Prototyping of a Browser-Based Social N-Screen Platform

[An Improvement of its User Experience]

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ABSTRACT

A second screen is a hand-device which is susceptible to provide added value to the TV content consumption. Notube, with their web browser-based second screen application, moved further through this concept, creating an assosiation between the second screen, Web and TV content. Nevertheless, the implemention still lacks completion in order achieve a full service and its users' satisfaction. This project shows the development of a social N-Screen prototype based on previous researches and implementations carried out by Notube. This platform is intended to be used by small groups to explore on-demand content. The main goal of the project is consisted on searching and implementing features to the platform in order to offer to the final user an improved user experience. This improvement is leaded by the features that allow a completion in the user interaction flow with the platform, such as the implementation of a registration and login, the provision of persistence to the user based content and the addition of new functionalities as personal lists and likes/dislikes tracking.

1. INTRODUCTION
1.1 Background

1.1.1 The Multi-Screen World

The human being has become throughout the last years into a multi-screener[1] nation. From the appearance of television in our living rooms, until the incorporation of lighter and portable new devices such as smartphones or tablets, users have been including all these devices in their routines until turning them into everyday objects. Consequently, tablets, smartphones, televisions and computers has become the main group of devices with which an average user consumes most of their media content[?].

Despite each archetype provides a particular motivation and practise to users, an important fact is that screen devices as

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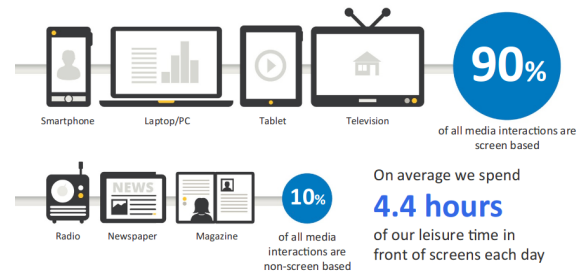[1] *Multi-screening*: use of more than one screen at a time.

Figure 1: Study of daily media interaction, obtained from [?]

mentioned before are no longer used in isolation but collaboratively. There are two different models referring to multi-screen: sequential and simultaneous. *Sequential usage* refers to moving through more than one device in order to achieve a task. *Simultaneous* concerns the usage of multiple devices at the same time for either related or unrelated activities. Both consumption forms are increasingly becoming the default mode and is surely influencing the way users engage.

Following this scenario comes the necessity to understand how users interact with these screen devices in combination[?]. The opportunity to decide which device to use, where and how makes possible to users to control their own interaction and flow content.
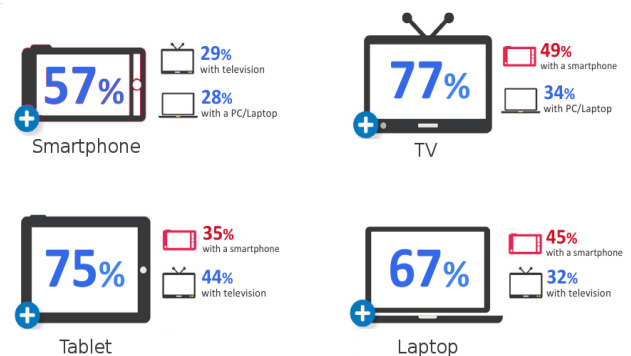

Figure 2: Study of companion devices during simultaneous usage, obtained from [?]

A Google study developed in 2012 [**?**] exposed how an average consumer makes use of companion devices - smartphone, TV, tablet and laptop - during simultaneous[2] usage - See Figure 2. There are three main multi-screen combinations:

- Smartphone + TV   - 81%

- Smartphone + Laptop/PC   - 66%

- Laptop/PC + TV   - 66%

Additionally, a research developed by Microsoft in 2013 [**?**] illustrated how is the user behaviour while multi-screening in simultaneous usage.

- 68% of consumers interact with multiple devices at the same time to access unrelated content; e.g. they may be texting a friend while watching TV.

- 57% of consumers make use of more than one device simultaneously in order to achieve a related activity.

From now on, we will focus our attention in simultaneous usage for *related* activities.

1.1.2 Second Screens

One of our everyday routines that has been altered by this new screen multitasking[3] behaviour is that moment while a user watches TV. Viewers no longer focus their entire attention to the TV screen but share it with portable devices.

