Inclusive Design for Recycling Facilities: Public Participation Equity for the Visually Impaired

Kin Wai Michael Siu, Chi Hang Lo, Yi Lin Wong

Abstract

Researchers and designers are increasingly advocating wider and fairer participation in recycling. However, many people are still excluded from this meaningful social participation. For example, visually impaired persons (VIPs) still face many barriers to participating in recycling independently. Since 2015, a series of studies has been conducted to explore the possibility of VIPs participating in recycling. Through a case study of designing recycling facilities for VIPs, this paper explores and discusses the difficulties and limitations that the visually impaired experience in participating in recycling, despite technological advancements that claim to help people with disabilities. It also identifies some directions for researchers and designers for future studies and professional practice.

Keywords: Equity, fairness, inclusive design, public design, recycling, participation, visually impaired persons (VIPs)

Introduction

Recycling has become a worldwide issue since human beings began to generate more waste than our planet can afford. According to Geyer, Jambeck and Law (2017), in 2015 only around 9% of plastic waste ever manufactured was recycled, and 79% was disposed of in landfills or the natural environment. The recycling rate is low, but due to limited natural resources, it is imperative to promote recycling and waste reduction campaigns in communities. Wider participation in recycling is thus important, and approaches such as participatory action research have been developed rapidly to explore how it can be achieved (King & Siu, 2017; Siu & Xiao, 2017). Groups that are not included in recycling activities have drawn the attention of researchers and advocates. Children are one of these groups, and an increasing number of researchers are including children as subjects in research about sustainability activities and environmental issues (e.g., Borg, Winberg, & Vinterek, 2017; Casaló & Escario, 2016; Matthies, Selge & Klöckner, 2012). However, other groups such as visually impaired persons (VIPs) still face many barriers to participating in this meaningful social activity, and are excluded from active participation (Siu, 2013b). VIPs also face many difficulties in their daily life in accessing public events and facilities (Siu, 2013a; Siu, 2013c; Siu & Wong, 2013, Siu, Xiao & Wong, 2018). Although different kinds of technology and city planning such as smart cities have been developed to help VIPs and other people with different levels of disability (Ramirez et al., 2017), no new inventions or devices have been introduced to facilitate VIPs to participate in recycling activities as members of their communities. They are unable to contribute to the public environment by joining recycling activities.

Designers and governments in Western countries such as Canada, the U.K., and Australia have noticed this problem and have designed recycling bins that address the needs of VIPs. For

instance, in the city of Calgary in Canada, a plaque with a raised letter “G” and its braille equivalent is attached to the lids of recycling bins (Peterson, 2014). The colours of the letter and the bin are in high contrast so that VIPs can easily recognize the bins. In the Derbyshire Dales in the U.K., designers found that the recycling bins were confusing for VIPs, and so they designed bins with braille on the top and two notches on the sides of the lid (Letsrecycle, 2018). The local government of the Greater Geelong district in Australia provides tactile information on the lid of their recycling bins. A square tactile symbol is placed on bins for green waste, a triangle symbol on bins for recyclables, and a circle symbol on bins for garbage (City of Greater Geelong, 2017). However, these bins are only provided on request. It is also unknown whether the bins really do help VIPs to distinguish between the different kinds of bins and encourage them to participate in recycling activities.

Since 2015, the Public Design Lab at the Hong Kong Polytechnic University has conducted a series of studies to explore the possibility of VIPs participating in recycling. It is found that involving VIPs in the design of recycling facilities encourages them to participate in recycling events and activities. VIPs are respected, and their opinions are valued in the process. This paper presents that design process, and discusses the importance and fairness of the participation of VIPs in recycling. The needs and preferences of the VIPs in recycling, and how new inclusive designs can fit their needs, are also addressed.

Method and process

A case study of recycling facility design was conducted to investigate the difficulties and limitations of VIPs using recycling facilities. The key design research activity was participatory design workshops. Through the design process, several groups of VIPs introduced by non-governmental organizations (NGOs) were invited to provide design ideas, modify the designs, and test prototypes. A participatory design approach was adopted. According to Druin (2002), participants in a participatory design process can play four roles: user, tester, informant, and design partner. The participating VIPs in this study took the roles of user and tester. Participatory design research is a recent design movement and research method in which designers design not for users but with users (Sanders, 2002).

