ELWAHAT Journal for Research and Studies
Available online at :https://www.asjp.cerist.dz/en/PresentationRevue/2

ISSN : 1112-7163 E-ISSN: 2588-1892 Volume(17)/Issue (1) (2024):995-1014

The Realities of Engineering Design Challenges in Urban Environments: Perspectives from Individuals with Mobility Disabilities and Strategies for Mitigation The case of Wilaya of Naâma (Algeria)

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Received: 24-01-2024 Accepted: 24-04-2024 Published: 06-06-2024

Abstract:

This study aimed to explore the practical challenges of urban engineering design, particularly on the experiences of individuals with disabilities living in Naâma Province, Algeria. The study comprised a sample of 80 participants with disabilities, and it used a descriptive-analytical approach, employing a questionnaire as the primary data collection method.The study's findings highlighted the prevalence of challenges faced by individuals with disabilities in Naâma Province, particularly within the domains of mobility and anthropometric considerations, internal spatial arrangements, and external environmental design, often and always indicating the presence of design-related issues.

Keywords: Mobility Disabilities, Engineering Design.

1. Introduction:

The issue of human disability encompasses a complex interplay of biological, social, and health factors that significantly influence individuals' lives, Disability can curtail an individual's ability to fulfil their societal roles, spanning the realms of family, education, and employment.

Among the various forms of disability, physical disability stands out, and its prevalence has surged recently due to several factors. Genetic factors play a role, as certain detrimental traits can be inherited from one's parents. Additionally, environmental elements, such as a lack of health awareness

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within society and rising levels of environmental pollution, contribute to this increase. Traumatic events like road accidents, conflicts, and internal and external wars also exacerbate the prevalence of physical disabilities.

The repercussions of physical disability are profound, severely limiting an individual's mobility and his capacity to live a normal life. It is imperative that proactive measures are taken to prevent physical disabilities and to offer robust support to individuals living with disabilities, ensuring their meaningful and active participation within society.

Despite the development in various domains worldwide, such as science, technology, economics, and societal progress, a crucial aspect still requires great attention, which is the issue of protecting people with disabilities in societies.In this context,"protection" implies taking responsibility for enforcing laws and policies that secure their physical and emotional well-being, alongside offering the essential support needed for their complete inclusion in society. Furthermore, protecting healthy people requires us to design strategies to prevent accidents and dangers threatening their lives, thus ensuring secure and wholesome environments

2. The research problem:

According to a World Health Organization report (2011, p. 8), there are "more than one billion people with disabilities, or about 15% of the world's population, according to global population estimates for "2010", on a global scale. At the local level, Algeria is not immune to these alarming figures in the field of disability. Some data suggests that there are over two million individuals with disabilities in Algeria, while other studies indicate that the number exceeds three million (Bousnoubra, 2010, p. 176). Within the scope of the current investigation, Naâma Province, under the purview of its Directorate of Social Action, has recorded 6,581 individuals with specific needs. The highest percentage comprises those with visual impairments, totalling 4,094 individuals, followed by those with physical disabilities at 3,256, individuals with mental disabilities at 1,658, and individuals with multiple disabilities with 652 numbers.

Based on the above, disability can lead to feelings of inferiority and helplessness among people with disabilities, which may lead to insecurity and a desire to isolate oneself from society. In addition, the material problems associated with disability can create additional challenges, especially if the person with a disability is the sole breadwinner in the family.

Therefore, disability affects all family members in more than one way. We find that the birth of a disabled child in the family is a major shock followed by feelings of sadness, including shame, denial, and feelings of pity and care. This situation is further compounded by the inadequate awareness and support measures essential for assisting families in dealing with this

crisis and ultimately surmounting it. Although there are international and local charters that recognize their full rights and emphasize the need for their actual integration into society, this integration has not been done adequately so far, according to the researcher's knowledge.

Among the most common disabilities in society is physical disability. Many people with physical disabilities face problems that prevent their psychological, social, and design compatibility. The design aspect refers to the suitability of the urban environment to the requirements of movement and mobility.

In this regard, Wafi (2006,p. 102) believes that"the ability of the physically disabled person to communicate with the surrounding environment plays an important and basic role in the growth and development of his psychological structure, his relationship with himself, and his harmony with his community."

