Is M-marketing an Accessible Technology for Consumers with Visual Disabilities? – A Preliminary Study

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Abstract. Marketing is becoming more and more important in our daily life. However, the communication channel and technology used is not accessible, in many cases, for consumers with visual disabilities. In this paper, we evaluate the current state of the art, which includes t-marketing, e-marketing and m-marketing, with the goal of reviewing suitable techniques and tools for consumers with visual disabilities. Our study demonstrates that m-marketing provides personalization, interactivity and comfort to consumers with visual disabilities, making it more accessible and flexible than e-marketing. Moreover, we found that m-marketing is less intrusive than t-marketing and e-marketing in maintaining consumers' privacy.

1 Introduction

Recently, we have lived in a boom of wireless technologies which are applied in different areas of our daily life, creating mobile services [1], [2], [3], [4], [5]. Mobile services refer to any electronic transaction using mobile devices and wireless technologies, where the end user is the beneficiary of the service. In this new scenario, the end user can get access to mobile services whenever and wherever she wants by means of her private and personal mobile device. For that reason, mobile services are changing the way in which people interact among each other.

M-marketing (mobile-marketing) is another successful mobile service which provides new options to consumers and organizations [6], [7], [8]. We define m-marketing as the process of promotion of ideas, goods and services using wireless technologies and mobile devices with the goal of creating consumer satisfaction.

Unfortunately, m-marketing has inherited problems from e-marketing (electronic-marketing), like spam and the absence of trust [9], which must be resolved before this service grows to replace t-marketing (traditional-marketing). Another aspect which must be resolved is the accessibility to promotions of special sales and offers to

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consumers with visual disabilities – people who are blind, who have little or no functional vision, and people who have low vision - in order to contribute to create a fair society.

This study aims to analyze the technological environment perception in relation to m-marketing to focus on people with visual disabilities. According to [10] people with visual disabilities in the Worldwide exceed 314 million and 45 million of these are blind. In Mexico people with visual disabilities are around 500,000 [11].

The M-marketing focus on people with visual disabilities is interesting to study because even though, on the one hand, it has had a relatively developed technology environment – communication and mobile devices – for many years; on the other hand, its application to consumers with visual disabilities is recent. Highlighting the challenges in introducing new technology in this field can provide useful insights that can relate to other contexts.

The research methodology consists of literature reviews of theoretical material related to marketing evolution – t-marketing, e-marketing and m-marketing – which focuses on consumers with visual disabilities and human-computer interaction (HCI). In addition, this study tries to understand the opinion and perception of a consumer with visual disabilities about the correct use and application of techniques and tools in marketing.

This paper is organized as follows. In section 2, we describe the techniques and tools which can be used by organizations in their marketing campaign. Section 3 describes the research method which includes human-computer interaction and a marketing focus on consumers with visual disabilities. We present our results in section 4. In section 5, we give conclusions and plans for future work.

2 Marketing

According to [6], marketing is defined as the process of planning and executing the conception, pricing, promotion, and distribution of goods, services and ideas to create exchanges that can satisfy individual and organizational goals. In this way, marketing for consumers with visual disabilities is an alternative field which requires special attention. The use of new technologies and approaches in marketing management focusing on consumers with visual disabilities brings opportunities and challenges for academic and industrial communities.

In this section, we describe how technology can be applied with a marketing management focus on consumers with visual disabilities through audio-media and tactile-presentation, making human-computer interaction accessible for anyone.

2.1 T-marketing

T-marketing is the most common way to promote goods or services via print-format, television-advertising and radio-advertising [12]. This type of marketing is very well known by organizations and consumers. In order to capture the attention of consumers with visual disabilities, academic and industrial communities have designed the following options:

2.1.1 Audio-media

Audio gives to consumers with visual disabilities information about the promotion of ideas, goods and services that they might not be able to see. We found the following options:

- Audio file with a voice talking about an idea, good or service [13], [14].
- Speech system can be used to – automatically – read aloud text [13].