Researchers and designers who were specialists in designing inclusive facilities went through the design process with the VIPs and eventually designed a set of recycling bins. The set comprised a purple bin for general waste, a blue bin for paper recyclables, a yellow bin for aluminium recyclables, and a brown bin for plastic recyclables. The whole set was then brought to the VIPs to obtain their opinions and test the bins in use. Photographs were taken to record the test process. Semi-structured interviews were conducted after the tests to understand the usability of the bins and the VIPs’ experiences of using the recycling facilities.

The findings of previous studies have shown that VIPs are often unable to identify different kinds of recycling bins and are unable to throw recyclables into the correct bins, despite the use of different colours. Therefore, the new recycling bins designed in this study had a new opening at the top of the lid, and a tactile pictogram and Braille were added to the edge of the lid so that VIPs were able to identify the bins by touching and did not need to open the lid to throw the recyclables inside.

After receiving comments and opinions from the VIPs after the tests and interviews, the researchers and designers were tasked with managing the data and optimizing the design. After three rounds of tests and interviews at three different stages of design using different test prototypes, the final set was produced. The test and interview data are organized and summarized in this paper.

Findings and Analysis

Figure 1 shows the testing of the size and shape of the bin openings. The recycling bins were designed to have openings of different shapes. The opening of the general waste bin (purple) was circular, that of the paper recyclables bin (blue) was a long oval, that of the aluminium recyclables bin (yellow) was square, and that of the plastic recyclables bin (brown) was hexagonal. The size of the openings was designed to match the maximum size of existing recyclables in each category. The VIPs were satisfied that the shape and size of the lids allowed them to distinguish the different bins by the shape of the opening.

Figure 2 shows the testing of the tactile information on the edge of the lid, and Figure 3 shows the tactile pictograms and the Braille before modification. One of the VIPs commented that the tactile pictograms were too complicated and she could not understand the information; however, the Braille on the edge was clear. Figure 4 shows the final testing of the lid of the recycling bins. All of the VIPs who participated in the test were satisfied with the final design. The VIPs generally welcomed and were happy with the new design ideas.

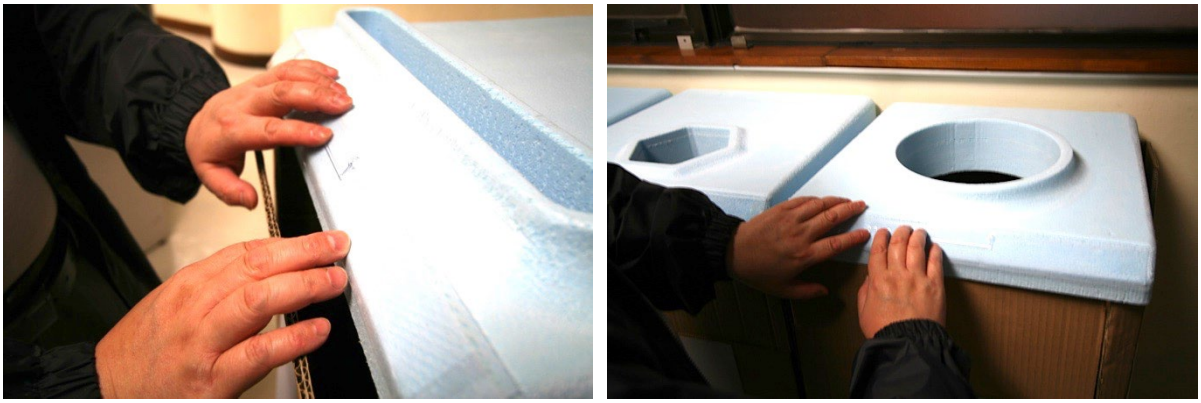
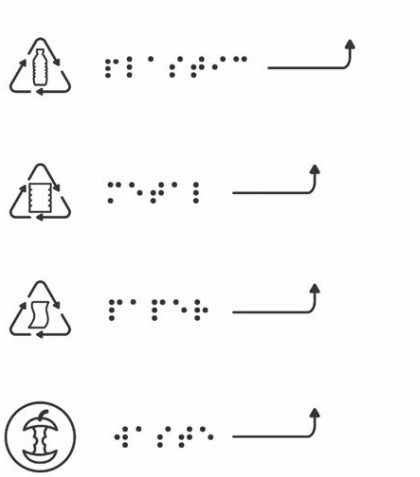


