

# Disability Models and the Concept of Accessibility: Object-Subject Model

Negoslav Sabev

[negoslavsabev@gmail.com](mailto:negoslavsabev@gmail.com)

Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Sofia, Bulgaria

**Abstract**— This article briefly presents some common disability models, three of which are briefly discussed. Then a few definitions of accessibility from different perspectives are presented. The main goal is to propose a simplified conceptual model that considers the interaction between the person as a subject with a specific object and is applicable to different subjects and objects in different contexts. The model is applicable in various fields - transport, education, cultural heritage, tourism and others. Its advantage is that it can observe the interaction between the person as a subject and a series of objects in dynamics, without being influenced by the variety of views reflecting different perceptions and attitudes towards disability.

**Keywords**— accessibility, conceptual model, object, people with disabilities, subject.

## I. INTRODUCTION

Historically and in the context of social conditions, social order, generally accepted morality and a number of other factors, in different periods, specific views are formed regarding people with disabilities. The views form a certain attitude towards the issue, and on this basis the philosophy of politics and decisions at various institutional levels are built and applied - from the family to the state and global associations. We can call this philosophy a "model" because it structures a certain attitude and behavior. Here, some already established models are briefly discussed, and a different perspective is offered on the interaction of people with disabilities, not just with the world around them, but on a narrower and more specific scale, based on the understanding of accessibility.

## II. EXPOSURE

In their article "Models of Disability: A Brief Overview", Marno Retief and Rantoo Letšosa

offer nine models [1]:

- moral and / or religious - the oldest model presents disability as God's work or punishment;
- medical - the injury as a disease;
- social - disability as a socially constructed phenomenon;
- identity - the disability as identity;
- human rights model - disability as a human rights problem;
- cultural model - disability as culture;
- charitable model - disability as suffering;
- economic model - disability as a challenge to productivity;
- model of limitations - disability as an embodied experience.

There are also other models available, but those listed here are some of the most common. The main models - the medical and social - will be briefly considered, as well as the International Classification of Functioning, Disability and Health (ICF).

### A. The Medical Model

The medical model considers the injury mainly from a biological and medical point of view as a biomechanical problem, caused by illness, trauma or other factors, requiring prevention and medical care in the form of treatment and rehabilitation. The model is strictly normative. The individual is perceived as incapable of functioning as a healthy individual would. In other words, the disability, according to the model, is a state of health, difficulty, inability to perform an activity in a normal way.

The contribution of the medical model is in the strive of returning the body back to a normal healthy state. At the political level, it contributes to the provision of health care and medical rehabilitation. Some negative aspects of this model are the consideration of the individual as

an object to which it shows condescension.

### B. The Social Model

On the other hand, the viewpoint of the social model is related to the issues of civil rights and social integration, the focus is on the environment and living conditions. From an object, the individual with a disability is transformed into a full-fledged subject. For the better functioning of people with disabilities, not only prevention, medical care and rehabilitation are important, but also the possibility for their free, safe and unimpeded movement in the architectural environment, as well as the attitude of society towards them. It can be said that the social model considers disability as a social phenomenon caused by public attitudes. Therefore, disability is not an attribute of the individual, but is a creation of the social environment and requires social change. This change has been gradual, happening over decades and thanks to various movements for the rights of people with disabilities and their public campaigns, as well as through relevant legislation. In fact, it is the social model that underlies modern legislation on people with disabilities.

### C. The ICF Model

However, neither model provides a fully adequate answer to the question of what disability is. Although both points of view are justified, neither of them fully presents the complexity of the problem, as some aspects of the disability are internal and others external. The International Classification of Functioning, Disability and Health (ICF) model is a kind of compilation between the models presented above, combining them in such a way that the disability is presented as a result between the interaction of the environment and the individual with a specific health condition. It can be defined as a bio-psycho-social model. Figure 1 shows the multilayer interactions according to ICF.

Functioning is presented in three dimensions:

1. Body dimension. Two classifications are included here - one for the functions of the body's systems and the second for the structure

(organs) of the body. In fact, this is an anatomical and physiological classification of the organism. This level is entirely medical and clinical.