Hence, individuals with physical disabilities, much like other types of disabilities, require a society that caters to their needs and exhibits understanding towards their unique challenges. They do not have any distinctive qualities that distinguish them from others, but they face difficulties forming friendships due to the restrictions imposed on their movement. These difficulties can give rise to psychological and familial compatibility problems, reduced self-esteem; obstacles in attaining independence, and, in some cases, individuals may resort to isolation and withdrawal as coping mechanisms.

A study by Si Bashir in 2018 highlights the role of ergonomics in shaping the design of workspaces and transportation systems tailored for individuals with physical disabilities. It underscores the crucial influence of these design aspects on the psychological health and the development of pessimistic traits in people with physical disabilities. The interest in this issue stems from the observation that work centres in Algeria do not apply the engineering standards developed by ergonomics. These standards emphasize principles, controls, and specific engineering requirements when designing the urban environment. The failure to apply these standards has led to the fact that the sample members perform their jobs at a low level of professional, behavioural, and emotional adaptation, which has affected the psychological health of people with physical disabilities.

Another study was conducted by Masoudan (2006) on the reality of the care of physically disabled people in Algeria and the goals of the policy of their social integration from the perspective of social service at the National Centre for Vocational Training for Physically Disabled People in Khamisati, Tiaret Province. The study proved in its results that community institutions, both public and private, are not equipped in entrances and exits, stairs, and even corridors. Regarding transportation challenges, this study confirmed the hardships faced by individuals with disabilities, as there is no bus equipped to accommodate those with physical disabilities. Furthermore,

even the sidewalks and waiting stations are not adequately adapted to meet their needs.

Therefore, it was incumbent on the agencies working in the field of disability in general, whether governmental or private, to adhere to and comply with those conditions and standards in their projects, taking them into account before granting licenses for private projects. These measures are significant as they facilitate the smooth mobility and travel of individuals with physical disabilities. These conditions and standards generally focus on services located outside buildings, such as streets, sidewalks, pedestrian paths, building entrances, places, parking lots, and public restrooms, considering the suitability of the internal design of their homes, especially those built recently. In many cases, the engineering designer may modify the facilities and residences designed earlier to suit the nature of the physical disability in terms of movement and mobility.

Based on the problems that people with physical disabilities face in various fields and areas, it is imperative for us, given the reality of scientific research, to find scientific and practical solutions to assist these people, increase their chances in life, protect them from danger, and help them meet their needs. This is done in light of their life problems from all aspects through institutions and centers that care for their rehabilitation.

The problem of the study lies in revealing the reality of the difficulties of engineering design in the urban environment from the perspective of people with physical disabilities and ways to address them, with proposed solutions for their care in light of the difficulties they face, starting from the main question: What is the nature of the problems of engineering design in the urban environment from the perspective of people with physical disabilities? What are the proposed solutions for them?

This research question will be addressed in several areas:

- The nature of the problems in engineering design in the urban environment in the field of (movement and anthropometric measurements).
- The nature of the problems in engineering design in the urban environment for people with physical disabilities at the level of (internal space).
- The nature of the problem in engineering design in the urban environment for people with physical disabilities at the level of (external space).

3. The objectives of the study are as follows:

- To examine engineering design challenges within the urban environment of Naâma Province, Algeria, through the lens of individuals with disabilities.
- To understand the nature of the problems in engineering design in the urban environment for people with disabilities at the level of anthropometric measurements.
- To explore the nature of the problems in engineering design in the urban environment for people with disabilities and their suitability for indoor space.

- To investigate the nature of the problems in engineering design in the urban environment for people with disabilities and their suitability for outdoor space.

4. The Importance of the Study:

The significance of this study lies in its exploration of ways to care for physically disabled individuals in the field of engineering design within the Algerian context. To the researcher's knowledge, there is a shortage of studies in this domain in the Algerian environment. While some studies exist in this field, they may differ significantly from the social and cultural context of Algerian society; nevertheless, it is possible to compare the results of these studies in certain variables. Furthermore, the findings of this study could assist decision-makers in making appropriate choices to address the challenges that might hinder the integration and adaptation of physically disabled individuals with the general population.

5. Study key terms:

5.1. Engineering design:

The researcher means by it :"The most important basic standards that must be available during the urban planning process, in order to secure an environment free of obstacles that is compatible with the nature of the motor disability, which came in light of the dimensions of the current study scale (Anthropometric measurements for physically disabled individuals, outdoor space of the building, and indoor living space) "

5.2. People with physical disabilities:

The researcher means by the operational concept of people with physical disabilities in the current study: "They are those individuals who have the ability to use a manual wheelchair due to physical impairment as a result of an accident, illness, or congenital disability, which deprives them of the ability to use both legs."