Figure 1. Testing prototype 1 with a VIP



(Left) Figure 2. Testing prototype 2 with a VIP
(Right) Figure 3. Tactile pictograms and Braille on the lids of the recycling bins before modification

Figure 4. Testing the final design with a VIP

The VIPs suggested that the main difficulty with using the recycling bins was that the bins were often covered in dust and dirt. They were reluctant to touch the lids and open the bins because they were unable to see clearly. This discouraged them from using the facilities and thus hindered them from joining recycling activities. The poor hygienic condition of the facilities implied that other users of the facilities may not use them properly, and this was not adequately managed.

Some of the VIPs also expressed concerns that although the recycling bins were newly designed and made so that they could identify and recognize them easily, other facilities

related to the recycling bins, such as a tactile guide path guiding VIPs to the recycling bins, were not well allocated or managed. Other pedestrian or street users may not understand the needs of VIPs, and thus may affect the usability and accessibility of recycling bins. These bins do not have fixed locations, and it is difficult for VIPs to find them if they are moved elsewhere. The VIPs also reported that Hong Kong people seldom offer help to them on the street. They have to be very independent, and engaging in recycling activities is just not an option for them when they have so many other issues to tackle in their daily lives.

The findings of the study show that the problem of deigning inclusive recycling facilities involves not only technical aspects, but also social, cultural and environmental aspects. It is important to address all of these aspects, because providing the proper facilities is not enough to encourage VIPs to engage in recycling. Other considerations need to be addressed so that they can participate in recycling independently and with dignity. Equity in public participation is the key to building a harmonious society.

Several suggestions to help VIPs be active in joining recycling activities in society are summarized below.

- In addition to a high contrast in colour and size, designs that require as little contact as possible with the facilities are favoured by VIPs.
- Standardization of design is essential for VIPs to become familiar with recycling facilities.
- The location of facilities should be fixed so that VIPs can locate them easily and independently.
- Researchers and designers should consider the entire system of accessing recycling facilities when designing them for VIPs.
- Information must be disseminated to VIPs about new recycling policies and facilities for them and their communities.
- NGOs that help VIPs and governments should work together to develop policies that address the needs of VIPs.
- More VIPs should be invited to join the design process for recycling facilities so that they are able to provide useful and constructive comments and opinions on the design.
- Education is required to inform other users of how to use recycling facilities properly and of the needs of the VIPs in this regard.

Conclusions

Through a case study of the design of a set of recycling bins for VIPs, this paper identifies several key limitations and difficulties that VIPs encounter when participating in recycling activities. The findings of the interviews with VIPs showed that apart from developing an inclusive design for recycling facilities, the corresponding social, cultural, and environmental coordination is needed to encourage VIPs to recycle. It is necessary to ease VIPs' worries about hygiene and management issues and educate other recycling users to be inclusive behaviourally and psychologically. This paper also identifies some design directions and approaches for researchers and designers that can be used as references for future studies

and practical development. Designs that are generated through a participatory design process or other theory-based design process should be publicized and made visible and convenient for all users so that recycling rates increase (Largo-Wight, Johnston, & Wight, 2013). Collaboration and coordination among different stakeholders as well as researchers and professionals from different disciplines (i.e., an interdisciplinary approach) are essential to cultivating an equitable and inclusive society that promotes public participation.

Acknowledgements

The authors thank Tthe Hong Kong Polytechnic University (PolyU) for its research fund support for the study. The authors also acknowledge partial support from the Hong Kong Research Grants Council's Humanities and Social Sciences Prestigious Fellowship Scheme (RGC 35000316) during the data collection and the preparation of this paper. The Eric C. Yim Endowed Professorship provided financial support for the data analysis. The authors also thank the visually impaired participants from the Hong Kong Blind Union, PolyU, and other NGOs and social service organizations for the visually impaired.