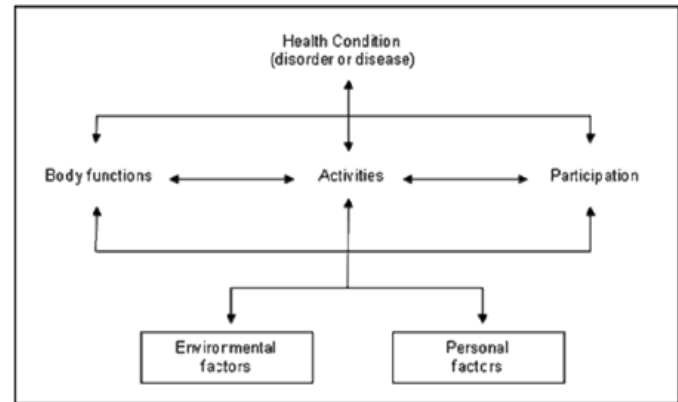


Figure 1. The ICF components and their interactions

2. Activities dimension. This includes all the actions that are specific to the individual, and the relevant parts are organized from simple to complex actions.

3. Participation dimension. Here the areas of life in which each individual usually participates are classified, to which he has access and / or for which there are opportunities or barriers [2].

### D. Defining Accessibility

Regardless of the considered model, the main reason for its existence is the presence of people with disabilities. Characteristics of a specific condition form the corresponding needs. They are diverse in nature and scope, covering all aspects and activities, regardless of personal or public roles and commitments. The conflict between needs and reality raises the question of access to information, services, buildings, etc.

Just as the understanding of disability, so the definition of accessibility depends on the context in which it is considered - physical (architectural), transport, digital (web, software), sensory (museums, galleries).

The Oxford Online Dictionary of English defines accessibility for people with disabilities as a quality that allows easy access, penetration or use [3]. The definition of the Cambridge edition is similar [4].

ISO 9241-11: 2018, Ergonomics of human-system interaction - Part 11 defines accessibility

as “the extent to which products, systems, services, environments, tools can be used by a population with the widest range of consumer needs, characteristics and ability to achieve specific objectives in a specific context of use” [5].

The term “use context” includes both direct and accessible technology-mediated use.

Here, “accessible” is used not in the sense of “available” or as “accessible”, but in the sense of a characteristic of documents or websites, determining their compliance with the standards for accessibility and usability by people with disabilities.

Accessibility is not a concern for a particular social group or category, but an important prerequisite for improving usability by all people. This is not “an act and not a state, but a freedom of choice, giving the opportunity to enter an environment, to move in it, to communicate with it or to take advantage of situations” [2].

The EU Disability Strategy 2010-2020 defines accessibility as “equal access to the physical environment, transport, information and communication technologies and systems (ICT), and other structures and services” [6].

Directive (EU) 2016/2102 addresses more specifically web accessibility, defining it as “principles and techniques to be observed in the design, creation, maintenance and updating of websites and mobile applications in order to make them more accessible to consumers, and in particular for people with disabilities” [7].

### *E. Subject-Object Model of Accessibility*

It is important to note that accessibility is not limited to the possibility of access to a building, premises, vehicle, information, etc., but the degree of real possibility for their assimilation and use. For example, can a person with a visual impairment not only buy a newspaper, but also be able to read it, a person in a wheelchair not only to move successfully and safely to the bus stop, but also be able to get on a bus on public transport, a person with complete deafness not just to watch a movie, but to be able to fully perceive and enjoy the content, or a person with cognitive disorders not just to read, but also to

understand at least the basic idea of a specialized scientific text. From the contextual situations considered here, access to a ‘living being’ is completely excluded in the sense of whether the boss is available for conversation, whether he is currently in person, etc.

Having and accessing an object or content does not automatically make them accessible. An example situation is considered in which a computer configuration and an operator are in the same room. The operator is located in the same room and his access to the configuration is not limited. But the fact that a computer system is available is not enough. In order to use it, a number of conditions must be met:

- Connection to the electrical network and the presence of electricity with normal parameters;
- Correct connection and serviceability of all hardware components;
- Installed and working operating system (OS).

The assumption is that all three conditions are met. The following few questions would give a realistic idea whether the operator can perform a specific task.

Can the operator perform the task if:

- is not trained to use the installed OS?
- the software needed to complete the task is not available?
- one or more of the input / output devices or peripherals (mouse, keyboard, monitor, printer) are defective and cannot be replaced?

