Accessibility of Mobile Applications

A

Pankaj Kamthan
Concordia University, Canada

INTRODUCTION

The increasing affordability of devices, advantages associated with a device always being handy while not being dependent on its location, and being able to tap into a wealth of information/services has brought a new paradigm to mobile users. Indeed, the *mobile Web* promises the vision of universality: access (virtually) anywhere, at any time, on any device, and to *anybody*.

However, with these vistas comes the realization that the users of the mobile applications and their context vary in many different ways: personal preferences, cognitive/neurological and physiological ability, age, cultural background, and variations in computing environment (device, platform, user agent) deployed. These pose a challenge to the ubiquity of mobile applications and could present obstacles to their proliferation.

This article is organized as follows. We first provide the motivation and background necessary for later discussion. This is followed by introduction of a framework within which accessibility of mobile applications can be systematically addressed and thereby improved. This framework is based on the notions from semiotics and quality engineering, and aims to be practical. Next, challenges and directions for future research are outlined. Finally, concluding remarks are given.

BACKGROUND

The issue of accessibility is not new. However, the mobile Web with its potential flexibility on both the client-side and the server-side presents new challenges towards it.

Figure 1 illustrates the dynamics within which the issue of accessibility of a mobile application arises.

We define a *mobile application* as a domain-specific application that provides services and means for interactivity in the mobile Web. For example, education, entertainment, or news syndication are some of the possible domains. The issue of accessibility is intimately related to the user and user context that includes client-side computing environment. To that regard, we define *accessibility* in context of a mobile application as access to the mobile Web by everyone, regardless of their human or environment properties. A *consumer* (user) is a person that uses a mobile application. A *producer* (provider) is a person or an organization that creates a mobile application.

The Consumer Perspective of Mobile Accessibility

The accessibility concerns of a consumer are of two types, namely human and environment properties, which we now discuss briefly.

Human Properties

Human properties are issues relating to the differences in properties among people. One major class of these properties is related to a person's ability, and often the degree of absence of such properties is termed as a disability. We will use the term "disability" and "impairment" synonymously.

The statistics vary, but according to estimates of the United Nations, about 10% of the world's population is considered disabled. The number of people with some form of disability that do have access to the Internet is in the millions.

Figure 1. The interrelationships between a consumer, a producer, accessibility, and a mobile application

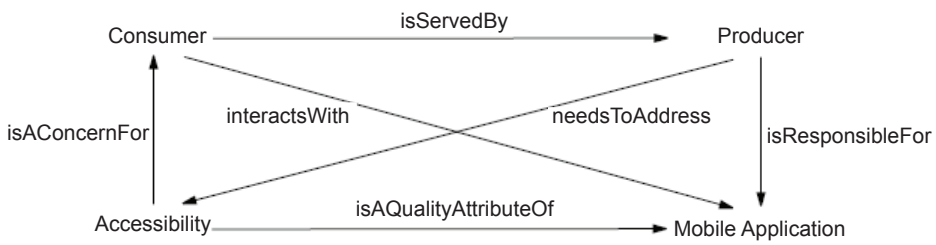

Table 1. A semiotic framework for accessibility of mobile applications

Semiotic Level	Quality Attributes	Means for Accessibility Assurance and Evaluation	Decision Support
Pragmatic	**Accessibility** [T4;E]	• Training in Primary and Secondary Notation • "Expert" Knowledge (Principles, Guidelines, Patterns) • Inspections • Testing • Metrics • Tools	Feasibility
	Comprehensibility, Interoperability, Performance, Readability, Reliability, Robustness [T3;E]		
Semantic	Completeness and Validity [T2;I]		
Syntactic	Correctness (Primary Notation) and Style (Secondary Notation) [T1;I]		

There are several types of disabilities that a producer of a mobile application needs to be concerned with. These can include visual (e.g., low visual acuity, blindness, color blindness), neurological (e.g., epilepsy), auditory (e.g., low hearing functionality, deafness), speech (e.g., difficulties in speaking), physical (e.g., problems using an input device), cognitive (e.g., difficulties of comprehending complex texts and complex structures), cultural/regional (e.g., differences in the use of idioms, metaphors leading to linguistic problems).

Environment Properties

Environment properties are issues relating to different situations in which people find themselves, either temporarily or permanently. These situations could be related to their connectivity, the location they are in, or the device/platform/user agent they are using. For example, a user using a computer in a vehicle shares many of the issues that some people have permanently due to a disability in hand motorics. Or, for example, a user may be accessing the *same* information using a personal digital assistant (PDA) or a cellular phone.

The Producer Perspective of Mobile Accessibility

The motivation for accessibility for a business is to reach as many users as possible and in doing so reduce concerns over customer alienation.

It is the producer of the mobile application that needs to adjust to the user context (and address the issue of accessibility), not the other way around. It is not reasonable for a producer to expect that the consumer environment will be conducive to *anything* that is delivered to him/her. In certain cases, when a consumer has a certain disability, such adaptation is not even possible.

If the success of a mobile application is measured by the access to its services, then improving accessibility is critical for the producers. Still, any steps that are taken by a producer related to a mobile application have associated costs and trade-offs, and the same applies to improvements towards accessibility.

Initiatives for Improving Accessibility in Mobile Contexts

There are currently only a few efforts in systematically addressing accessibility issues pertaining to mobile applications.

There are guidelines available for addressing accessibility (Chisholm, Vanderheiden, & Jacobs, 1999; Ahonen, 2003) in general and language-specific techniques (Chisholm et al., 2000) in particular.

ADDRESSING THE ACCESSIBILITY OF MOBILE APPLICATIONS

To systematically address the accessibility of mobile applications, we take the following steps:

1. View accessibility as a qualitative aspect and address it indirectly via quantitative means.
2. Select a theoretical basis for communication of information (semiotics), and place accessibility in its setting.
3. Address semiotic quality in a practical manner.

Based on this, we propose a framework for accessibility of mobile applications (see Table 1). The external attributes (denoted by E) are extrinsic to the mobile application and are directly the consumer's concern, while internal attributes (denoted by I) are intrinsic to the mobile application and are directly the producer's concern. Since not all attributes corresponding to a semiotic level are on the same echelon, the different tiers are denoted by "Tn."

We now describe each component of the framework in detail.