8th IADIS International Conference

INFORMATION SYSTEMS 2015

Madeira, Portugal 14 - 16 March

* PROCEEDINGS *

Edited by:
Miguel Baptista Nunes
Pedro Isaías
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INTERFACE DESIGN FOR A SENSORY ANALYSIS DECISION SUPPORT SYSTEM

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ABSTRACT

Adequate interfaces are an essential part of any Decision Support System (DSS) since they can contribute to a more efficient use of that system. Also, a user-friendly design can facilitate the acceptance and utilization of the software by its end users. This work presents the development process of the interfaces designed for a DSS that is being developed in order to help decision-making in a context of Sensory Analysis. That process began with the construction of mock-ups and, for that purpose, the tool chosen was Lumzy, a web-based wireframing tool for rapid user-interface prototyping.

KEYWORDS

Interface Design, Mock-ups, Sensory Analysis

1. INTRODUCTION

Sensory Analysis can be defined as "a scientific discipline used to evoke measure, analyse, and interpret reactions to those characteristics of products or materials as they are perceived by the senses of sight, smell, taste, touch and hearing" (Stone and Sidel 1993), (Dijksterhuis 1997).

Usually Tasting Panels are used to evaluate sensory characteristics of products' samples (Zeng et al. 2008), and are formed by professional tasters (Sensory Analysis type I) or undifferentiated potential consumers (Sensory Analysis type II) (O'Mahony 1988).

The DSS that is being developed is restricted to type I, and can be of interest to the food industry (namely, wine, olive oil, chocolate) where that type of panels is widely used.

Those panels and the inherent tasting process generates a large amount of data that needs to be stored and analysed in order to help decision makers: (i) determine the quality of the products and (ii) assess the performance of individual tasters. In this context a DSS in Sensory Analysis would be a crucial tool in order to improve the consistency and quality of the decision process of Tasting Panels.

Since the system is expected to have different types of users namely: tasters, technicians and decisor (Teixeira et al. 2014), adequate interfaces are essential in order to facilitate the acceptance and usage of the software by its end users (Preece et al. 2002) (Dix et al. 2004).

The work described in this paper is part of a more comprehensive project which main purpose is the specification, conceptualization, development and test of a prototype for a Decision Support System (DSS) to be used in Sensory Analysis.

In the next section a brief explanation of the interface design process for that Sensory Analysis DSS is presented.

2. INTERFACE DESIGN PROCESS

The first step in developing the system's interfaces was to design mock-ups. Creating mock-ups is thus considered an essential part of any project that aims at creating an interactive application.

Succinctly, a mock-up is a model or a replica of parts of the system, which can be a valuable tool to provide a context which users better understand by representing interfaces that are usable, thus helping to design an end solution more close to the real needs and expectations. For these reasons, it is useful to introduce mock-ups from the early beginning of the development process in order to interact with the different stakeholders and achieve rapid value and responsiveness.

There is a vast array of free online tools developed to create mock-ups (e.g. Wirefy, Cacoo, Lumzy, Frame Box, MockFlow) and most of them offer a free plan with some restrictions and a paid upgrade plan with premium features.

These tools include libraries with graphical elements, which enable managing and publishing information elements, as well as incorporating new graphical components (Arnowitz et al. 2006). A mock-up generated by such tools has the same advantages as a paper prototype, having a low cost, easiness of construction and use, and providing an interface that allows the user to perceive that is using a disposable prototype.

For this project the focus was only on online free tools and since some free plans are more restrictive than others, depending on the target project needs, those limitations might rule out a tool. The restrictions of unpaid versions can vary as limitations to the number of diagrams, maximum contributors or overall size of the mock-up. Most of the tools offer the same basic diagram creating functionalities, and the differences are in extra features like, for example, real time collaboration and chat, and interactivity.

