving to a view of every individual's rights to live and be part of society. The construction of the concept of normality is essential. From a philosophical point of view, accessibility should move from "what am I" to the question "what role does my different, constantly changing levels of ability play in this context"? On an overall user group perspective, this is moving the accessibility to something that is valid for most people at some point in time, in some situations, in some places. The approaches and design thinking discussed in the previous chapter are pointing at the need of taking a broader spectrum of people into account (accessibility) in the design process. This is to ensure that a wide range of users, including older people and those with disabilities, can use mainstream equipment and services.

The authors' view of accessibility has from the input of history, philosophy, design thinking, national and international politics and cooperation led to two main directions in the discussion. First, the consequence of having none, one or multiple definitions of accessibility and secondly, the central role of measurability when it comes to promoting accessibility.

7.1 Consequences of …

7.1.1 No definition

If there is no definition at all, there will be major difficulties in several areas. For example, it will be difficult for consumers to know whether or not a product meets their needs. Also, for manufacturers and designers, a lack of definition would lead to considerably higher development costs due to the research needed in every design process in order to establish and meet the needs of undefined edge user groups. In public procurement, the process to formulate the product demands would potentially become more complex. However, a positive consequence of this would be that, since accessibility would have to be defined in each particular product development, it would bring an active accessibility analysis into the very core of each design process.

From a juridical point of view, a lack of definition makes it difficult to set legal boundaries for when accessibility limitations lead to discrimination. This of course also means that from an individual perspective, as well as from a company perspective, it becomes equally difficult to decide when sufficient accessibility has been reached in the eyes of the law.

Maybe the most serious challenge to deal with as a consequence of not defining accessibility is related to the very foundations of our society, i.e. the inclusive vision of democracy. How are we to guarantee every citizen's right to participate in societal activities and exercise influence over the governing structures of our society without some sort of agreed upon understanding of what access to these fundamental civic rights means?

7.1.2 Many definitions

From a consumer perspective, having many definitions could lead to difficulties for individuals to know whether or not a product meets their needs. A variety of definitions would also make it difficult to compare products, and the risk of misunderstanding would be high. On a positive note, there is also the possibility for a particular individual to choose the definition or definitions most suitable for him/her. The manufacturer and designer would need to decide which definition or definitions to be used in a specific development process, and they would also need to relate this definition or definitions to the targeted user groups. The same sort of decisions would need to be made by stakeholders in public procurement, which would also render the evaluation process of the respective companies' bids more difficult.

From a juridical perspective, determining which definition is applicable in a specific situation would pose a considerable challenge, especially if the definitions are not coherent.

From a democratic and political point of view, there would be a need to be very specific about which definition or definitions to be used in a specific area and which group of individuals is considered.

7.1.3 A single definition

Having one single definition of accessibility would make it easier for consumers to set demands on products or services; however, there is a risk that the definition would be too wide to be effective.

A challenge when trying to formulate one single definition is how to do this without falling prey to the metaphysical quest for essence and identity. Drawing on Derrida's previous argumentation, accessibility defined in terms of identity would mean disregarding the pluralistic consequences of accessibility being context dependent. Any single definition would have to be construed so that both the dynamics of the ever-changing contexts and the ever-changing capacities of the individual are taken into consideration.

Another challenge in formulating one single definition is that it is necessary to be aware of the perspective from which accessibility is defined and the potential role the definition will play in relation to structural power. As seen in Foucault's description of the construction of the concept of normality, all definitions run the risk of being used as tools for constituting and maintaining structural power. This is a constantly present societal dynamic of which one needs to be aware.

7.2 Measurability

Based on the previous sections, it is necessary to discuss what consequences a revised definition of accessibility would have for the possibility of measuring the level of accessibility.

It is suggested that any model trying to capture and measure the dynamic aspects of accessibility described in the previous sections needs to be formulated in a way that avoids too strong a focus on identity, essence and human characteristics and instead focuses on the functional gap between what an individual would like to achieve in a specific situation and what the individual actually can achieve in a specific situation. It is in the difference between user intention and outcome that one can construct an accessibility measurement that can take into account the dynamic aspects of accessibility as a fully context-dependent endeavour. Measurability from this perspective is highly complex, involving not only descriptions of physical characteristics and technical specifications, but also analyses of intentions, desires and habitus. Based on this, developing methods for measuring accessibility would have to draw on a broad variety of scientific disciplines. Not only would thorough analyses from a technological and medical perspective be necessary, but also input from social science and the humanities would be needed in order to describe the complex area of accessibility.

