Landscape and Urban Planning 177 (2018) 191–195

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Research Note

Development of a smartphone app to evaluate the quality of public open space for physical activity. An instrument for health researchers and urban planners

Elaine Hoffimann[a], David Campelo[b,1], Paula Hooper[c,2], Henrique Barros[a,d], Ana Isabel Ribeiro[a,d,*]

[a] EPIUnit – Instituto de Saúde Pública, Universidade do Porto, Portugal
[b] Departamento de Comunicação e Artes, Universidade de Aveiro, Portugal
[c] Centre for Health Equity, Melbourne School of Population and Global Health, The University of Melbourne, Melbourne, Australia
[d] Departamento de Ciências da Saúde Pública e Forenses e Educação Médica, Faculdade de Medicina, Universidade do Porto, Porto, Portugal

ABSTRACT

Public Open Spaces (POS) such as green spaces have well-known health benefits and certain attributes are important for encouraging their use. Audit tools have been developed to evaluate POS quality. These are mostly available in paper form, although software applications (app) offer several advantages, such as facilitating data entry, organization and exportation and allowing access to sensors available in portable devices. We aimed to develop a free and open-source app for smartphone based on the original paper-form Quality of Public Open Space Tool (POST), and to describe its development, functionalities and strengths. Adapting the paper version of POST to an app was a relatively straightforward process. Taking advantage of the smartphone sensors and functionalities, we have been able to incorporate several tools that can improve the POST functionality and efficiency. Given the ubiquity of smartphones, the POST app has potential to be used widely by both researchers and planners.

1. Introduction

Public Open Spaces (POS) such as green spaces have a well-documented beneficial health effect, as they offer opportunities for leisure activities and contact with nature (McCormack, Rock, Toohey, & Hignell, 2010; WHO Regional Office for Europe, 2016); encourage physical activity and walking (Giles-Corti et al., 2005; Kaczynski & Henderson, 2007); and provide a meeting place for users to develop and maintain social ties and sense of community (Larson, Jennings, & Cloutier, 2016). Therefore, they have been recognized as important tools for planning healthy livable cities (Frumkin, 2003; Shanahan et al., 2015).

Quantity, accessibility and quality influence green space use (Berg et al., 2015; Giles-Corti & Donovan, 2002). Proximity of large attractive green spaces appears to positively influence the frequency of green space use (Giles-Corti et al., 2005), with their attributes (amenities, maintenance, safety) playing an important role in encouraging use (Frumkin, 2003).

The Public Open Space Tool (POST) was developed to try to capture incorporate the attributes that influence green space use in a single instrument (Broomhall, Giles-corti, & Lange, 2004). The POST is a validated tool designed for auditing POS such as parks and other green spaces, with particular emphasis on the attributes that may either encourage or discourage their use for physical activity (Giles-Corti et al., 2005). The POST relies on direct observation and is composed of 49 items covering four key domains: activities (e.g. type of use and specific activities), environmental quality (e.g. presence of attractive elements, such as trees, water), comfort (e.g. presence of amenities, such as cafés, public restrooms) and safety (e.g. presence of illumination, signs and characteristics of the surrounding roads) (Lange, Giles-Corti, & Broomhall, 2004). This tool has been enhanced for a remote-use version, POSDAT. This is a major improvement because it reduces collection time, especially for large areas and samples (Edwards, Hooper, Trapp, Bull, Boruff, & Giles-Corti, 2013; Edwards & Hooper, 2012). However, some maintenance and security variables are not possible to observe remotely. We believe that in some cases direct observation on

* Corresponding author at: EPIUnit – Instituto de Saúde Pública, Universidade do Porto, Rua das Taipas 135, 4050-600 Porto, Portugal.
E-mail addresses: david.campelo@ua.pt (D. Campelo), paula.hooper@uwa.edu.au (P. Hooper), hbarros@med.up.pt (H. Barros), ana.isabel.ribeiro@ispup.up.pt (A.I. Ribeiro).
[1] Digimedia (CIC.DIGITAL), Aveiro University, Campus Universitário Santiago, Portugal.
[2] Centre for Health Equity, Melbourne School of Population and Global Health, The University of Melbourne, Building 15, Level 3, Room 12, 124 La Trobe Street, Melbourne VIC 3000, Melbourne, Australia.

https://doi.org/10.1016/j.landurbplan.2018.05.005
Received 23 December 2017; Received in revised form 30 April 2018; Accepted 3 May 2018

the spot is still necessary and relevant.

With the advent of new technologies, it is possible to rethink the data collection methods. The old clipboard, pen and notepad can now be replaced by an application software (app) to run in smartphones or tablet computers (Raento, Oulasvirta, & Eagle, 2009), facilitating data entry and organization, reducing paper copies, scanning time, possible transcription errors and inconsistencies. They allow access to multiple sensors enriching the data collection (Aanensen, Huntley, Feil, Al-Own, & Spratt, 2009; Patel, Nowostawski, Thomson, Wilson, & Medlin, 2013). Apps offer the possibility of transmitting instant information to internet and can be developed under open source licenses, reducing technical and economic costs (Patel et al., 2013; Raento et al., 2009). Finally, apps support citizen participation, allowing people to retrieve useful information but also to provide feedback about community resources (Ertiö, 2015).

