Chapter 66
Towards Visually Impaired Autonomy in Smart Cities:
The Electronic Long Cane Project

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ABSTRACT

Urban growth adversely affects accesses to public spaces and to their physical and functional structures. Simple tasks become a challenge for visually impaired individuals either because of the difficulty getting reliable non-visual information from the surrounding space or the lack of information. In Smart Cities scenarios, important investments will be directed to urban accessibility, but nowadays people with sensory disabilities still have to face mobility problems in those spaces. Therefore, designing suitable solutions to provide more information about urban spaces is extremely important and requires user participation. This context motivated the development of the Electronic Long Cane project. The project enhances the features of traditional long canes to detect obstacles located above the waist. Nowadays, the electronic cane was redesigned including new functions based on the Internet of Things. As a result, evidences of User-Centric Design have emerged, increasing the probability of success of this technology in Smart Cities context.

INTRODUCTION

Cities are the places where the greatest technological changes will take place during the next few decades. In a Smart City, people rather than technology are the true actors of the urban "smartness" (Chourabi et. al, 2012).

Smart City is a new concept. It represents an aware effort to use technology improving efficiency and the quality of life of its citizens. In this scenario, new participatory and innovation ecosystem emerges, in which citizens and communities interact with public authorities and knowledge developers (Sanchez, 2011).

Such collaborative interaction leads to co-designed user-centered innovation services and new models of governance (Oliveira & Campolargo, 2015). However, although there are legal regulations in many countries, the ecosystem is still incomplete, limited by physical barriers and the lack of information, whose constrains mobility through public spaces.

Promoting accessibility in urban spaces is a complex task and requires a deep understanding of the people's diversity and the specific needs. In this context, accessibility is related to the freedom or ability to achieve the basic needs in order to sustain quality of life (Lau & Chiu, 2003).

Despite the legal provisions to guarantee equality between citizens, the implementation of accessibility criteria in urban spaces is not still a reality. Meanwhile, individuals with any sort of disability will have to face a large distance between laws, ordinances and technical standards, and the necessary actions to implement them.

In addition, benefiting individuals and their families, in order to promote better living conditions to disabled people, also benefits the society as a whole (Hersh, 2010). This enables disabled people to go from a situation of dependency to an active participation in the society (Wiener et al, 2010). However, benefiting society is only possible if disabled people receive appropriate support (Hersh, 2010).

This chapter discusses the design process of the Electronic Long Cane project providing elements about how this device can be introduced in the Smart Cities context. Evaluation and cost analysis aspects are also discussed giving new evidences about the relevance of the User-Centric Design.

MOTIVATION

According to the World Health Organization (WHO), there were 285 million visually impaired people in 2010. In addition, 39 million were blind people and 90% of them inhabit in low and middle-income countries (Pascolini & Mariotti, 2011). The population with some sort of visual impairments was 4.25% and 82% of blind people were over 50 years of age.

In Brazil, more than 45.6 million people reported some sort of disability (IBGE, 2010). This number represents 23.9% of the population. In addition, 18.8%, say, they have some difficulty even using glasses or contact lenses and 18.7% of the population of 90.7 million of visually impaired individuals were declared blind.

In June 2004, the Cities Ministry launched the Brazilian Program for Urban Accessibility (Accessible Brazil) establishing a new vision for the universal access to public spaces. This program consisted of actions and instruments that aim to encourage and support local and state governments developing rules to ensure access and free circulation in public areas to any sort of individuals.

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