When it comes to defining tools that can measure this kind of complex, dynamic accessibility, there are, in fact, already steps being taken in this direction that can be further developed. For example, the working group for the revision of the ISO 20282-3 standard is looking into having the methods currently used for measuring usability to also be used for accessibility statements. One of the key difficulties in such an effort is to select appropriate test panel participants that are representative of the user group for that specific product. The suggestion is instead to use stratified user groups that are most sensitive in certain area of the use of the product. The intention of this is broadening the scope of accessibility measurability and by this reach all that are less sensitive in the specific area.

It is important to have an ongoing development of accessibility, especially within the context of public procurement. In this view, a dynamic value rather than a static value is preferable, though there has to be a limit value to start from as a lowest acceptable level. One could argue that indirectly, the rigidity of a static value could in fact inhibit producers and prevent them from exceeding the demands defined by the public procurement process. Especially within the context of public procurement, it is crucial to have easily determinable values that make it possible to apply them in the procurement process and to make the producers compete with these values.

There are at least two ways of conforming the accessibility demands, as described in the report of phase one of the MANDATE 376 [69]. One is to show the accessibility level and another is to use a design standardization process such as ISO 9241-210, which should be complemented to include particular attention of accessibility issues such as description of targeted users with special attention to user diversity [70]. This makes it possible for the companies to compete in actual percentage of conformance with the standard or commercial competition. In both cases, it is preferable to have standardized ways of describing how accessibility is addressed. When carrying out user tests to validate accessibility, the CIF (Common Industry Format)-styled report, which is used for reports on user tests of usability, is a good format to start with, which also includes a part where the participants in the test should be described [71].

7.3 Proposing a definition of accessibility

Considering these challenges, it is suggested that a discourse on accessibility should focus on the flexible, ever-changing gaps between a person's ability and a potential activity in a changing environment. All persons have different abilities and disabilities, making it impossible to decide who is and who is not disabled, which taps into the ethical stance of equality formulated in the UN Human Rights convention. Adding to the complexity of the situation, these abilities and disabilities change over time and in different contexts. In ICF, disability is the gap between an individual's body function–structure, the environment and prior personal experiences and knowledge, viewed in relation to limitations in activity and participation, which

can be interpreted as a practical application of the ontologically fundamental role of *différance* and diversity described by Derrida. Thus, accessibility problems occur at the constantly changing intersection between the product, the context and the user.

How then should accessibility limitations that are not related to the individual's body function and structure, as mentioned by ICF, but nevertheless give similar effects during the use of a product be handled? It seems difficult to have different definitions for the same usage problems. Here, it would be wise to tap into the ISO definition, such as the extended accessibility definition in ISO 9241-171, which is not focusing only on individuals with a defined physical or cognitive disability, but on a wider group that experiences difficulties in using a specific product [72].

Based on this, a new, widened accessibility definition is suggested, that defines accessibility as "the extent to which products, systems, services, environments and facilities are able to be used by a population with the widest range of characteristics and capabilities (e.g. physical, cognitive, financial, social and cultural, etc.), to achieve a specified goal in a specified context."

As argued, a single definition provides a common framework for discussion, development, assessment and standardization. It relates back to the international ISO standards and provides measurability and thus possibilities for assessment and conformance checking. It is not the goal of this definition to outline what responsibilities the user has and what responsibilities rests with the developers of infrastructures and services. One may also argue that a single definition does not recognize the needs of different cultural contexts, but in the true spirit of international standardization the aim is to provide a minimum common framework to foster international collaboration and understanding.

8 Conclusions

Clearly the need to increase the possibility for everybody to access, interact with and complete his or her goals with interactive systems is evident and indisputable. However, the ways in which this could be achieved vary greatly. Different approaches to accessibility serve slightly different purposes, though they all share the same overall goal: To provide as effective and usable opportunities as possible for all potential system users, regardless of the challenges, the users may face.

The wide variety of different concepts do lead to confusion, political struggles and lack of clarity about what is required to achieve these goals; however, at the same time, it shows the youth of the approaches and the needs for further development and research to achieve some form of common understanding.

This paper serves the purpose of shedding some light on the methodological, historical and philosophical aspects of the concept of accessibility and shows the need to join forces to arrive at a common conceptual framework. A clear definition promotes awareness, facilitates discussion, enables implementation and promotes the development of methods. A clear definition also promotes the credibility and seriousness of the issues and among other things acknowledges the diversity of the user population and knowledge hereabout that is so much needed.

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