Evaluating inclusive design products from the accessibility chain

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Blucher Design Proceedings
November 2016, Number 1, Volume 1
http://www.proceedings.blucher.com.br/article-list/icdhs2016/list

Abstract

When talking about the Accessibility Chain, one can easily identify the points where a person with disabilities cannot continue with the activity he or she was doing. But, when talking about Inclusive Design, it is much more difficult to assess whether the products or combination of products represent more a barrier than an aid, in developing any daily activity in public spaces. By analyzing products from within the chain, it becomes more obvious where the braking points are and what characteristics or lack of features make the products become either a nuance or essential, or even if some characteristics should be found together in a single object or unbundled in several.

From this point of view, the question is if the degree of usefulness of any given product found in public spaces can be measured as to assess a degree of inclusiveness for any and all of disabilities; and so the purpose of this investigation is to try to attain a well balanced evaluation instrument to assist such enterprise, by identifying the critical points in direct relation with visual dysfunction and the task performed, in a specified public surrounding.

By inferential observation and the active involvement of diverse users, we can identify the most relevant needs that people with disabilities have and the features that cover them in a most satisfying manner; translating them into categories, and variables, and logically relating them for measurement. As a byproduct of this research, it would be desirable for designers to take into consideration the needs of people with disabilities and come up with more inclusive mainstream products and also, for the general public, to be familiar with them and thus to promote a broader culture of inclusion and non-discrimination towards people with disabilities and vulnerable populations.

Keywords

Inclusive design, accessibility, disabilities, evaluation

Introduction

Nowadays, as societies, we have a moral debt towards people with disabilities and vulnerable populations for we have, consciously or not, built urban environments structured by physical barriers which, at the same time, have created more barriers in our own minds, flowing in a permanent relationship and thus creating a vicious cycle. It has been a gradual process, but has advanced with steady pace for many years, beginning when we introduced standard measures for the human body, creating a false image of the "average" individual. This trend increased with the establishment of industrial processes and the ideal concept of a good, efficient worker for a factory job. Fortunately, a different consciousness is growing, taking down those barriers, both physical and cultural, but where much is to be done yet.

According to the United Nations' (UN) International Convention on the Rights of Persons with Disabilities, "disability is an evolving concept and results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others." It is worth mentioning that not only persons with disabilities live and deal with impairments, we also have to consider vulnerable populations like the elders, obese persons, children and even persons from different cultures and languages, who, at a certain moment, face some type of barrier.

Also for the UN, "Universal Design" means the design of products, environments, programes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal Design" shall not exclude assistive devices for particular groups of persons with disabilities where

How to quote:
GONZALEZ, Patricia Guadalupe Landeta; "Evaluating inclusive design products from the accessibility chain", p. 378-382 . In: Wong, Wendy Siuyi; Kikuchi, Yuko & Lin, Tingyi (Eds.). **Making Trans/National Contemporary Design History [=ICDHS 2016 – 10th Conference of the International Committee for Design History & Design Studies]**. São Paulo: Blucher, 2016. ISSN 2318-6968, DOI 10.5151/despro-icdhs2016-04_014

this is needed." So it means that there is an intention to give service to the greater extent of people possible, in a general, and in particular manners.

Regarding Inclusive Design, the main difference with Universal Design is the application purpose. The word "Inclusive" implies an adaptation has been made, sometimes to a preexisting space or product, to accommodate or include certain needs so that a person with disabilities may access and/or use it. This is a more discerning method that analyzes what is really needed, where it is needed, and when.

These concepts aim to give the person with disabilities, through the surrounding environment, the capacity to do any activity with autonomy, in a secure manner, comfortably and with dignity and self-esteem. Talking about urban environments, there are some factors that should be taken in account like the scale at which the activity is taking place: urban - streets, open spaces -, or buildings - closed spaces of different scales and uses -. The products found at each of these spaces have particular design considerations and may be used by very different people, one at the time or maybe even several persons at the same time. From this points of view the concept "Accesible Chain" plays a main role as it analyses the activities along the four moments of use -approach, enter, use and exit- and wherever the "chain" of tasks "brakes" or has to make a stop, there is where a physical barrier is identified. It should also be taken into account that usually there is more than one product involved in satisfying the needs of the population using that determined space, which can make even harder to determine if all the users needs are being satisfied properly. It is pertinent to make clear that this is a work in progress and will be presented as such, with the results attained at the time of the presentation.