2.1.2 Tactile-presentation

Organizations can use Braille codes [15] for representing documents. These codes consist of characters of either six or eight dots in columns of three or four dots. By means of Braille codes, it is possible to translate material such as promotion or special sales into sequential strings of similar Braille characters. Marketing focus on consumers with visual disabilities can use the following techniques and tools:

- Microcapsule paper is a special paper onto which millions of thermally-foamed microcapsules have been uniformly coated [16]. These microcapsules of wheat-flour will instantly expand to hundreds of times the size of the original volume upon absorbing the energy of light or heat. By means of this technology any material such as a drawing, map or photograph, whether hand-written or printed, can be 3D.
- Flexi paper must be passed through a machine called "tactile image enhancer" which creates a sensory image [16], [17]. By means of the flexi paper and the machine, it is possible raise any image on the paper.
- Tooling consists of impressing points on the reverse side of Braille paper or foil using special tools [16]. By means of this technique if any is necessary to prepare the Braille impression on the pages before adding the raised areas.

In this way, blind users can use their hands to identify the message printed on the paper. This means that blind people used and enhanced their tactile sense.

2.2 E-marketing

E-marketing appeared thanks to the constant growth of internet users. E-marketing is the process by which a product or service is promoted via the internet and electronic media. E-marketing is a view in where the organization's website creates relationships with internet users creating direct access to personally relevant news. In this perspective, organization's Web-site is an autonomous system which not only provides information, but also remembers consumer's information about their interests. According to [18], e-marketing increases consumer satisfaction resulting in consumer loyalty but how we can give access to promotions of special sales and offers via internet to consumers with visual disabilities? In order to answer the question, we have reviewed the literature and we found the following techniques and tools which can be used to promote ideas, goods and services focused on consumers with visual disabilities [19], [20], [21]:

- Screen-reader software speaks all the text information which comes on the screen as well as the text which is typed on the keyboard. Another advantage of this software is that it provides to blind users the support to identify the content of a

web page, such as windows, buttons and media player controls, giving as a result a better interaction between people with visual disabilities and computers.

- Braille display is hardware which presents the information on a Braille code. These displays are made of crystalline material points, which through electrical pulses, are able to raise their level on the display, so that characters are represented in Braille. The information about the content to display is sent from the operating system to screen-reader software, which through a series of algorithms translate the information into Braille to be represented on the Braille display. By means of, consumers with visual disabilities can read with their fingers.
- Multimedia presentation includes the combination of text, graphics, video, and audio which can be used for consumers with visual disabilities.

2.3 M-marketing

M-marketing is the next step in the evolution of marketing. It appears thanks to the adoption of mobile devices in developing and non-developing countries, advances in wireless technology, higher connection speed, larger screens and new functionalities in mobile devices.

In this case, organizations have several channels to promote ideas, goods and services because m-marketing requires wireless technology to establish a contact with consumers. Wireless technology can be classified into groups: short-range and long-range [22], [23], [24].

Short-range wireless communication includes the following:

- Bluetooth is low-power consumption and robustness. Bluetooth consists of an radio-frequency transceiver, base-band and protocol stack and offers services that enable the connection of devices and the exchange of a variety of data (audio, video, text, and images) between them.
- Near field communication (NFC) is a high frequency wireless communication technology which enables the exchange data over about a 10cm distance. NFC combines the interface of a smartcard and a reader into a single device.
- Radio frequency identification (RFID) is a wireless technology which detects and identifies objects using radio signals. RFID system comprises two basic components – tags and interrogators –. Tag has a unique identification number (ID) and memory to store the data (e.g. manufacturer name) that enables the entire system to identify items. On the other hand, the interrogators can read and/or write data from/to the tag.
- Wireless-USB is a high-bandwidth wireless radio communication protocol. The goal of this technology is intended to replace the cables from USB based PC peripherals.

Long-range wireless communication includes the following:

- Wi-Fi has a data rate up to 11 Mbps within a range between 60m to 100m. It is standardized by IEEE 802.11b (2.4 GHz).
- WiMax was designed as a wireless alternative to low-cost broadband via standard interface to the public networks operating over around 50Km at 70Mbps.
- 3G or 4G offer high speed wireless connectivity.

