Towards an approach to interactive Signage Design for People with Disabilities in Egypt

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Abstract

The research on interactive environments between humans and devices has become a commonplace during this decade. The deployment of interactive signage has come to be a very major interest for creating interactivity that might bring a great advancement in the signage design and technology.

The immersive nature of interactive technologies is just one of its many benefits. It has also been shown to maximize end users brand recognition and information retention, while also improving end users' perception of the brand. Interactive signage helps provide a high level of customer service while keeping costs low. The interactive technology in signage design can even create greater insights into consumer characters and habits, helping a company to optimize its marketing and customer service initiatives. Along with an increasing number of different innovative capabilities, the need for the adoption of interactive signage in public increases, in order to minimize information overload due to 'overuse' of functionalities especially in case of the environment for people with disabilities. This research aims to put the basics of interactive digital signage design for people with disabilities. The research also aims to explore the benefits of employing the interactive signage with other devices such as cell phones, tablets, smart phones, and wearable devices to achieve very suitable interactive environment for people with disabilities.

Keywords:

Interactive Signage- Interactive Technology- People with Disabilities

1. INTRODUCTION

Digital signage is a type of digital devices that displays information from different media, it's typically provided in a fixed location. The interactive technology is the other big current of digital signage, it makes a digital signage becomes far more attractive and useful for users, so it can be included in many user interaction techniques. [5]

As the industry of digital signage continues its unbelievable growth, the interactive application is becoming an essential part of market success. The interactive application holds significant potential to create strong business growth for solution providers that offer digital signage technologies for years to come.

The interactive digital signage aims to provide seamless, engaging communication between a digital signage system and the audience. Interactive technology seeks to create an immersive experience, that is much more allow an end user to be involved instead of simply viewing a digital display. [9]

The immersive is one of the interactive technology's benefits. Immersive interactive technologies have, so far, mainly been developed for entertainment and training applications.

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However, these technologies potential is wide and we are beginning to notice the direction of the field shift toward more experiences of supporting positive human functioning and change. [6]

1.1 Research problem:

The research problem stems from the increasing number of different innovative capabilities of interactive digital signage technology, the need for the adoption of interactive signage in public places, in order to minimize information overload due to 'overuse' of functionalities especially in our research case of environment designed for people with disabilities.

1.2 Research Objectives:

This research aims to put the basics of interactive digital signage design for people with disabilities. The research also aims to explore the benefits of employing the interactive signage with other devices such as cell phones, tablets, smart phones, and wearable devices to achieve very suitable interactive environment for people with disabilities.

1.3 Research hypotheses:

The research hypothesizes that employing digital technology in designing interactive digital signage for people with disabilities will improve their standard of living and provide appropriate information for their disability.

1.4 Research methodology:

The research follows the descriptive methodology.

1.5 Research limits:

Spatial limits: Egypt
Time limits: From 2015 until now
Objective limits: applications of interactive technologies for: -

1. Visual Impairment.
2. Hearing Loss and Deafness.
3. Mobility Impairment and Limited Dexterity.

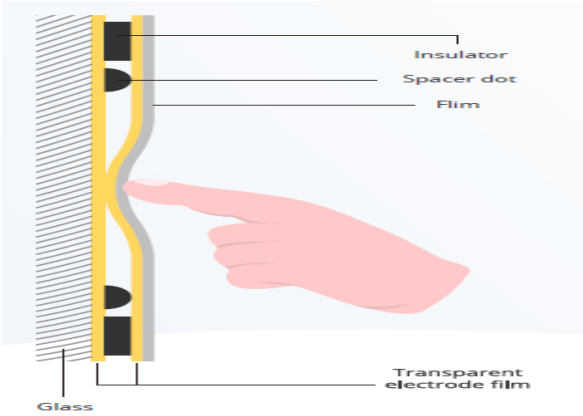
2. INTERACTIVE DIGITAL SIGNAGE APPLICATIONS

Interactive technology provides many solutions in our life, one of its effective application is digital signage, that can be one key to success in a wide range of installing interactive environments, as well as the ways in which becoming ordinary with the most common scenarios for the technology that can be of benefit to many business fields. The following are 5 categories of interactive digital signage applications, with several key use cases for each:

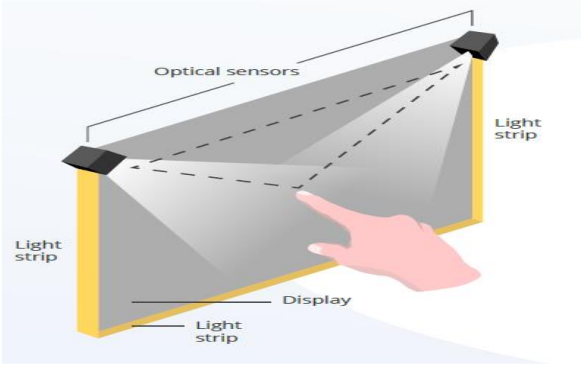
2.1. Touch Screen Information Service

One of the leading uses of interactive digital signage is in touch screen information service applications. Thanks to the interactive nature of the signage, it is a natural fit for informational applications, providing information to the end user in a self-paced, easy-to-follow way. There are several key ways to leverage touch screen displays in order to provide information to

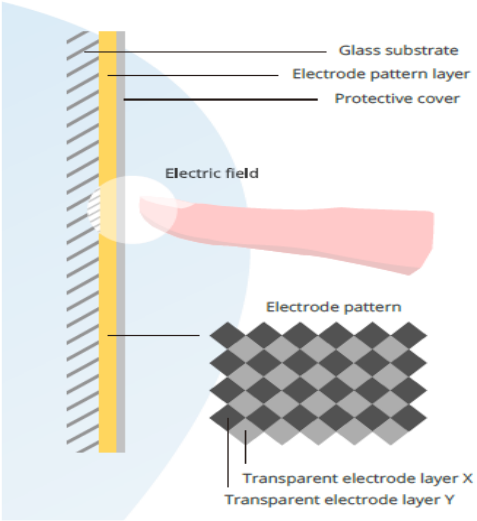
customers, visitors and other end users, including digital directories, product catalogs and wayfinding for event venues and corporate headquarters.



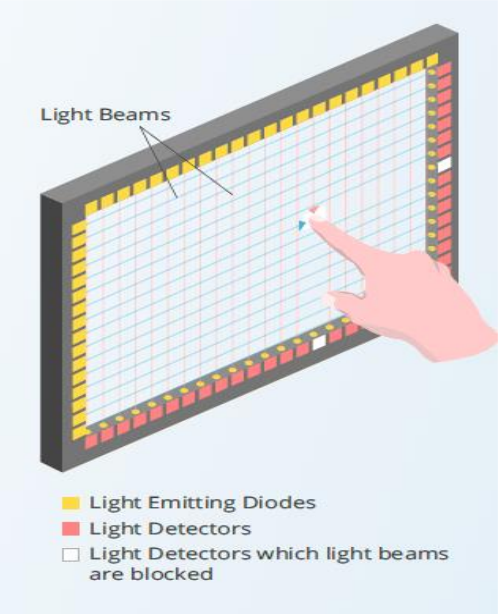
Resistive touch technology can be found in many devices, including touch monitors and car navigation systems. Resistive touch panels are not the most durable touch technology because it needs pressure to be applied to the screen.



Optical imaging touch technology uses infrared cameras and light to detect touches inputted onto the panel. Touch detection accuracy on optical imaging touch displays can vary based on the components used.



Projected capacitive touch is the touch technology commonly used in the smartphone market; if you use an iPhone then you're already familiar with using projective capacitive touch. Projected capacitive touch is normally used on smaller touchscreens and is known for highly precise touch recognition and speedy response times. Projected capacitive touch panels are capable of multi-point touch and are most commonly less than 32 inches in size.



Infrared touch technology uses light beam interruption as a means to detect touch commands. In infrared touch displays, infrared beams are organized in a grid over the panel itself and touch points are calculated when the beams are interrupted.
Infrared touch screens are capable of multi-point touch and can be found in sizes ranging from 20 – 150 inches.

Fig. 1 - touch technologies types [10]

2.2. Content Creation and Management

The process of content creation can be divided into two types, namely streaming content and non-streaming content. Content management system (CMS) will help the organization to manage the content stored in different servers at different locations and help to distribute based on user query [1]. Sourcing high-quality content and managing it over time have become leading concerns for digital signage customers in general.