Identifying variables and their relevance

The purpose of this research is to give the basis to further achieve an evaluation instrument for all types of disabilities; that is physical, intellectual or sensory related. Nonetheless, the extent of the particular needs for each one is too big to handle at the same time. Even though, it is worth mentioning that one of the first findings at the beginning of the research was that there are common needs shared by sensory and intellectual disabilities and this can give a firm foundation to further developing this instrument.

Taking in account the estimate number of individuals that have impairments of each type, the biggest percentage belongs to the physical group, the second to the senses and lastly to the intellect. So the first decision to take was as to whom to consider for the project. The decision turned towards the sensory disabilities, in particular the visual ones, because that population is not usually considered first hand when designing or adapting public spaces, at least in Mexico City, base town of the research; and because some regulations that apply to the building or remodeling of public spaces in search of accessibility, do not explicitly consider this segment of the population.

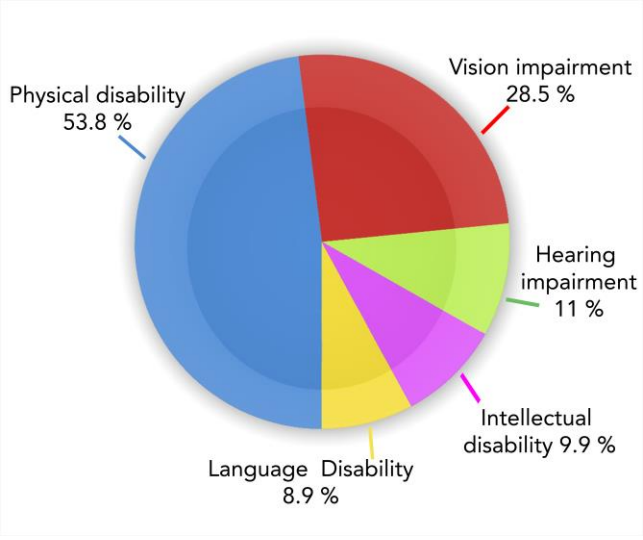

Fig. 1: Percentage of persons with disabilities in Mexico in 2000. Own authorship. (Source of the Data: National Institute of Statistics and Geography - INEGI's 2000 National Population Survey) Total percentage is bigger than 100% due to persons with multiple disabilities. 2010 National Population Survey had flaws in the design and it is not considered of real value.

As a first approach, a revision was made to the International Classification of Functioning, Disability and Health (ICF), adopted by the World Health Organization (WHO) in 2001, as an aid to identify the particular dysfunctions related to visual disability and the environmental requirements related to it. Even though the ICF's approach is strictly medical, it gives a valuable overview of the needs that have to be satisfied by the phisical surroundong for the persons with disabilities. It is fair to mention that the Classification does not take in account what is known as *remanent abilities*, which therapist rely so much on for the development of particular daily activities, when working with a persons' autonomy. It is with these abilities that designers also need to work with to provide the needed aids, focus on what can be done instead of what cannot be done.

The Classification uses a series of ranges to assess the degree of functionality or disability a person has,

Streets			
Barriers		Facilitators	
Bollards/posts/reflective posts/hanging chains	9	Symmetry	11
Kiosks	9	Order	11
Telephone booths	9	Texture changes	6
Objects higher and wider than the base	6	Names of streets in Braille	5
Inadequately parked vehicles	6	Well leveled	4
Garbage bins	4	Tactile adjustments	3
Banner ads	4	Audible stoplight	3
Audible stoplights	4	People	3
Low tree branches	3	Standardized textures	2
Benches	3	Paths of travel	
Uneven floors	3	Audio guides	
Disrespectful drivers	3	Typhlo-technologies	
Building sites	2	Mnemonics	
Open or protruding windows	2	Distinctive odors	
Toggles	2	Environmental sounds	
Loud noise in general			
Unattended objects, missplaced			
Light meters outside buildings			
Fire extinguishers/water intake			
Canopies			
Urban infrastructure registries			
Uneven pedestrian bridges			
Bad lighting			
Audible advertising			

Fig. 2: Listing by frequency of appearance, ones at the top are the most mentioned. Indicates the aspects more relevant to the interviewees, in this table, in relation to translating to one point to another.