5.3. Research method:

The researcher used the descriptive-analytical method in this study to describe and clarify the nature of the engineering design challenges in the urban environment, as they exist on the ground from the perspective of people with physical disabilities.

6. Study population:

The study population is defined as the group of individuals who have a physical disability and live in the Wilaya of Naâma and its surrounding municipalities. They are registered with the Ministry of Social Affairs in the Wilaya of Naâma and are members of centres for people with disabilities.

7. Sample:

The sample was limited to people with physical disabilities (those with lower limb disabilities) who are at least 14 years old and use manual wheelchairs. The sample consisted of (80) participants. As is well-known in the social sciences and psychology in particular, the selection of samples is

subject to rules and criteria in line with the requirements of scientific research.Sampling was done purposively based on the researcher's assumption that the cases for this research represent the research community.

Table 1: Distribution of the Characteristics of the Study Sample

Name of the region	Sample Distribution by Gender		Sample Distribution by Place of Residence	
	Males	Females	Urban Area	Rural Area
Naâma	20	01	15	06
Ain El Safra	18	03	13	08
Mécheria	11	06	10	07
Moghrar	03	02	04	01
Makman Ben Amar	04	03	05	02
Aslaa	02	01	03	00
Sfissefa	04	02	05	01
The total	80			

Table (1) displays that the majority of the sample is represented by males, at a rate of (17. 5%) while females are at a rate of (22. 5%) It is also noticeable from the table that the majority of the sample is residents of urban areas, at a rate of (55%), while residents of rural areas are at a rate of (45. 5%).

8. The Study Tool:

The researcher based the initial design of the tool on two primary components. The first component encompasses personal information relevant to the respondent, while the second component encompasses the scale items. These items collectively articulate the challenges faced by individuals with disabilities in engineering design and are divided into three dimensions: anthropometric measurements,

Options	Mean Category	Correction Key
Never	1,79- 1	1
Rarely	2,59 -1.80	2
Sometimes	3,39- 2.6	3
Often	4,19- 3.4	4
Always	5,0-4.2	5

indoor space, and outdoor space, comprising 20 items.

From Table (2), We note that the researcher calculated the numerical class length of the arithmetic means for the items and the tool as a whole by subtracting the smallest correction key from the biggest correction key and dividing the result by the number of tool categories, and its value was (0.8), as shown in the table.

Table (3): Correlation coefficient of each dimension of the scale of the problems of engineering design for the physically disabled with the total score of the scale

8.1. Stability of the scale:

Measurement Dimensions	Pearson correlation coefficient	Spearman correlation coefficient
Anthropometric measurements	0,84	0,76
Interior Space	0,81	0,72
Outdoor space	0,73	0,71

The study employed the Cronbach's alpha method to assess the scale's reliability and determine the degree of consistency among its items. This equation was applied to the previously selected sample of 30 individuals with physical disabilities to measure the scale's internal consistency. The table below displays the stability coefficients of the research tool.

Table (4): The stability coefficient of the engineering design problems questionnaire using the Cronbach's alphaα equation

Measurement Dimensions	Number of items	Field stability
Anthropometric measurements	06	0,71
Interior Space	08	0,74
Outdoor space	06	0,69
General stability coefficient	20	0,71

It is clear from **Table (4)** that: all the values of the correlation coefficients for the domains of the scale of problems of the physically disabled and the total score of the scale are statistically significant at the significance levels (0.01) and (0.05), which confirms the stability of the homogeneity of the dimensions and the paragraphs, and can be trusted for measurement.

Table (4): the stability coefficient of the engineering design problems questionnaire using the Guttman split-half method

Statistical significance	Stability coefficient after correction	Correlation coefficient
Statistically significant	0,70	0,81

It is clear from **Table (14)** that the stability coefficient (0.70) has a very high stability, it is statistically significant, and it can be trusted.

9. Presentation and interpretation of the answer to the main question:

"What is the nature of the problems of engineering design in the urban environment from the point of view of the physically disabled?"