Therefore, accessibility can be considered schematically as an interaction between two factors. On one side is the object or information with certain characteristics, and on the other side - the user as a subject also with specific characteristics. Taking this into account, we can distinguish both sides of accessibility: accessibility of the object (object accessibility) and accessibility according to the subject (subject accessibility).

There is a wide variability and intersection with the concept of usability, as the subject is measuring the object accessibility. If for one operator the console OS is a problem, respectively it is inaccessible and unusable for her/him due to the lack of acquired skills to work with it, then for another who has the necessary skills, there would be no difficulty, i.e.

it would be accessible and usable. In short, the object accessibility is characterized by the availability and serviceability of the object, and the subject is characterized by the ability of the subject to perceive, understand and use the object.

However, subject accessibility is not always in direct relation to the subject's knowledge and skills. There are many factors that work individually or in different combinations, and to a varied degree can affect and even hinder the usability and understanding of the object. Such examples can be physical, sensory and cognitive disorders. They may distort the functionality to the extent that a certain amount of compensation is required on the part of the subject to achieve a balance with the generally accepted norm. When this is unattainable on the part of the subject, modification of the object is resorted to. An example of this is the change in vision. In farsightedness, physiological changes in the visual analyzer are compensated by other optical means - magnifiers, lenses, glasses. When this level of compensation proves insufficient in case of further visual impairment, a change of / object (environment) is applied - an additional software magnifier can be installed for better perception of the visual information. If the visual impairment progresses and it is impossible to see the picture on the monitor, then it is compensated with another type of software - screen reader. If severe hearing loss occurs to the point where audio feedback cannot be received, the only possible compensation is the refreshable braille display. However, if the sensitivity of the fingers weakens to the point where Braille cannot be used, then there is a practical impossibility of further compensation. The conclusion is that, although advanced, at present, technologies do not offer a universal and sufficient possibility to compensate or restore functioning within the generally accepted framework in all cases [8].

Although technological solutions are not a panacea, they can undoubtedly provide high-quality and sometimes even irreplaceable help to those who need it. This brings us to the topic of assistive technologies. They are largely responsible for compensating for limited or

completely missing operational capabilities. These can be low or high-tech products in the form of hardware or software. As there is no definition of auxiliary technologies in the Bulgarian legislation, definitions from foreign theory and practice are used. The first examples are definitions of US law. The Technology-Related Assistance Act of 1988 (PL 101-407) [9] and the Accessibility Technology Act of 1998 (PL 105-394) [10] offer a standard definition of assistive technologies, defining them as "any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities".

On one hand, it is about equipment for the benefit of people with disabilities, and on the other, about the process of facilitating the use of equipment by the same people. Thanks to these technologies, the spheres of independence are expanded, the opportunities for participation are improved and in general their quality of life is improved, facilitating or making possible activities difficult or impossible before.

However, there is also a variant in which the adaptation of the subject to the object reaches its maximum potential and the subject is hindered to the extent of difficulty or complete impossibility. The subject does not have more means to adapt to the site and does not have mechanisms to adapt the site to its preferences and capabilities. Examples are the lack of elevators or wheelchair ramps, the lack of platforms convenient for the elderly and people with reduced mobility, and the lack of software and websites that are not built according to good practices and accessibility standards, resulting in information and interface presented in inappropriate and inaccessible way to the assistive technologies, which makes their use difficult or even impossible.

So, on one hand is the object, on the other - the subject, which has the means to adapt, but also the objective impossibility to influence the object. There are barriers that can be overcome by means of partial or complete adaptation and barriers that require site changes.

As mentioned above, the subject is the one who

measures accessibility. A set of specific standards, guidelines and criteria serve as tools for independent measurement. It is not necessary to use them only by people with some kind of disability. Each of these measures (indicators) has its own specifics, consistent with the area for which it is intended and used.

The overlap of separate requirements to the objects and the information is inevitable due to the similarity of their characteristics in their different incarnations. For example, the requirement for a certain ratio of the contrast between the main and background color is valid for both print media and electronic media. And since they can take a different form, this is even more important. If in certain transformations certain characteristics can be changed in advance, then in others there is a restriction to influence the final product. What is meant by this? If after the transition of an image from physical to digital form the final characteristics such as color, brightness, etc. can be changed. Printed on paper, it is considered as a final product, as it can no longer influence the characteristics that have already taken physical form.