Although the use and development of apps for public health and environmental sciences is new, in the past decade, they have been increasingly developed (Aanensen et al., 2009; Besenyi et al., 2016; CIAFEL, 2016; McConnell et al., 2016; Raento et al., 2009; Schoeppe et al., 2016). In the green space-health research context, however, it is important to note that, there is a demand to be met.

Given the importance of assessing the quality and characteristics of green spaces in academic research, but also in territorial planning, our study aimed to develop a free and open-source app for smartphone based on the original POST paper instrument, and to describe the development, functionalities and strengths of this new app.

2. Methods

2.1. Workflow

Fig. 1 depicts the process of the app development, which took place between April and November 2016. In the prototype development phase (Phase 1), two researchers (EH and AIR) conceptualised the functions and features to be included in the app: variables to collect; user interface; grouping POS into projects; mapping; and exporting data. Then, they contacted a software developer (DC).

The app was developed for Android (Amadeo, 2013), due to its worldwide reach, open-source nature, and greater market share over other mobile platforms, such as iOS and Windows (IDC Analyse the Future, 2017). The Android API selected for development was the version 17 (Jelly Bean), as it would enable larger compatibility with devices already present in the market (Android Developers, 2017), while allowing the use of GPS resources needed to locate and delimit the POS. We used the Google Maps API for 2D mapping and the KML specification when producing output for Google Earth.

Firstly, the software developer (DC) transcribed integrally all the items from the original paper-form tool to the app. Taking advantage of the available technology, additional features were included: the use of maps and GPS to set the project geographic extent and draw the POS; the project-oriented organization that allows putting together POS that were audited within the same project; the automatic calculation of the POS area and its geographic coordinates that avoids the need to measure them using other software; the data exportation, in table (csv) and map (kmz) format, that save digitizing time, minimize digitizing errors and facilitate subsequent data analysis.

To guarantee data consistency, validation checks were implemented to block invalid inputs (e.g. numerical fields do not allow text and vice versa) and to block questions whenever they are not applicable based on previous answers (e.g. if the auditor selected the option that states the POS do not have water features, questions related with the amount or type of these features become blocked).

The development process involved a continuous dialogue between all the researchers and the developer to communicate and solve problems detected during testing phases. The visual schemas were developed later on by a graphic designer.

2.2. Testing

The first app version (alpha) was available for preliminary tests in July 2016 (Phase 2 – alpha testing). Two authors (AIR and EH) tested the app by using it to collect data on the green spaces of Porto city (n = 55) (Hoffimann, Barros, & Ribeiro, 2017). Throughout the process of data collection, the two authors provided feedback about the app interface and functionality to the software developer (DC), who performed the required improvements in an iterative process, releasing a new version after each change, until the requirements of the two authors were met. Accordingly, the app was changed (and a new alpha version was released) five times. The first change was made after evaluating one green space, and the second, third, fourth and fifth alterations after evaluating three, four, seven and ten green spaces, respectively. Improvements ranged from bug fixing to changes in the

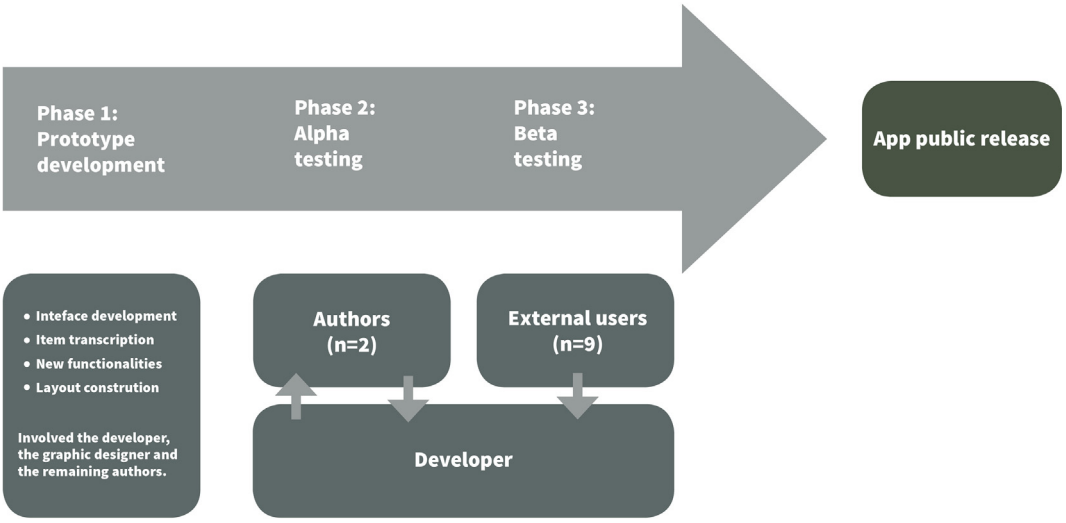

Fig. 1. App development process. In Phase 1 (Prototype development) the developer transcribed to the app all the questions from the original paper-form POST tool, added new functionalities (e.g. mapping, data exportation) and the designer developed the layout; in Phase 2 (alpha testing) the app was tested by two authors to collect data on Porto green spaces and feedback was given to the developer, who made the requested changes, until all the requirements were met; in Phase 3 (beta testing), the last testing before public release, the app was tested by external users, a total of nine including lay people and researchers, who were asked to evaluate the app and to suggest improvements. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)