Number	Statement	Mean	Standard deviation
1	I have a problem with the size of wheelchairs that are suitable for my size.	4,20	1,29
2	I find it difficult to use my wheelchair at the level of movement inside the corridors and walkways.	4,15	1,41
3	I find it difficult to use my wheelchair at the level of movement and transportation.	4,09	1,40
4	I suffer from the lack of dedicated walkways that help with movement and transportation at the level of the sidewalk and street.	4,01	1,44
5	I have difficulty using the interior elements of the building (doors and windows)	3,99	1,25
6	I have a problem with the lack of appropriate standards in the design of educational spaces (libraries and terraces).	3,91	1,28
7	I have a problem with the lack of appropriate standards in the design of stairs, ladders, and elevators.	3,86	1,24
8	I suffer from the lack of appropriate design standards for bus waiting areas for the disabled.	3,72	1,14
9	I suffer from the problem of the lack of guidance signs and banners inside buildings and public facilities.	3,69	1,18
10	I find it difficult to access public places outside such as: gardens and streets.	3,63	1,26
11	I have difficulty using the internal elements (bathroom.)	3,58	1,28
12	I find the height of furniture or equipment in the house makes it difficult to reach or use it.	3,52	1,36
13	I find it difficult to access public places such as ATMs.	3,47	1,27
14	I suffer from the problem of the lack of appropriate standards in the design of the internal spaces of the	3,40	1,37

	dwelling (toilet.)		
15	**I find it difficult to access public places such as: (stores and restaurants)**	**3,36**	**1,17**
16	**I suffer from the problem of the lack of appropriate standards in the design of the internal spaces (bedroom)**	**3,22**	**1,29**
17	**I have difficulty using the internal elements of the building such as: (supports and floors)**	**3,18**	**1,33**
18	**I suffer from the problem of the lack of appropriate standards in the design of the internal spaces (kitchen)**	**3.16**	**1,21**
19	**Difficulty accessing health and medical services within hospitals and health centres.**	**3.10**	**1,19**
20	**Difficulty accessing places of worship (mosques...)**	**3.03**	**1.22**
Total		**3,61**	

Table (05): The answers of the study participants ranked in descending order according to the average answers By referring to Table 6, it is evident that the mean values varied between 4,20 and 3,03 while the standard deviation ranged from 1,40 to 1,14. Consequently, we can conclude that the prevailing challenges encountered by individuals with physical disabilities in engineering design were predominantly observed at the "always" and " often" levels.

The results showed that statement number (1) had a mean of (4,20) It stated: "**I have a problem with the size of wheelchairs that are suitable for my size**"The researcher believes that one of the most significant obstacles facing people with physical disabilities in using a wheelchair is the size of the chair. The chair may not be suitable for the size of the disabled person, either because the disabled person cannot move the chair in the case of a heavy weight or because the disabled person's limbs have difficulty reaching the wheels for movement due to their small size.

The researcher attributes the problem of the size of wheelchairs and their lack of compatibility with the size of the disabled person to the absence of the correct anthropometric measurement conditions. These conditions were pointed out by Khater and Al-Bek. (1997, pp 87-88) as follows:

- The person performing the measurement process should be familiar with the anatomical points specified for the measurement sites, taking into account the positions of the examinee during the measurement that be carried out in a unified way.
- With all these procedures, the person conducting the measurement must be familiar with the methods of using measuring devices, considering the implementation of the first and second measurements (if there is a re-measurement with the same tools).

Undoubtedly, the lack of appropriate anthropometric measurements poses a significant challenge for individuals with physical disabilities who rely on wheelchairs. This is primarily due to the fact that wheelchairs may not be tailored to their specific requirements, encompassing aspects such as height, shoulder height, seat height, eye level, shoulder height, and multi-directional arm reach. These inadequacies can greatly exacerbate functional issues related to limb mobility and overall mobility while hindering the optimal utilization of the wheelchair.

Talking about anthropometric measurement leads us to discuss the administrative procedures that precede this type of measurement. This is done by identifying the problems at the level of the departments and centres for people with disabilities, especially people with physical disabilities, such as the National Office for Artificial Members and their Accessories. These problems include the difficulties associated with the procedures for acquiring wheelchairs from the perspective of people with physical disabilities at the centres affiliated with this office, which are the subject of the current study. These difficulties are reflected in the long response time of the National Office for Artificial Members and their Accessories in delivering wheelchairs, which may sometimes exceed six months.

Ziyani Hamadi, the director of the National Office for Artificial Members and their Accessories Centre, said in a personal interview on November (6/ 2021), that one of the problems facing people with disabilities at the centre is the issue of conformity certificates. He verified that artificial limbs are only dispensed following approval from the medical oversight of the social security system. The problem stems from the unavailability of a designated physician at the centre to authorize requests made by individuals with disabilities, even after completing administrative procedures within the centre. This is due to the many commitments and multiple concerns of the specialized doctor at the social security directorate, on the one hand, and the large number of files deposited at his offices, on the other hand.