Figure 3 illustrates how consumers make use of their tablets and smartphones while watching TV. We can observe how indeed users not only surf on the web, but they interact with the device with activities directly related to the program or advertisement that they are watching in that moment. This demonstrates the fact that consumers are not merely interacting with their hand devices as a simple distraction, but sometimes in order to improve their TV content consumption.

This new practice has led to the creation of the new concept *second screen*. Second screen is a hand-device which is susceptible to provide added value to the TV content consumption. These devices such as tablets or smartphones play a role as companion screens that 'connect' viewers to complementary interaction opportunities while they watch TV via applications, additional show-oriented content or in-synch functionalities [**?**].

This new activity has become such important that a survey developed by Nielsen Holdings N.V. [**?**] reported 'Using a tablet or smartphone while watching TV is more common than not'. Nearly half of tablet owners - 43%- and smartphone owners - 46% - declared that while watching TV they are making use of their devices as second screen every day.

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[2] Usage for either related or unrelated activities.

[3] *Human multitasking* is the apparent performance by an individual of handling more than one task at the same time.
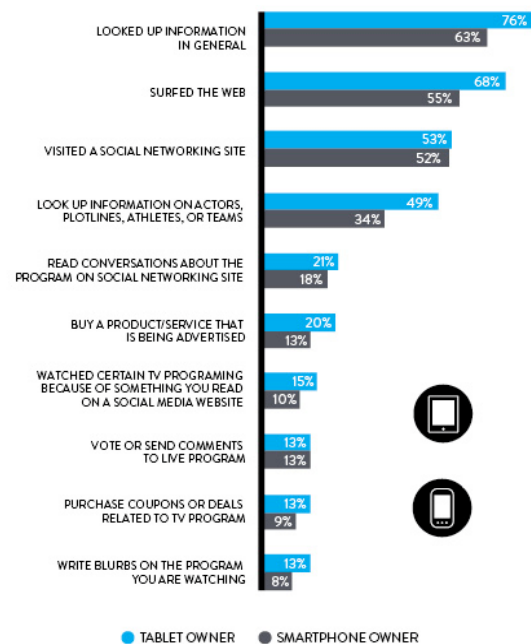

Figure 3: Tablet or smartphone activities while watching TV, obtained from [?]

As a consequence of this fact, there are emerging new apps[4] which take advantage offering second screen experiences that can improve even more this interactivity while watching TV.

Second screen apps [**?**] are intended to enable viewers to interact before, during and after the broadcast of a programme using a laptop, smartphone or tablet. The most competent apps, instead of distract, have the potential to increase the viewers' attention and enjoyment on the watching programme. According to [**?**], eight types are distinguished in order to categorize these apps based on their functionalities:

- Socializing

- Loyalty

- Recommendation

- Transaction

- Information

- Program guides

- Participation

- Creation

On that account, second screen apps arised as a manner to unlock new research and business models due to the wide range of potential possibilities that offer.

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[4] *App* is an abbreviation for application. An app is a piece of software. It can run on the Internet, on a computer, on a phone or other electronic device.

1.1.3   Use case

This project is developed based on an already existing platform developed by **Notube**[**?**]. Notube, is a project funded on 2009 that was specialized in second screens and Web merging. Their motivation was getting the Web and TV closer together via shared data models and content across multiple devices. They developed their own N-Screen[5] prototype, a Web browser-based second screen application[6] for small group exploration of on-demand content, both in the same room and remotely, with each individual having their own second screen device. It integrates different combinations of recommendation strategies and allows to decide within a closed group to watch a selected program sharing a 'virtual television', that in their case is the hand device itself.
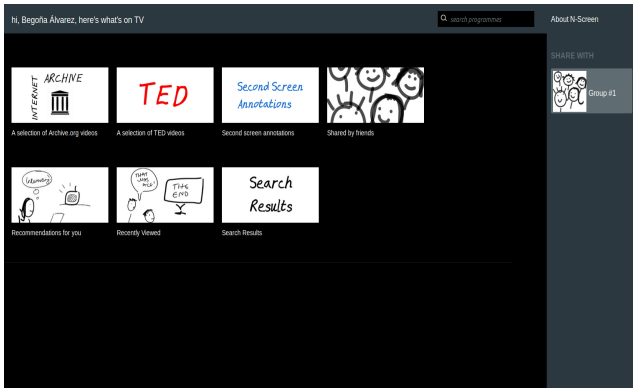

Figure 4: Notube N-Screen screenshot, source code obtained from the public repository *https://github.com/notube/n-screen*

It is developed following a *user-centric approach* in order to explore main aspects of users' content customisation demands, interaction requirements and entertainment preferences. Their main goal was to investigate if working together and collaborating to make a final decision might help people to guide them in order to find something interesting to watch.