2.3. Customer Service

Today many institutions are adopting interactive digital signage, both in their departments and in their drive-through lanes.

A face-to-face experience was provided for the consumer by the technology in customer-service applications, which improves the customer perception of the service that he receives and simplifies communication. For the users, the system help reduces waiting time and requirements of streamline staffing, which supports the final result.

2.4. Traffic Information Services

Interactive signage can also be precious in the traffic world management, particularly for the areas that are prone to traffic overcrowding. Interactive signage can help drivers understand the best way during heavy traffic, emergency situations, special events and more.

2.5. Disaster Information Service

Interactive digital signage is also appropriate for disaster information services, due to the ability to be updated, as interactive digital signage can serve many roles in the disaster locations. [9]

3- DISABILITY AND PEOPLE WITH DISABILITIES

Disability referred to the interaction of person functional status with the physical, cultural and political environment. Disability is an umbrella term for impairments, activity, limitations, and participation restrictions. Disability means the negative considerations of the interaction among

an individual with a health condition and the individual's contextual environmental and personal factors. The World Health Organization confirmed that there are over one billion people with disabilities all over the world, with between 110-190 million experiencing profound disabilities. [7] These numbers are expected to be increasing as the populations age, and the prevalence of periodic health conditions.

Disability', for the purposes of these research is where people with sensory, cognitive, physical or other conditions experience unintended barriers when engaging with the built environment.

The spectrum of disability is therefore broader than the stereotypical images of people in wheelchairs, deafness and blindness, there are other health and environmental factors influencing patterns of disability including:

Transport and other accidents, natural disasters, war, diet, and substance abuse .

4- INTERACTIVE DIGITAL SIGNAGE FOR PEOPLE WITH DISABILITIES

In the advertising environment wayfinding is whether the designs are 'enabling' or 'disabling', and whether the wayfinding experience of the place feels inclusive or organized. In wayfinding strategies there has also been a shift in design thinking about disability, away from a medical to a social view, under the umbrella terms of accessibility and inclusion. Institutional responses are now actively focusing on removing functional and environmental barriers to enable greater social and economic inclusion. [8]

In our everyday lives, technology is becoming increasingly more dominant. Yet, for all the new available devices, we have only recently seen an increased interest in designers, developers, and researchers deliberately thinking about how these technologies might be used to improve people with disabilities lives and increase their well-being.

4.1. Digital Signs and Dealing with Visual Impairment

visual impairments are categorized into two groups:

Blindness and low vision, and color blindness.

The retina at the back of a human eye has two types of receptor cells: rods and cones. The cone receptors detect color, and there are three types of cones sensitive to red, green, and blue light. In some measure human's color vision works similar to video cameras and displays that either detect or project colors through combinations of red, blue, and green pixels. Those with color-blindness may have fewer than three cone types, however it does not mean a person cannot see colors. [2]

Red-green is the most common type of color-blindness while other ones are much more uncommon. Regardless of the name, this does not mean a person with red-green color-blindness cannot distinguish between only red and green light, but are unable to distinguish between all colors which have been mixed with red light or green light .

Accommodating visual impairments.

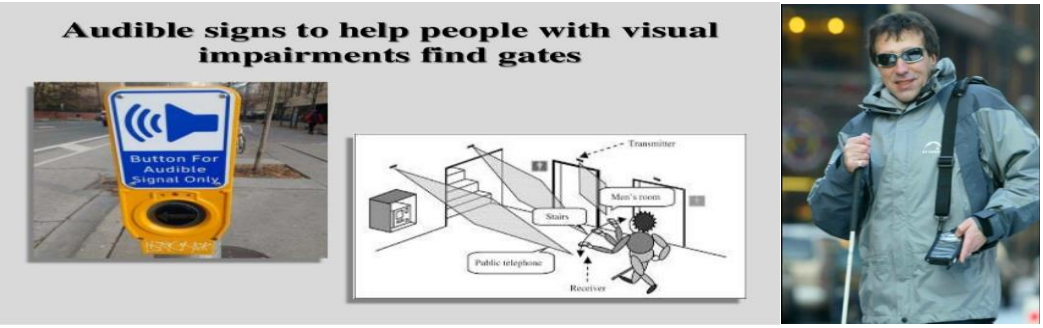


Fig. 2 - signage hardware and software for visual impairments. [2]