Hamadi also pointed out that there are problems outside the centre, at the level of the central administration of the National Office for Artificial Members and their Accessories in Algiers. Although they have affirmed their commitment to addressing all requests from individuals under social insurance for artificial devices or rehabilitation aids as soon as they receive the necessary documentation, with a maximum processing time of 90 days for essential equipment like wheelchairs and 30 days for orthopaedic shoes and minor accessories.

Based on the results obtained on the common problems in engineering design, item (2) had an average of (4.15), which stated: "**I find it difficult to use my wheelchair to move around in the corridors and aisles**"

The researcher believes that the prevalence of this problem is due to the lack of basic standards in the design of the internal spaces of homes where people with physical disabilities live. This is true for both entry and exit spaces, such as the difficulty of moving a wheelchair due to the presence of stairs at the doors, as well as the narrowness of the internal corridors, which leads to difficulty in turning and manoeuvring the wheelchair, especially if there is an attendant.

"Therefore, the door must be wide enough to allow the person to enter and exit through it using a wheelchair, and if the entrance is high, a ramp should be made next to the stairs" (Suleimani, 2014, p .113).

The researcher also observes that all types of rooms necessitate specific spatial accommodations to facilitate wheelchair mobility, owing to the substantial size of the furniture present within the rooms or living spaces. Regarding ventilation, challenges arise in reaching the windows and their handles, and controlling them due to their placement at heights beyond the reach of individuals with physical disabilities.

The kitchen is considered one of the most important spaces that should be regarded in the engineering design of homes. Khalaf (2015, p 1020) believes that "the kitchen is one of the main functional spaces in residential buildings, so its design requires a good and suitable study for the movement of the disabled person without difficulties or obstacles."

One of the most important of these obstacles is the effort exerted by a person with physical disabilities when doing work inside the kitchen due to the distance of the equipment or their height, which requires much movement in the narrow space and the difficulty of turning and manoeuvring the wheelchair, which exposes the person with physical disabilities to the risk of burns.

It is important to highlight that a significant issue within the kitchen's interior space pertains to the height of the preparation tables, which are often unsuitable for individuals with physical disabilities. Additionally, the depth of the sink for dishwashing exacerbates the challenge of using the preparation table.

Based on the fact that the most used spaces in the daily life of a person with physical disabilities are those related to the use of the internal space of toilets and bathrooms, and through personal interviews with the study sample, they indicated, in general, a number of problems, and perhaps the

most important of them is the absence of supports on the walls to rely on in the sitting position, due to the absence of the attendant who helps to sit on the toilet seat, which may not be suitable for the size of a person with physical disabilities.

Another significant issue pertains to the narrowness of toilet entrances, particularly concerning the direction the door opens from inside and outside. This narrow configuration restricts the movement of wheelchair users within the confined space.

The researcher attributes the prevalence of these problems to the difficulty of adapting these homes, mainly if the person with a physical disability has acquired their condition due to an accident or illness. Most of these residences do not adhere to engineering design standards that cater to the requirements of individuals with physical disabilities, as most of them fall under the category of social housing designed for the general population and not specifically tailored to accommodate those with special needs. The difficulty lies in adapting them due to the narrowness of the space and the limited modification.

It can be argued that the adjustments in building and interior designs should not be limited to catering only to individuals with permanent disabilities, It is essential to consider that anyone might encounter a sudden physical disability due to an accident, illness, or surgery, Buildings should be designed in a manner that allows individuals to use them conveniently, irrespective of their current physical condition. A structure equipped for the needs of individuals with disabilities is relevant to more than 60% of the entire population at some point (Al-Ma'aytah, n.d, p 4).

While the answers of people with physical disabilities to item (3), which stated: **"I find it difficult to use my wheelchair on the level of movement and mobility"** had an average of (4, 09) the researcher attributes this challenge, linked to engineering design, to the issues surrounding wheelchairs and the associated complexities in their design, These challenges encompass aspects of wheelchair safety, which, if not appropriately addressed, can lead to severe injuries when navigating and manoeuvring in spaces like restrooms or other areas that demand flexibility of movement.