Full or partial inaccessibility exists when both the object and the subject cannot adapt to each other at all or in part, and this leads to complete or partial impossibility of use for the object by the particular subject.

Optimal accessibility we call the consistency of the characteristics of an object with the capabilities and understanding of the widest possible range of subjects.

Full accessibility is present when the object is adapted to the greatest extent to the peculiarities of the perceptions, possibilities and understandings of a subject.

When the totality of all objects and the whole volume of information meet this requirement, there is perfect accessibility. At the moment, it is a purely theoretical statement of logic with the "ideal competition" in the economy - such is not practically achievable, at least in the foreseeable future.

### III. CONCLUSION

There are several views on the problems of people with disabilities, called 'models', but they address issues not so much of interaction as of different perspectives on attitudes towards people themselves and rather on perceptions of disability. However, none of them considers human interaction as a subject with a specific object. The proposed model considers on a smaller scale the interaction between a person with a disability and an arbitrary object.

### ACKNOWLEDGEMENTS

This research was funded by the National Science Fund of Bulgaria (scientific project "Digital Accessibility for People with Special Needs: Methodology, Conceptual Models and Innovative EcoSystems"), Grant Number KP-06-N42/4, 08.12.2020.

### REFERENCES

- [1] M. & L. R. Retief, Models of Disability: A brief overview, *HTS Theologies Studies/Theological Studies*, vol. 74, no. 1, 6 3 2018.
- [2] Ivkov, B. The terms "disability" and "disabled" ("person with a disability") - names and definitions (Sociological aspects), in Bulgarian, 15 1 2007. [Online]. Available: [http://web.archive.org/web/20200610143708/https://litemet.bg/publish17/b\\_ivkov/poniatiata.htm](http://web.archive.org/web/20200610143708/https://litemet.bg/publish17/b_ivkov/poniatiata.htm) [accessed 03.05. 2021].
- [3] Definition of accessibility in English, Oxford University Press, [Online]. Available: <https://en.oxforddictionaries.com/definition/accessibility> [Accessed 03.05. 2021].
- [4] Cambridge University Press, ACCESSIBILITY meaning in the Cambridge English Dictionary, Cambridge University Press, [Online]. Available: <http://web.archive.org/web/20200610151924/https://dictionary.cambridge.org/dictionary/english/accessibility> [Accessed 03.05. 2021].
- [5] International Organization for Standardization, ISO 9241-11:2018 (en), Ergonomics of human-system interaction — Part 11: Usability: Definitions and concepts, [Online]. Available: <https://www.iso.org/obp/ui/#iso:std:iso:9241-11:ed-2:v1:en> [Accessed 03.05. 2021].
- [6] European Commission, Disability Strategy 2010-2020: A renewed commitment to a barrier-free Europe for People with Disabilities, in Bulgarian, 15 11 2010. [Online]. Available: <https://eur-lex.europa.eu/legal-content/BG/TXT/?uri=celex:52010DC0636> [accessed 03.05. 2021].
- [7] European Parliament and the Council, DIRECTIVE (EU) 2016/2102 OF THE EUROPEAN PARLIAMENT, in Bulgarian,

26.10.2016. [Online]. Available: <https://eur-lex.europa.eu/legal-content/BG/TXT/?uri=CELEX%3A32016L2102#MainContent> [accessed 03.05. 2021].

[8] Weible C. Accessible Technology vs. Assistive Technology, [Online]. Available: <https://web.archive.org/web/20181214121834/https://www.peatworks.org/talentworks/resources/accessible-vs-assistive> [Accessed 14.05. 2021].

[9] Congress of the United States, U.S. Government Publishing Office, The Technology-Related Assistance Act (PL 101-407), 19 8 1988. [Online]. Available: <https://www.gpo.gov/fdsys/pkg/STATUTE-102/pdf/STATUTE-102-Pg1044.pdf> [Accessed 18.05.2021].

[10] Congress of the United States, "congress.gov", the Accessibility Technology Act, 13 11 1998. [Online]. Available: <http://web.archive.org/web/20200618201711if/https://www.congress.gov/105/plaws/publ394/PLAW-105publ394.pdf> [Accessed 07.05.2021].