which are:

0 – No disability - 0% - 4%
1 – Light - 5% - 24%
2 – Moderate - 25% - 49%
3 – Severe - 50% - 95%
4 – Complete - 96% - 100%

Next, the identification of the most common products used in public spaces and their main characteristics was required. For this step, several national and international recommendations for achieving accessibility were consulted, identifying the products mentioned in the documents. The most relevant documents were the America with Disabilities Act (ADA)'s *2010 Standards for Accesible Design*, the National Organization of Spanish Blind People (ONCE)'s *Accessibility for Blind People or with Visual Deficiency*, and Mexican Secretariat for Social Development (SEDESOL)'s *Norms for Urban Furniture*. The main products identified were classified in: Vegetation and Ornament, Rest, Communication, Information, Physiological needs, Commerce, Security, Hygiene, Services and Infrastructure.

At the same time, walks around popular buildings and facilities were taken for the same purpose. The main products identified were urban equipment and furnishings, and related products like vending machines, information and transportation modules. During the exercise there was the possibility to observe people with disabilities interacting with those same products, which later resulted in a list of objets´ main features in relation to boldly functions or structures, that is to say, the human interaction with certain parts of the objects themselves. This provided a particular approach to the specific needs of certain individuals and a first glance at the user point of view.

At this point, it became apparent that, in the same way that intellectual and sensory disabilities shared needs, some needs identified for people with sensory disabilities were also common to some needs for mobility impairments. This finding reinforces the need to continue the research and develop the instrument to assess the needs of the whole of disabilities, at the greatest extent possible. From this perspective, the needed evaluation instrument is complex but still, attainable. It also became apparent that there would necessarily be more steps involved to assess the accessibility or inclusion of a certain space by means of the products involved; but in any case, this project could be used as a platform or point of departure for further investigation in other projects.

Depending on the use of certain characteristics like Braille applications, formal differentiation of buttons and their dimensions, to mention some, it is possible to determine if a product is a facilitator in the development of a certain activity; and the lack or wrong use of this same characteristics, results in the product becoming a barrier.

Finally, the ultimate purpose of identifying the barriers is to eliminate them, but in doing so, frequently there are budget limitations so the adjustments are usually done by stages. To identify the most urgent needs, it was imperative to assign a degree of usefulness to every characteristic and so determine which is the biggest barrier to give it priority in attendance. At this point it was necessary to apply ergonomic and anthropometrical principles, assigning acceptable and unacceptable ranges of dimensions, valuing the convenience of use of certain geometrical forms or profiles for certain parts of the products in direct contact with the user, for example. To accomplish this, it would be necessary to refer to certain norms and tables on one hand, and to establish a range of qualitative parameters on the other.

It is hard to establish objective methods or techniques to evaluate if there are no means of measure, so the proposal is to establish certain parameters in relation to standardized measures and accessibility recommendations, in combination with a more qualitative method like Maslow's pyramid of satisfaction or a Likert scale.

To gasp a notion of these satisfaction parameters it was indispensable to approach the user, blind people, to assign these values to the products and their specific characteristics. For this stage, two qualitative methods were used, a questionnaire as a first approach, and afterwards, semi-structured interviews were held with blind people, resulting in a listing of products and general features of facilitators and barriers as well.

The results pointed mainly towards the lack of information, audible and in Braille or generally tactile, but also in relation to people. Interpreting the results, it is noticeable that autonomy is quite limited due to contextual barriers relating to information in the first place, and secondly towards the interaction with people, regarding disposition, sensitivity or lack of disabilities culture. It was noticeable that urban disorder plays a relevant role in relation to transit and orientation, maybe even more than the particular features in the products themselves. The products location within the environment is the first step towards accessibility.

On the other hand, the resulting listing of products was then applied to develop a triple entrance matrix interrelating the variables action-task versus functions-abilities and particular characteristics of products, along the stages of an activity.

The degree of usefulness was determined by a 5 degree color code value in such a way that the output of the instrument can be visualized graphically, making it easier to identify the ruptures of the chain and which are the features needed to provide the required assistance and where.