Due to the mobile device's popularizations, companies have developed devices with better features (e.g. different wireless communication technologies) and more accessible for anyone; so that, the inter-connection among different devices can be automatic, making easier the use of mobile devices for people with visual disabilities.

By means of wireless communication and mobile devices, consumers with visual disabilities can access promotions via screen reader software, voice recognition and multimedia [25], [26].

3 Research Method

After a review of many techniques and tools proposed in the literature, we talked with the only student who is blind in the *Universidad de la Sierra Sur*. We wanted to know his opinion and perspective about the advantages and disadvantages of the techniques and tools described in section 2.

For this study we considered HCI concepts [27], [28], [29] that provide understanding and knowledge of the way in which consumers perceive and process information, so it is possible to improve the relationship between consumers and computer systems, and the way in which they perform tasks.

Mobile devices and informatics systems being the medium by which m-marketing offers advertising, those systems must adapt to blind users in terms of accessibility, comfort, convenience and interactivity, which fall into a discipline called Human-Computer Interaction (HCI). That's why we considered in the interview the following concepts: HCI and marketing.

3.1 Human-Computer Interaction

- Accessibility involves two points: 1) how users with disabilities (e.g. visual) access electronic information and 2) how content is presented to people with disabilities. The challenges affect both sides – consumers and organizations. On one hand, consumers need to identify the best technique or tool that can provide the most convenience access to information. On the other hand, organizations must identify those obstacles which prevent accessibility to information in order to design the best tools and techniques for people with disabilities.
- Comfort: represents the satisfaction from people with disabilities with the technology and tools used to give access to information and/or services.
- Convenience: evaluates the quality of being suitable technology and tools for people with disabilities.
- Interactivity: indicates a measure of the effectiveness with which people with disabilities can achieve specified goals by means of technology or tools defined.

3.2 Marketing

- Convenience: evaluates the ease with which blind people can access advertising.

- Intrusiveness: represents the aggressiveness of advertising practices which interrupt the activities of consumers.
- Localization: presents promotions based on physical location of the consumer.
- Personalization: promotion of ideas, goods and services oriented to a specific group of consumers.

4 Results

Table 1 shows our preliminary results in the first phase of the research. We compared the techniques and tools used in t-marketing, e-marketing and m-marketing focus on consumers with visual disabilities. The comparison is carrying out based on the information found in the literature and our perception.

Table 1. General perception of accessibility to promotions via t-, e- and m-marketing

	Characteristics	**t- marketing**	**e- marketing**	**m-marketing**
HCI	Accessibility	High	Medium	Medium
	Comfort	High	Low	Medium
	Convenience	High	Low	Medium
	Interactivity	High	Low	Medium
Marketing	Convenience	Medium	Low	High
	Intrusiveness	Medium	High	Low
	Localization	High	Low	High
	Personalization	Low	Medium	High

Table 1 demonstrates that t-marketing is the best option for organizations to prepare management campaigns focused on consumers with visual disabilities because it provides more advantages in terms of HCI. According with section 2, people with visual disabilities can perceive information by means of ear-sense and tact-sense, thanks to the tools and mechanisms used by companies (e.g. bottles and medicine boxes with Braille text printed on them and audio files), consumers can get information anywhere and anytime, while in e-marketing blind users need use computers and internet connection. Moreover, computers must have installed special software like screen-readers, which have the following drawbacks:

- High rate of speech.
- Don’t respect dots and commas.
- Don’t describe images.

In terms of comfort and interactivity, t-marketing offers the possibility to consumers with visual disabilities to be more independent, making decisions by themselves to purchase a product or not.

However, t-marketing has disadvantages in terms of Marketing. Table 1 demonstrates that t-marketing is poor in personalization because it is focused on capturing many consumers as possible. On the other hand, m-marketing makes use of mobile devices, which can be customized in accordance with the needs and characteristics of its owner, from which we can get a user profile and design advertising based on this profile. Plus, these devices some kind of have built-in

communication technology, giving the facility to the consumer to connect to any network, so they can access the advertising anywhere at any time.