The researcher posits that several factors contribute to this issue, with one of the most prominent factors being the type of wheelchair utilized by individuals with physical disabilities. Specifically, the commonly used wheelchair in the study sample is of the cheap variety, identified by serial number (44-2404), The choice of this wheelchair type can be attributed to

several reasons, A key factor is its widespread availability through disability-focused associations and in the general market at an affordable price point, making it accessible to many users, Moreover, it is known for its user-friendliness and straightforward maintenance in case of damage. It also offers seat adjustability to accommodate various body sizes, with design components related to the wheelchair frame. However, despite its apparent utility for disabled individuals, it lacks the necessary safety standards that should be present in such wheelchairs. This discrepancy may pose difficulties for users, particularly safety during use.

While we have encountered another type of wheelchair, called "push wheelchairs," which Harbi (2008, p75) sees as "used for people whose physical ability is due to physical weakness or the disability that has affected them, so the need for an assistant to push is required," Through our observation of people with physical disabilities who have this type of wheelchair, "push wheelchairs," the lack of an assistant forces them to often resort to passers-by on the street for help, and sometimes they may be met with rejection by some, which may generate some psychological problems such as feeling inferior that he is an unwanted and rejected person by his community.

The issues related to engineering design encompass various challenges faced by individuals with physical disabilities as they navigate both indoor and outdoor environments. These environments include homes, workplaces, rehabilitation centres, hospitals, sidewalks, and transportation stations, with all types of surfaces (asphalt, sand, or grass) which fall within the movement of the person with physical disabilities through wheelchairs, The central problem lies in the scarcity of assistance, i.e., having another person available to push the wheelchair. Even if such help is available, the difficulty persists in effectively manoeuvring the wheelchair.

This challenge is exacerbated by the absence of designated pathways and the inability to smoothly navigate or make sharp turns, making it challenging for both the assistant and the wheelchair user due to different development-related issues.

The answers of people with physical disabilities to item (4), which had an average of (4,01) stated: "**I suffer from the lack of special lanes that help movement and mobility at the level of the sidewalk and the street**" The researcher believes that the external design considerations are subject to many requirements, which are called general or technical requirements that the relevant authorities must take into account when establishing or granting a license for projects at the level of public spaces that contribute to the

movement and mobility of people with physical disabilities. Perhaps the most important of these are those related to slopes, which can be dangerous if not designed correctly. This problem is manifested in the fact that this slope is very steep, which results in difficult and tiring climbing when using a wheelchair. Awadah (2007, p 183) believes that "there is a problem with an inappropriate design, or there is no original change in the level between the edge of the sidewalk and the street at the intersection of pedestrian paths and near the entrances to buildings. The intention here in planning is to overcome the problem of the difference in level between the sidewalk and the road surface, as well as above the sidewalk itself."

Based on this, the researcher attributes the problem of the lack of architectural design, which we mean by those special lanes on the sidewalk to facilitate the movement of people with physical disabilities in the street or even inside their centres or universities or even homes, to the lack of development in some rural areas and cities, especially in paving roads and paving streets in the context of the spread of chaotic construction, which limits the creation of streets and sidewalks that facilitate the movement and mobility of disabled individuals. In many instances, we have encountered an issue related to disorderly development, referring to the kind of development that fails to adhere to the standards established by specialized study offices. This chaotic development often results in the termination of projects that have not been in operation for a few months and have not yet reached the required legal timeframe. Instead, these projects are replaced with new ones by decisions issued by the governing body, This situation gives rise to a state of development chaos, affecting the infrastructure, such as roads with speed bumps and potholes, and the facilities, including disability centres, universities, and schools. Moreover, the extended development timelines often do not respect the specified delivery dates, adversely impacting mobility in general and particularly affecting individuals with disabilities who rely on wheelchairs, whether manual or electric.

The researcher believes that there are problems related to the design of the lanes, which are represented in the tiling of the floor with a type of tile that poses a danger to the movement of people with physical disabilities, as it is slippery, which is supposed to be made of rough materials to prevent slipping; Through on-site observations, we have noticed some sewer covers that are improperly designed and protrude in lanes and streets. This inadequacy poses a potential obstacle for some vehicles, not to mention the challenges it presents for wheelchair users with disabilities, impeding their movement. This issue is further exacerbated by the presence of pedestrian

lanes on the sidewalks adjacent to the outer walls of buildings. Some air conditioning units or window railings are often prominently displayed in a manner that can pose a collision risk for individuals with disabilities or impede their free movement.