1.2   Goals

The main goal of the project is to design and implement a browser-based[7] second screen platform[8], based on the N-Screen developed by Notube, which is categorized as a social recommendation system. The implementation must meet functionality, interactivity and favourable user experience requirements.

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[5]*N-Screen* because it might be the primary screen, or one of a bunch of equals.

[6]All the source files used to generate this application can be accessed at the public repository: *https://github.com/notube/n-screen*

[7]*Browser-based* refers to computer tools and applications which run on a web browser via the Internet without accessing the operating system of any individual computer. These applications are accessed through web pages and can be used by people who are prevented from downloading software applications by firewalls.

[8]A *platform* is a group of technologies that are used as a base upon which other applications, processes or technologies are developed.

Most of the second screen apps in the market are not successfully developed because are focused to enhance activities that do not fulfil the real consumer needs[**?**]. Consequently fail the audience engagement. This fact is crucial and it must be taken into account in order to make the platform valuable.

Furthermore, the project must accomplish certain requirements for a potential release to final users. It needs to be developed offering user based content, due to its recommendation feature. In addition, it is required to provide engaging content and interaction activities, as well as offering an intuitive appearance. Moreover, the platform must be easily adaptable, so it will not need to be entirely redone with every particular change. Hence, it is needed to reach a complete solution covering all these features, overcoming the gaps and deficiencies that other platforms show.

Here, the main goal is fragmented into more specific sub-goals:

- *Analysis of previous conclusions and results*. Study of already tested aspects. Definition of new tests to provide new data of interest. These data will help in making decisions about the implementation of interaction activities.

- *Requirements definition*. Study of needs and constraints.

- *Back-end design*. Global design of the server requirements and new involved software. Debugging and optimization.

- *Front-end design*. Global design of the client side requirements and new involved software. Debugging and optimization. Graphical User Interface improvement.

- *Platform development*. Full integration of both back and front end. Development of the final demo.

- *General purpose tests*. Tests oriented to prove the proper operation and verify the achievement of the requirements and constraints compliance.

- *Results analysis and conclusions*. Achievement evaluation. Study of weaknesses or possible improvements. Definition of further studies.

1.3   Project Organization

The organization of this project is described as follows:

- *Analysis of previous conclusions and results*.

  At this first stage, N-Screen-related information and specific knowledge was acquired. An approach to the development tools was also outlined. Goals:

  - Second screen state-of-the-art review. Review of the current commercial solutions.

  - Adaptation to the development of the platform as well as required tools (repository, client and server side programming languages research and learning, etc. . .).

- Analysis of related projects results, either completed or under development.

- *Software design.*

  This phase covered from the first software definitions and specifications, to the platform implementation until reaching a final demo. Goals:

  - Back-end design and implementation for required features.
  - Front-end design and implementation for required features.
  - Content dataset migration.
  - Back and front end integration. Source code debugging and improvement.

- *Tests and evaluation.*

  At last, the final demo was evaluated and the results were analyzed. Goals:

  - Fully integrated back-end and front-end test.
  - Interaction test.
  - Graphical user interface test.
  - User experience test.
  - Results interpretation and conclusions review. Statement of further studies and future development lines. Found problems evaluation.

- *Documentation generation.*

  Dissertation and other required documentation writing.

1.4   Outline

Typically, the body of a paper is organized into a hierarchical structure, with numbered or unnumbered headings for sections, subsections, sub-subsections, and even smaller sections. The command \section that precedes this paragraph is part of such a hierarchy.[9] LaTeX handles the numbering and placement of these headings for you, when you use the appropriate heading commands around the titles of the headings. If you want a sub-subsection or smaller part to be unnumbered in your output, simply append an asterisk to the command name. Examples of both numbered and unnumbered headings will appear throughout the balance of this sample document.