Also, Table 1 shows that m-marketing is the best option for companies to provide their advertising to consumers with visual disabilities. This is convenient because using mobile devices and wireless technologies, they can design advertising using multimedia files, so the cost of it will be lower, giving as a result that a blind user can be part of advertising culture. Moreover, m-marketing offers the advantage that consumers get advertising according to where they are, automatically. Regarding personalization, in m-marketing, blind users can get advertising according to their interests and profiles, eliminating the biggest problem of e-marketing, known as spam, making m-marketing less intrusive.

In order to understand much better the implications of these techniques and tools in the daily life of a blind person, we extended our study with the goal of knowing the experience and perspective of a blind person – a student from Universidad de la Sierra Sur. We designed a questionnaire for knowing his perception about the use of tools and techniques for blind people in marketing (Appendix 1 shows the questionnaire and his answers which explain his perception). It is very clear that few organizations take advantage of the techniques and tools, described in section 2, to prepare their marketing campaign.

Today, the cost of mobile devices is becoming less, offering more services and ease of use, being more accessible for anyone, even for people with visual disabilities. People with visual disabilities have more mobility, comfort and privacy using such devices. Therefore, organizations should use m-marketing as a first option for marketing campaigns oriented toward consumers with visual disabilities.

At the same time, m-marketing is less intrusive than t-marketing and e-marketing because handheld devices are more personal devices than computers, which results in higher privacy for consumers.

5 Conclusions and Future Work

We have presented the first results of our work where the results are clear. We have found several techniques and tools focused on people with visual disabilities. These have been designed and developed by universities, organizations and governments with the goal of giving equal opportunities to participate in a fair society and to have the benefit of the correct use of computer resources. Unfortunately, organizations in Mexico have not taken advantage of such a mechanism in their marketing campaign.

Our study emphasizes the fact that, in order to successfully use techniques and tools for consumers with visual disabilities, organizations must be directly involved in the correct design and development of such technology. It also emphasized that if technology is adapted to consumers with visual disabilities, everybody can benefit, even consumers with no disability.

When we look at consumers who have visual disabilities, we must think about how we can apply technology in their benefit. Several efforts have been described in this paper which can be used to improve their quality of life.

All the techniques and tools described in this paper were developed for people with visual disabilities, but these technologies are not used by marketing or advertising.

Our paper presented the perception of blind person about the correct use of such technology in his daily life. The results described in Appendix 1 are clear; he knows about the technology but he has used it few times in his life.

In order to understand better the use and adoption of techniques and tools for people with visual disabilities, we want to extend our study to all of the country by means of the internet and organizations for blind people.

The concept of the correct use of techniques and tools in marketing focused on consumers with visual disabilities should be considered by organizations. Thanks to researchers and designers, we have technology for blind people; now, organizations must take advantage of them.

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Appendix 1. Point of view from a consumer with visual disabilities

Questions	Answers
Do you have computer at home?	Yes
Do you have a laptop?	Yes

Do you have a handheld?	Yes
Which device is more comfortable?	Mobile phone
Have you received promotions by t-marketing?, specially for blind people	Yes
If your answer is yes, describe your experience	I could read an advertising, written in Braille code, in a bottle of water
Have you received promotions by e-marketing?, specially for blind people	Not yet, but I can listen some promotions and advertising
If your answer is yes, describe your experience	By means of the screen reader software, I can understand some advertising
Have you received promotions by m-marketing?, specially for blind people	No yet. but I can listen some promotions and advertising
If your answer is yes, describe your experience	By means of multimedia messaging system (MMS), I can listen some promotions and advertising
From your point of view, which marketing can be more useful for blind people?	T-marketing's techniques and tools are good options but unfortunately these techniques and tools are not feasible in my city. On the other hand, e-marketing requires a computer and be online all the time to know the last promotions and advertisings send to my email, making it less attractive. Finally, m-marketing can be a good solution for consumers with visual disabilities because we can receive MMS and promotions that focus on blind people.