Because signage software are static devices in public use, the big challenge for a user with disability in low-vision is that they cannot control the size of the showing text or image, the contrast of the screen, or the surrounding lightning conditions to suit the vision they need like they would do on their personal computer or mobile device. design special signage for the visual impaired people would mean creating a separate style sheet with greater contrast and bigger size of the text. Doing that could compromise the look and aesthetics of the interface. Another solution is to provide the low-vision user with a choice to adjust the size of the text or image from the interface.

There are five guidelines to follow when designing with the colorblindness in mind:

1-Use saturation, brightness and hue to distinguish color. A quick way to see if there is enough contrast between colors to render them in grayscale.

2-Use of distinctive colors. The most distinctive colors are black, white, red, green, yellow and blue, each of them causes a strong signal on only one color-opponent. All other colors cause signals on one or more color-opponents and because of that, human minds are not able to distinguish them from the other colors quickly.

3 -Avoiding the use of color pairs the color-blind cannot distinguish: Such pairs include, dark red versus black, blue versus purple and light green versus white.

4 -Do not rely on color alone: If color is used to mark something, it should be accompanied by something else too, a symbol for example.

5. Separate strong color-opponents: Using color-opponents on top of or right next to each other should be avoided as it causes a flashing sensation in our vision.

4.2. Hearing Loss and Deafness

Hearing loss can be categorized by its severity, similar to the way how severity of visual impairment can be measured. For some of those suffering from partial hear loss, the use of a self-service device can be an effective experience, as it means the person will not necessarily have to rely on written notes or an interpreter when trying to do something.

While hearing might not be the most critical sense needed to operate a self-service signage, there are aspects which should be taken into account. Firstly, given the nature of the self-service signage software development, they are most likely to be found in environments with much background noise, such as travel centers, train stations, and other busy outdoor locations with surrounding traffic. Provided that sounds are accompanied with appropriate imagery or text alerts on the screen, the error of user forgetting to pick up their change or tickets for example is

minimized. In general, it is a bad idea to leave an alert to be perceived by hearing, or by any single sense alone, since it can be missed when the user gets distracted by something else.

4.3. Mobility Impairment and Limited Dexterity

Mobility impairment is a wide category of different physical disabilities including upper limb and manual dexterity disabilities, loss of fine-motor control and some conditions such as cerebral palsy and carpal tunnel syndrome. The disabilities can be of temporary or permanent nature and range in severity, Loss of muscle strength, stiffness and spasticity are common traits in those with physical and mobility impairments. Loss of muscle strength and restricted mobility takes place naturally as people age. Loss of mass and stiffer joints and changes in one's gait can significantly compromise the person's balance.

People with dexterity disabilities can have problems with one or more touch screen functions. The most prominent one is likely to be having issues with pressing hard or accurately enough to interact with the correct buttons or a virtual keyboard on the screen. [2]

Fig. 3 - smart signage [4]

5. CASE STUDIES IN INTERACTIVE DIGITAL SIGNAGE FOR PEOPLE WITH DISABILITIES

5.1. Smart Signage system

The components of smart Signage system include three parts (user component-signage environmental component- smartphone app.) The user with disability component, which can be attached to conventional O&M aids like a long cane, includes a Bluetooth 4.0 BLE tag transmitting signal representing user with disability need every set interval to the signage

environmental component within the set range and a tiny push button used to resend a request to the signage environmental component. The signage environmental component, which can be attached to the service site, includes microprocessor, a Bluetooth receiver, and a sound chip. It takes a continuous distance reading.