Therefore, the reality of the development of sidewalks and pedestrian lanes in some Algerian states does not meet the required level, as some of them are crowded with tree basins and some are crowded with electric poles in the middle of the sidewalk, not to mention the spread of holes on the edge of the sidewalks allocated to the construction of water channels that have become infested with dust and bags, which hinders the movement of the disabled and is forced in many cases to use the edge of the road to walk, which exposes his life to danger.

In terms of engineering problems, item (5) had an average score of (3, 99) which states**"I have difficulty using the internal elements of the building (doors and windows).** " Given the importance of internal elements in the movement and mobility of the disabled person in the internal space, perhaps the most important problems facing the physically disabled wheelchair users are those related to the location of doors and how to open them, especially the doors of toilets and rooms with small spaces, as it is difficult to reach in case of falling from the wheelchair. In this regard, Al-M Al-Ma'aytah (n.d, p11) believes that "one of the difficulties facing the physically disabled is the use of revolving, swinging, and foldable doors in public and private buildings, which makes it difficult to use them by people with mobility disabilities. Therefore, it is recommended not to use swinging, revolving, and foldable doors, and when necessary, sliding doors should be added for use by people with special needs."

Based on the following results regarding the field of engineering design, item (6) came in sixth place with an average score of (3, 91), which states: **"I am suffering from the problem of the lack of appropriate standards in the design of educational spaces (libraries and amphitheatres) "** The researcher contends that there are numerous challenges within the realm of engineering design in education environments, especially those old buildings that do not meet the standards and requirements of physical disability in terms of movement, mobility, and ease of access to departments, libraries, and public facilities, toilets, and recreational clubs, whether in terms of entrance and exit spaces and corridors that contain stairs, which make it difficult for wheelchair users to move, and expose the disabled to the risk of falling. Another issue that arises pertains to the layout of interior spaces within departments, specifically in establishing

the necessary and appropriate areas for wheelchair users in accordance with the requisite standards. The situation worsens in the pattern of designing the seating pattern inside the amphitheatres, which are mostly fixed and equipped for ordinary individuals in terms of movement and seating space, which forces many physically disabled people to sit in the front of the amphitheatre without a table or sit in the back with the possibility of difficulty in accessing, due to the lack of a dedicated corridor that meets the appropriate standards in terms of the lack of sufficient space to position the wheelchair for sitting or difficulty in manoeuvring and turning due to the narrow space. Perhaps the most important problems are those related to the lack of departments in the lower floors and their presence, in many cases in the upper floors, with the lack of elevators that guarantee them easy access and movement, which forces many of them to seek the help of their fellow students to go up to their departments.

Based on the problems mentioned in item (7), which is related to the field of engineering design, with an average score of (3.86), which states: "**I am suffering from the problem of the lack of appropriate standards in the design of stairs, ramps, and elevators**" the researcher believes that one of the difficulties facing people with physical disabilities is the height of the stairs, not to mention their abundance and the danger of slipping, which are located at the level of the entrances to buildings, whether they are private homes or public buildings, During the researcher's visits to various associations and centres focused on assisting individuals with disabilities, a significant issue became evident. It was observed that accessing their service areas was problematic, as many administrative offices were on the second or even third floors; some of these offices belonging to disability-focused associations were even located in higher floors due to challenges in securing appropriate premises from the government. What makes the matter more complicated is that some private clinics, most of which are in buildings that do not have elevators, even if they exist, they are not suitable for the nature of the physical disability, as they are in social housing aimed at ordinary individuals that did not take into account the design standards for people with physical disabilities.

Based on the above, it can be said that stairs and ramps are an essential link between the internal and external spaces, reflected in the ease of access for the disabled individuals to their service circle at the level of institutions that care for them. Given that stairs and ramps are one of the most problems facing this category of people, either in terms of their height or their abundance, not to mention the lack of convenient elevators, which

makes them often, depend on others permanently. This issue results in disabled individuals resigning from their jobs or forgoing certain support services provided by associations and organizations,Consequently, they might opt for isolation over participating in activities in locations that do not meet their specific requirements, This situation can lead to constant frustration and disappointment among these individuals.

The results of item number (8), with an average score of (3, 72) which states **"I suffer from the lack of appropriate design standards for disabled bus stops."** The researcher believes that this problem is one of the most significant obstacles facing people with physical disabilities, due to the lack of concrete standards in the design of parking spaces or bus stations for people with physical disabilities.