After experimenting with some of the available online free tools the choice was made to use Lumzy by Crunch Frog (Lumzy 2013). Lumzy is a web-based wireframing tool for rapid user-interface prototyping, emphasizing collaboration and interactivity, as well as promoting the clarification and validation of the software requirements without the presence of stakeholders in the same geographical space. Lumzy is easy to use, adopting drag and drop design (like most tools), it has an extensive component library that can meet a wide array of project needs, and the mock-up can be easily changed between three visual skins (Sketch, Windows, Mac/Apple) to better represent the final application look.

Beyond the basic usability there are a few features that set Lumzy apart from the other free tools:

(i) the free plan doesn't restrict the features available to the user, instead there's a reminder message to help support the project that popups from time to time but the message is not disruptive and can be quickly dismissed;

(ii) it offers the possibility of creating interactive controls and diagrams, this includes interactive buttons, text areas, dropboxes and interactive navigation between slides which allows a basic simulation of the workflow of the final application that helps explaining the intended functionalities;

(iii) it allows users to place annotations anywhere in the diagrams suggesting changes or simple comments, which is very useful for iterating and improving a mock-up by making it easy to provide accurate feedback; and

(iv) it provides a control of the mock-up versions which enables a user to navigate to previous versions of the mock-up and revert changes if necessary, and thus allowing users to submit changes and try different approaches without any risk of losing the previous version.

Although some of these features are present in other tools, Lumzy offers all these features in an interesting free model and all these features are integrated in an easy to use environment that translates into high productivity, accurate feedback and fast iterations, making Lumzy a powerful mock-up tool and the choice for this project. Figure 1 shows a sample of the screens developed using Lumzy namely an example of the users' management interface.

After creating the mock-ups they were presented and discussed with potential users of the system in order to obtain the necessary feedback, required to improve the system. At this point a short user's manual was also developed so as to help people with more limited technological skills, interact with the interfaces, give suggestions and introduce comments. Extra functionalities, the easiness to navigate between screens, the way to insert information and to access it, were some of the features debated and improved upon.

This phase took place over one month, involving an iterative and incremental process of evaluation and redesign of the prototype. As the prototype was adapted, the analyst understood the main features and the key difficulties of the users thus collecting the necessary data for defining the conceptual model. Based on this

prototype, the analyst identified the functional requirements as well as improved non-functional requirements. For example, certain users had some difficulties specifically on the usage of the navigation system which helped to improve that process.

Figure 1. Lumzy mock-up

After completing the process of prototype validation, performed iteratively and incrementally with the help of the potential users, the analyst converted all the functional requirements identified in a formal representation using UML notation, more specifically use-case and class diagrams.

The next stage of the project, with regard to the interface design process, was the implementation of the application's user interfaces. They are materialized by a single-page web-application (SPA) developed with HTML (HyperText Markup Language), JavaScript and CSS (Cascading Style Sheets).

The application was written using AngularJS, following the MVC (Model-View-Controller) pattern where the controllers are written in JavaScript using the AngularJS framework and the views are written in HTML with extended AngularJS attributes. Additionally CSS was used with TwitterBootstrap to help define the layout and give the application a polished look.

AngularJS is an open-source web application framework used for developing SPAs. It is available under the MIT license and is maintained by Google. It has become considerably popular since its release in 2009 with over 4000 questions per month in StackOverflow.com and over 50000 followers on twitter. AngularJS follows the MVC pattern, it extends HTML with new attributes, provides easy two-way data binding and form validation among other features. It is a highly popular Javascript framework, being used and developed by Google with the help of a very large community. It is a solid choice with strong features and a focus in readability and high productivity.

Twitter Bootstrap is used to help define the layout and to easily style the HTML elements giving the SPA a refined appearance with minimal work. Twitter Bootstrap is widely used and is notably the top project on GitHub (December of 2014) with over 75000 stars.