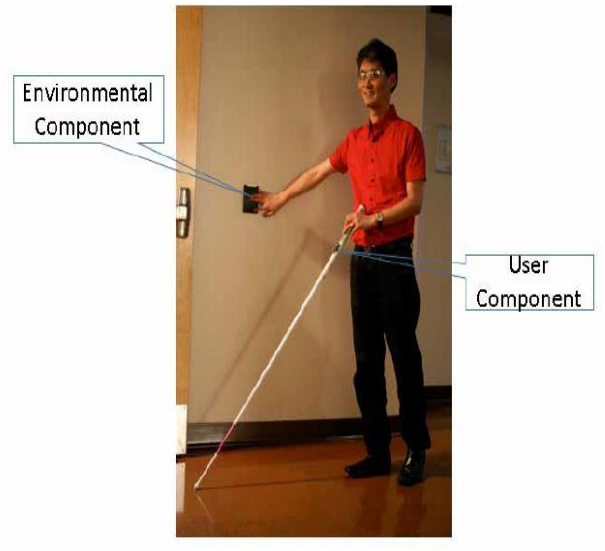


Fig. 4 - smart signage. [4]

The measuring distance can be adjustable and the received signal strength is to determinate if the user with disability walks in or out. The sound chip is prepared to store up to 10 different seconds and can be played back if needed. The importance of using the smartphone app is to configure both the user and environment components. When a person who walks with the user component is within the set range, the environmental component automatically plays a recorded voice. Based on the sound cue, the user with disability recognizes what/where it is. The recorded voice is not turned on again until the user with disability is away from the set range. The user with disability can get the sound played again anytime by pressing the tiny button on the user component. A coin sized battery is used for the user component and environmental component, respectively. [4]

5.2 OPEN (Orientation by Personal Electronic Navigation)

OPEN is a wayfinding system made for blind people or people with partially sight impairment for easy wayfinding within the metropolitan undergrounds of Europe.

The objective of this project is to give the fast assist to blind people or partially sighted people to easily find their way on the metropolitan underground systems of London and Paris. This project will develop a wayfinding system that can be used by all blind or partially sighted people throughout their journey in Europe. The navigation system is based on the development of interactive digital technology to help blind or partially sighted people to find specific features of the underground system and to provide information to aid orientation.

The system is preparing to enhance the available information for blind or partially sighted user only on personal activity related to wayfinding. The system consists of multi- beacons installed at key points in each underground station and a receiver device carried by the blind or partially sighted person. Beacons it sends messages to the receivers using infra-red beams methods. The beacons are interconnected by an independent network. The system will be integrated with the

communication network of the metropolitan railway system. The blind or partially sighted user will receive information message from the beacon in an appropriate European language. The message may either be fixed in time, or vary with time according to the situation. The user can decide whether to access the information available or not. [11]

6. INTERACTIVE SIGNAGE ENVIRONMENT FOR PEOPLE WITH DISABILITIES IN EGYPT

The growing demands of society for design for people with disabilities and the Egyptian government desires to meet them and make a development in their life, coping with the fascinating interaction with cultural change. signage design for people with disabilities and wayfinding methods affects the culture of the community through mutual interaction between the needs of people with disabilities and their preferences and desires, culture conveyed by the interactive signage. When the signage can respond to the requests of the community it will be able to continue to deliver the message and wayfinding in a manner compatible with community members specially people with disabilities. Because the design for people with disabilities have become an urgent necessity with the growing human rights trends, the Egyptian designer must develop his/her mental and intellectual abilities to achieve the requirements and needs of people with disabilities.

The next diagram shows the vision to design interactive signage environment for people with disabilities in Egypt.

