
Towards More Usable Planning Support Systems

Rosa Lanzilotti

Dipartimento di Informatica
Universita' degli Studi di Bari
Aldo Moro
70125 Bari, Italy
rosa.lanzilotti@uniba.it

Patrizia Russo

Faculty of Architecture Building
and Planning
University of Melbourne
Victoria 3010, Australia
p.russo@student.unimelb.edu.au

Maria Francesca Costabile

Dipartimento di Informatica
Universita' degli Studi di Bari
Aldo Moro
70125 Bari, Italy
maria.costabile@uniba.it

Chris Pettit

Built Environment
University of New South Wales
NSW 2052, Australia
c.pettit@unsw.edu.au

Abstract

Planning Support Systems (PSS) are software tools developed for assisting planning professionals. They are rather complex systems, which are developed with much more attention to their functionality than to their quality in use. The consequence is that such systems are not widely used and their low usability is one of the main reasons. Indeed, evaluations of PSS are rather rare. Some reasons are that PSS designers are not aware of the value of the evaluations and do not have enough expertise to conduct them. Thus, a framework has been developed that serves as a guide for usability evaluation of PSS. The framework has been used to evaluate three PSS by performing a test with land use planners. This user test provided insights and recommendations for the design of PSS, as briefly reported. More importantly, this research aims at demonstrating to PSS designers the need of adopting Human-Centred Design processes, in order to better sell systems capable to provide a significant user experience.

Author Keywords

Usability, evaluation, user test

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction and Motivation

Planning Support Systems (PSS) are software tools intended to assist professionals in their planning activities. These systems generally provide spatial analysis functionality and visualization capabilities in order to address one or multiple phases and tasks of the planning process.

Although recent publications show increased use of a number of PSS, wide scale implementation (especially for supporting strategy-making) is still not taking place [8][9]. Moreover, the focus of PSS studies has been mainly on instrumental characteristics, while the perspective of people, who have to use them, has been very much neglected [4].

Few studies for evaluating PSS usability have been performed, possibly because designers do not regard it as their task and have not so far been stimulated to conduct them. In [1], it is suggested to rigorously conduct evaluations of PSS in order to encourage designers to increasingly consider user-oriented aspects and to facilitate the selection of appropriate PSS by potential users. It is worth remarking that conducting usability evaluation requires specific skills that PSS designers usually do not possess.

While there are many books and websites that describe evaluation methods, interviews and discussions with PSS designers indicated their need of more practical guidance in order to plan and perform usability evaluation in the PSS development lifecycle. For supporting PSS designers, a framework providing guidance on performing usability and user Experience (UX) evaluation of PSS has been developed [7].

A usability evaluation framework for PSS

Inspired by the DECIDE framework [6], an evaluation framework specialized for the evaluation of PSS has been defined. The framework is intended to address evaluators, who do not have any expertise, e.g. the PSS designers themselves, so that they need detailed indications on all the important aspects to take care during the evaluation. The six activities indicated by the evaluation framework are described in the following paragraphs.

1. Determine the evaluation goals

To clarify what is the scope of the evaluation and what should be achieved once the evaluation is carried out, evaluation goals are defined as a first activity. Typical goals of PSS evaluation might be: a) assess the ease of use of a PSS for its adoption by planning professionals; b) compare the functionality and usability of multiple PSS; c) identify design suggestions for the next version of a PSS.

2. Explore the questions

As a second activity, more specific questions that underpin the goals and should be answered through the evaluation are formulated. A question can be "Is the PSS usable?" and furthermore "Is the user interface easy to navigate? Is the terminology confusing because it is inconsistent? Is the feedback provided to users sufficient? Is the response time too slow?".

3. Choose the evaluation and data collection methods

The framework proposes inspection and/or user-based methods and illustrates their advantages and disadvantages in order to facilitate the choice. Specifically, among user-based methods, the framework suggests using: 1) the thinking-aloud

technique; 2) questionnaire and interview for assessing user satisfaction and other hedonic qualities of UX; 3) video and screen recording for complex tests and for reviewing participant's interaction and behaviour if something is unclear; and 4) measures of user performance, of which the framework provides specific examples of application.

4. Identify the practical issues

Many practical issues have to be considered when conducting an evaluation. For example, before beginning with an inspection, it should be ensured that all evaluators: i) use the same inspection criteria, ii) have the same understanding of the criteria and iii) apply them in the same way. Novice evaluators might consider using Nielsen's heuristics [3]. After the inspection, the evaluators should compare and discuss the results. In user-based methods, the following issues have to be addressed: 1) choice of the participants; 2) choice of the experimental design (between- or within-subjects design); 3) choice of the task(s); 4) choice of the facilities and equipment. The framework also provides examples that may help evaluators in the decisions to be taken.

5. Decide how to deal with the ethical issues

This activity informs evaluators about the ethical issues involved in user-based methods in order to take them into account. The framework also provides an example of a consent form.

6. Evaluate, analyse, interpret and present the data

Before actually running the evaluation, decisions have to be made about how data are analyzed and presented. The framework suggests specific statistic

methods to adopt and provides examples of their applications.

Applying the framework: a user test

The evaluation framework has been applied to carry out a user test that evaluated three PSS *CommunityViz* [10], *Envision* [2] and *Online What if?* [5]. In particular, the modules devoted to Land Suitability Analysis (LSA) were evaluated. LSA is a basic activity that planners perform in order to determine the suitability of each land unit for a specific purpose and several parameters have to be taken into account. Through the assignment of weights, users can attribute different importance to parameters. The output includes a map, which displays the suitability score for each land parcel through color-coding. The LSA is differently calculated by the three considered PSS and different interfaces are presented to allow users to provide the necessary input.

The goals of the user test were to identify possible usability problems of the three PSS and to better understand users' expectations when performing LSA tasks. The user test was conducted with 6 planning professionals, who used the 3 PSS in a within-subjects design. Data were collected through the thinking-aloud technique and questionnaire. The thinking-aloud technique was chosen since it offers a window over the users' mental models, allowing evaluators to detect possible misconceptions about the system and the interface elements that cause them. In addition, it provides useful results even with a small number of users [3].

Lack of space prevents from reporting more details and figures about the user test. They will appear in the

poster. The user test revealed several problems. First of all, the interface of the three PSS does not provide any explanation on what the weighting actually mean, how the computation is performed and how to interpret the results. In addition, in some cases user interaction is not facilitated, for example by limiting the number of actions the user has to perform. The participants were surprised that GIS functionality was not available, since they were familiar with this GIS software and they expected similar functionality when analyzing the suitability layer. Finally, the help documentation is not easily accessible.

Starting from these results, a set of recommendations for developing more usable PSS, were derived, some of which are: a) Explanations about the weighting system, the calculation and interpretation of suitability scores should be provided; b) Layout, colors and fonts for the presentation of the parameters have to be carefully chosen to make it easier to understand for the user; c) Help documentation, including examples and short demo of system use, should be available.

We are confident that the research summarized here will convince PSS stakeholders that usability problems can be certainly limited if the PSS are developed by carefully following Human-Centred Design approaches, focusing on user aspects and evaluating early prototypes at the initial stages of the software lifecycle.

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