Basic Matrix

			Facilitators	Maneuver	Manipulation (grasp)	Reach	Information	Illumination	Obstacles	Finishing	
(Moment of the accessibility Chain) Environment change	Urban or architectonic element	Product		E.g.:Area, slope, hight	E.g.: size, shape	E.g.: hight, location	E.g.: clear, complete, tactile, auditive	E.g.: location, intensity, color (temp.), automatic	E.g.: at floor level or higher	E.g.: material, texture. Delimitator	Action by product
Translate											E.g.: touch, turn, press
Approach											
Use											
Exit											

Likert scale

Not Applicable
There is none
Doesn't work
Works
Good
Very good
Excellent

Fig. 3: shows the basic matrix and how it relates the 4 main moments of the accessibility chain with the main problems found in relation to the autonomus development of persons with disabilities, linked to particular actions taking place with architectural or product configurations. Own authorship.

Target user

This research aims to provide the people interested in adapting public spaces to make them accessible with an instrument to aid in identifying the points of interest and to assess a degree of inclusiveness of that space and its surroundings by the means of the products used in those environments. Preferably these persons should have a basic knowledge of inclusive design and maybe architecture to better take advantage of the instrument. So far, the skills needed focus on basic ergonomics and accessibility recommendations. If adapted as a digital instrument that could guide the user step by step, it may also be applied by any person with interest in physical inclusion, as a design reference. The next stage is to run trial tests to verify the usefulness of the instrument in pinpointing the barriers as well as the degree of usability for blind people of certain characteristics applied to products used in public spaces.

Following this logic, there are still other tests to be run to determine if this instrument might as well be useful during the first stages of the design processes, when the main characteristics or functions of any given product are being determined. It would certainly be desirable that the principles of inclusive design were applied to all mainstream products to achieve a change in the awareness of today's societies in relation to the persons with disabilities and the exclusion they have been victims of.

VISUAL DISABILITY MATRIX

(Moment of the accessibility Chain) Environment change	Facilitators: Urban or architectonic element	Facilitators: Product	Information: Braille /Tactile	Information: Information/ Audio Instructions	Information: Auditive alerts	Information: Contrasting colours	Information: Big and clear type (numbers)	Information: Clear information	Information: Complete information	Information: Redundant information	Action by product
Translate from one point to antoher	Signage										Reading/tactile
	Maps										Interaction
	Iconic locations										Interaction
	Pavement		NA	NA	NA		NA	NA			Pass through
	Tactile guiding tiles		NA	NA	NA		NA	NA			Pass through/read
	Crossroads										Pass through
	Sidewalk		NA	NA	NA		NA				Pass through
	Midwalk			NA			NA				Pass through
	Ramp		NA	NA	NA		NA				Pass through
		Handrail		NA	NA		NA	NA			Clutch/support
	Bridge			NA	NA		NA				Up
				NA	NA		NA				Pass through
				NA	NA		NA				Down
		Handrail		NA	NA		NA	NA			Clutch/support
	Over/under pass			NA	NA						Down
			NA	NA							Pass through
				NA	NA						Up
		Handrail		NA	NA		NA	NA			Clutch/support
	Rest	Bench	NA	NA	NA		NA	NA			Seat
		Ischiatic support	NA	NA	NA		NA	NA			Rest
	Bus stops/entrances										Wait/enter
	Stoplight	Botón/control									Action/wait
	Telephone										Read
		Screen	NA	NA	NA						
		Buttons		NA				NA			Press/touch
		Slot (CC/$)									Introduce/take out
	Garbage bins			NA	NA		NA	NA			Identify
			NA	NA	NA	NA	NA	NA			Use
	Luminary		NA	NA	NA	NA	NA	NA			No obrstuction
	Kiosk		NA	NA	NA			NA			Identificate/buy
	Advertising elements				NA						Passive information
	Information modules	Surface/window			NA						Passive information

	Not Applicable
0	There is none
1	Doesn't work
2	Works
3	Good
4	Very good
5	Excellent

Fig. 4: This section of the matrix shows the display of the features related to some products found in the streets, during translation, and the actions that could be done with them.

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Biographical note

Patricia Guadalupe Landeta Gonzalez, Studied Industrial Design at the National Autonomus University of Mexico. Worked at the Electoral Institute of Mexico City, where she developed several products to assist the vote emission of people with disabilities and the elders. Worth mentioning is the Braille Stencil for the ballots. With her partners, provides consultancy in accessibility.