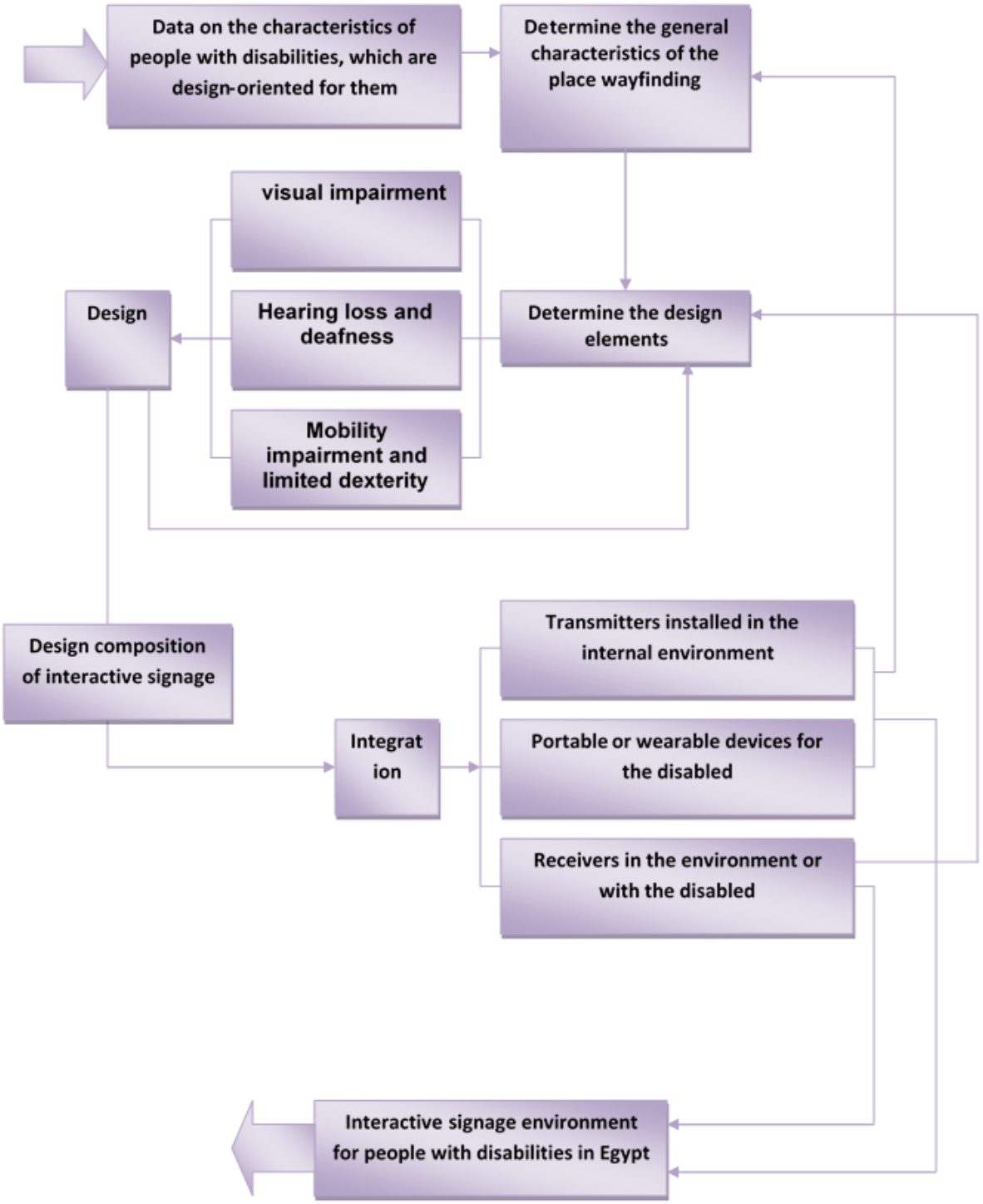


Chart.1 - Interactive signage environment for people with disabilities in Egypt

7. RESULTS AND CONCLUSIONS

Interactive technologies provide exiting new affordances for research and development in digital signage. Within the scope of this research, we have discussed the use of interactive technologies in digital signage for people with disabilities. We examined the characteristics of digital signage, discussed the value of existing understandings from human-computer interaction, as well as presented example technologies and scenarios to illustrate the potential of interactive technologies for people with disabilities. The main conclusion is that the interactive signage for people with disabilities is a crisscross between digital data, visualization,

interaction, context, and methods by mashing up theories and domain knowledge from humanities research, and computational technologies.

The application of interactive technologies, in digital signage for people with disabilities is enabling many new possibilities for extending human capabilities for them. In particular, these newly interactive technologies enable:

- Design meaningful experience of interactive signage systems through completely assisted environments.
- Design of new human experiences for people with disabilities through utilizing new technologies in form of interactive signage systems.
- Interactivity and user-experience as main factors to create new knowledge to design for people with disabilities contributing to humanities through new forms of interaction systems with digital signage.
- Enrichment of digital signage for people with disabilities by the adoption of new interaction modalities, sensor tracking, and motion capture to couple the people with disabilities bodies closer to virtual and augmented environments;
- Socially rich and embodied user experiences in actual spaces through a more 'natural' interactive digital signage.

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