2.   N-SCREEN APPS: STATE-OF-ART

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the appropriate heading commands around the titles of the headings. If you want a sub-subsection or smaller part to be unnumbered in your output, simply append an asterisk to the command name. Examples of both numbered and unnumbered headings will appear throughout the balance of this sample document.

3.   REVIEW STUDY

A model for the platform is defined in this chapter. Initially, the first version of the N-Screen developed by Notube[?] is evaluated to obtain some guidelines and potential improvements facing our own. The final software implementation requirements and constraints are defined. Finally, a discussion and evaluation over different features is carried out, exposing different options and some final conclusions in order to face a potential deployment to final users.

3.1   Browser-Based Social N-Screen Platform Model

Essentially, the BBSNSP[11] scheme responds to second screen application based on a recommendation system. However, a further review shows some general differences:

- *Browser-based*: instead of being developed as a mobile or computer app, the BBSNS is a web app. A *web app* refers to software that runs on a web browser. This way, not only the app can be updated and maintained without disturbing potential users by requiring them to re-download. Additionally, it provides implicit support for cross-platform[12] compatibility.

- *Group decision recommendation system.* The recommendation feature is focused on 'how collaborating together might help people find something interesting to watch'[13]. It is designed to be used within a small group of friends in a collaboratively way to reach together a successful programme to watch.

- *Apart*[14] group:

- Back and front end integration. Source code debugging and improvement.

4.   DESIGN STUDY

With the hundreds of channels available via modern TV providers, content selection and dealing with the vast amount of TV-related information become significant challenges for users.

Typically, the body of a paper is organized into a hierarchical structure, with numbered or unnumbered headings for sections, subsections, sub-subsections, and even smaller sections. The command \section that precedes this paragraph

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[11]Browser-Based Social N-Screen Platform

[12]*Cross-platform* regards the capability of a software to run identically on different platforms.

[13]https://notube3.wordpress.com/2011/10/10/n-screen-a-second-screen-application-for-small-group-exploration-of-on-demand-content/

[14]different physical locations.

is part of such a hierarchy.[15] LaTeX handles the numbering and placement of these headings for you, when you use the appropriate heading commands around the titles of the headings. If you want a sub-subsection or smaller part to be unnumbered in your output, simply append an asterisk to the command name. Examples of both numbered and unnumbered headings will appear throughout the balance of this sample document.

5. IMPLEMENTATION STUDY

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6. EVALUATION AND RESULTS

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7. CONCLUSIONS

This paragraph will end the body of this sample document. Remember that you might still have Acknowledgments or Appendices; brief samples of these follow. There is still the Bibliography to deal with; and we will make a disclaimer about that here: with the exception of the reference to the LaTeX book, the citations in this paper are to articles which have nothing to do with the present subject and are used as examples only.

8. ACKNOWLEDGMENTS

This section is optional; it is a location for you to acknowledge grants, funding, editing assistance and what have you. In the present case, for example, the authors would like to

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thank Gerald Murray of ACM for his help in codifying this *Author's Guide* and the **.cls** and **.tex** files that it describes.

APPENDIX
A. HEADINGS IN APPENDICES

The rules about hierarchical headings discussed above for the body of the article are different in the appendices. In the **appendix** environment, the command **section** is used to indicate the start of each Appendix, with alphabetic order designation (i.e. the first is A, the second B, etc.) and a title (if you include one). So, if you need hierarchical structure *within* an Appendix, start with **subsection** as the highest level. Here is an outline of the body of this document in Appendix-appropriate form:

A.1 Introduction
A.2 The Body of the Paper
A.2.1 Type Changes and Special Characters
A.2.2 Math Equations

Inline (In-text) Equations

Display Equations

A.2.3 Citations
A.2.4 Tables
A.2.5 Figures
A.2.6 Theorem-like Constructs
A Caveat for the TeX Expert
A.3 Conclusions
A.4 Acknowledgments
A.5 Additional Authors

This section is inserted by LaTeX; you do not insert it. You just add the names and information in the `\additionalauthors` command at the start of the document.

A.6 References

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B. MORE HELP FOR THE HARDY

The acm_proc_article-sp document class file itself is chock-full of succinct and helpful comments. If you consider yourself a moderately experienced to expert user of LaTeX, you may find reading it useful but please remember not to change it.