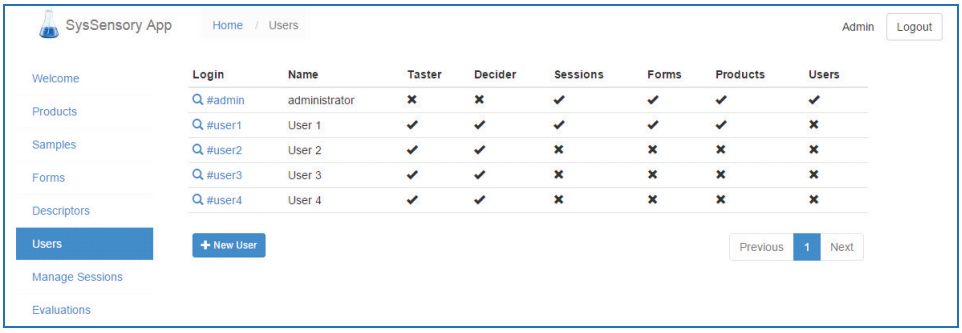

Figure 2. System interface

When implementing the views in the application, the mock-ups were used as reference. While the general layout and functionalities of each view in the mock-ups are mostly carried through to the final application, the emphasis is set on preserving the functionality/features of each view instead of copying the exact layout. This derives from inherent characteristics of the technologies used (HTML, Bootstrap, AngularJS) which

make it easier to implement some specific layouts that do not perfectly match the mock-up version but provide the same functionality. Some changes also came from a better understanding of the application workflow gained in the process of implementing and testing the views. This generates some tweaks to the layout and the addition of small features. Figure 2 shows a view from the applications as is, so far, more specifically the users' management interface that corresponds to the mock-up presented in figure 1.

At this point the prototype is in the testing phase and is being updated in accordance to feedback from the involved stakeholders, which has led to minor changes in the interfaces' design, as mentioned before.

3. CONCLUSIONS

This paper reports a case where mock-ups were adopted to elicit the requirements and validate the system's interfaces of a DSS for Sensory Analysis. Lumzy was the elected tool used to develop the referred mock-ups.

The way the design process was carried out, namely the use of mock-ups, helped to facilitate and expedite the conception of user-friendly interfaces as it allowed for an agile interaction with the different stakeholders.

The general layout and functionalities of the mock-ups were mostly maintained in the final application, however, as the implementation proceeds and the prototype is being tested, the feedback as well as a better understanding of the application workflow is still generating some adjustments to the layout and to the features of the system.

The use of mock-ups created with Lumzy encouraged feedback and continuous improvement, engaging the users in the developing process. This method also promoted the validation of the system's requirements previously elicited and identified.

ACKNOWLEDGEMENT

This work is funded by FEDER funds through COMPETE (Operational Programme Factors of Competitiveness) and by National Funds through FCT (Foundation for Science and Technology) in the context of the project FCOMP-01-0124-FEDER-041776.

REFERENCES

Arnowitz, J., M. Arent, and N. Berger. 2006. *Effective Prototyping for Software Makers*. Morgan Kaufmann Publishers Inc.

Dijksterhuis, G. 1997. *Multivariate Data Analysis in Sensory and Consumer Science*. Trumbull, Connecticut: Food & Nutrition Press Inc.

Dix, A., J. Finley, G. Abowd, and B. Russell. 2004. *Human Computer Interaction*. Harlow Pearson Education.

Lumzy tool© (2013) <http://www.lumzy.com/> (accessed September 2014)

O'Mahony, M. 1988. Sensory Difference and Preference Testing: The Use of Signal Detection Measures. Em Moskowitz, H. (Ed.), *Applied Sensory Analysis of Food, Vol. I*. Boca Raton, Florida: CRC Press.

Preece, J., Y. Rogers, and H. Sharp. 2002. *Interaction Design: Beyond Human-Computer Interaction*. New-York: JohnWiley & Sons.

Stone, H., and L. Sidel. 1993. *Sensory Evaluation Practices*. San Diego: Academic Press.

Teixeira, Leonor, Ana Luísa Ramos, Ana Raquel Xambre, and Helena Alvelos. 2014. Designing a Decision Support System for Tasting Panels. *Procedia Technology* Vol 16, pp. 440-446.

Zeng, X., D. Ruan, and L. Koehl. 2008. Intelligent sensory evaluation: Concepts, implementations, and applications. Mathematics and Computers in Simulation, Vol 77 (5–6), pp. 443-452.