This is for parking their vehicles in public or private institutions, and even if these spaces are available, they are exposed to parking other cars by some people, intentionally or unintentionally. Some argue that there are no special vehicles for people with disabilities in the institution where they work, without considering other disabled people coming from outside the institution, without any signs prohibiting parking vehicles Several parking facilities lack essential features, including the absence of the internationally recognized symbol for disability on the ground in the designated parking spaces and the absence of signboards providing guidance for those who require assistance when trying to locate these designated parking areas.

The researcher's analysis of the problem is accurate and comprehensive He identifies the specific issues that make it difficult for people with physical disabilities to use bus stops, such as the lack of designated parking spaces, shade, and accessible features.

On the level of bus stations, the problem lies in the absence of basic design requirements and equipment, such as awnings, which are mostly designed in general with non-standard fixed chairs, without creating additional space for wheelchair users Most of them are located on the edge of the road or on narrow sidewalks, which hinders the movement of pedestrians, with insufficient space to park the wheelchair, and the disabled person himself finds himself outside the awning, exposed to sunstroke, especially in areas with high temperatures in the summer.

Problems, item (9) came with an average score of (3, 69), which states "**I suffer from the problem of the lack of signage and signs inside public buildings and facilities.**" The researcher attributes this problem to the fact that most buildings designed at the level of public or even private facilities do not take into account the requirements of the engineering design that are

compatible with the characteristics of the disabled; therefore, we do not find this type of signage and signs that contribute to the ease of access of these individuals. In our review of reality, even if this type of signage or signs is found, the places are not regarded in their selection, whether inside or outside buildings, and in many cases, they are not at eye level to make them easy to see and read. If these signs are electronic, they are more prone to malfunction and power outages. In case that they are fit for use, their surfaces cause reflections that can hinder vision and reading.

Based on the results we reached, we find that the disabled face difficulties in the engineering field, such as transportation and movement at the level of public and private facilities, due to the lack of engineering supervision and the randomness of urban planning, which affects the lifestyle of the disabled in general, as the urban fabric in the Algerian environment, whether urban or rural, is not compatible with the nature of the physical disability in terms of movement and transportation.

This study's findings align with the broader engineering field, echoing the research conducted by Masoudane (2006) Masoud's examination also identified issues in engineering design, particularly related to the challenges faced by individuals with disabilities when accessing and navigating institutional, administrative, and service spaces.

Problems, item (10) came with an average score of (3, 63), which states**" I find it difficult to access public places outside such as: gardens and streets**. Ease of access to public places outside, such as parks and streets, can create a sense of psychological comfort for individuals with physical disabilities by providing a form of mental relaxation.

"herefore, it can be said that engineering design plays a crucial role in enhancing the psychological adaptation of individuals with physical disabilities.

The psychological aspect is an important element that cannot be overlooked in the engineering design for individuals with physical disabilities، Good design should not only meet the functional needs of users but also consider their psychological and emotional needs.

Engineering design can influence human emotions and behaviors in several ways, especially for individuals with physical disabilities, as it can contribute to:

- Feeling of comfort and safety: By using natural materials and calming colors, providing open and well-lit spaces, and creating quiet and comfortable areas.

- Feeling of productivity: By providing a comfortable and user-friendly work environment, adequate storage spaces, and creating places that encourage creativity and innovation.
- Sense of belonging: By creating places that encourage social interaction, providing shared spaces for various activities, and creating an environment that reflects the identity of the community.
- Feeling of stimulation: By using non-traditional materials and colors, creating places that encourage out-of-the-box thinking, and providing spaces that encourage collaboration and communication.
- Sense of independence: By providing dedicated spaces for individuals with physical disabilities that allow them to perform their daily activities independently, such as bathrooms, kitchens, and work areas.
- Sense of dignity: By providing specially designed spaces for individuals with physical disabilities that maintain their privacy and dignity.

10. Conclusion

Building upon the concepts discussed above, the overarching goals of this proposed picture in engineering design are to create a built environment accessible to all individuals, ensuring their safety and security. These pursuits are achieved by enabling people with disabilities to move without fear or danger, thereby empowering them to engage in their daily activities Thus, well-thought-out engineering design principles are to accomplished, resulting in urban environments free from obstacles and barriers within interior and exterior spaces To this end, it involves offering practical solutions tailored to handle the prevalent issues within the realm of engineering, We have aimed to contribute to this endeavour by providing some of these solutions, informed by the findings of our study, starting with addressing the most frequent challenges related to the tools and resources designed for mitigating these issues. We are aware that the field is still open to researchers to study other environmental and urban requirements that could help people with disabilities to move and access easily.

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