

User's Issues in Crossmedia Applications

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ABSTRACT

Technology allows users to interact with a wide variety of information and services. However, more and more users need to integrate complementary content to previously accessed information. Crossmedia applications combine different information pieces, which are stored in different media, as a continuous story. Our study selects the particular case of combining printed material and internet resources for the purpose of delivering complementary information to users. Our investigation conducts a workshop with users composed of a scenario-driven interview and a talk-aloud protocol. This experiment reveals the behavior and difficulties of users when they are combining digital and non-digital media to gather complementary information. In addition, some recommendation is suggested focused on the improvement of the user's experience in crossmedia application that should be considered by designers.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces – evaluation/methodology, Interaction styles, User-centered design.

General Terms

Design, Experimentation, Human Factors.

Keywords

Crossmedia, digital medium, non-digital medium, scenario-driven interview, user's behavior, think-aloud protocol.

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1. INTRODUCTION

Nowadays, ubiquitous and pervasive computing is concerned with delivering digital content to users anytime and everywhere. In order to accomplish this goal, different computational resources – such as devices, connectivity, applications, and services – have been combined in different ways. Some efforts have produced frameworks [16] and platforms [10] with the purpose of designing and adapting applications to specific and distinct contexts to provide continuous access to digital resources. Also, users are demanding to obtain solutions better suited to their needs and capabilities. New mechanisms are required to make interaction among users available, and between users themselves and the environment without additional knowledge or, at least, taking advantage of previous knowledge.

Firstly, the ubiquitous environment is considered as a set of computational resources, named the physical world, that can augment in a seamless manner, with information and digital services, the digital world [19]. Hence, a proliferation of software and devices took place with the goal of assisting everyday life in becoming more and more digital [20]. However, users continue to interact with elements that are essentially physical, such as printed magazines, books, billboards, posters and printed newspapers.

Indeed, users can combine different interaction elements, digital and non-digital, lead by their context and capabilities to construct their own way interacting with information and services. Infra-structure is a very important issue when designing ubiquitous applications [13]. However, it is essential to provide a natural form to connect the different elements distributed in a ubiquitous environment, both digital and non-digital. It is necessary to provide natural interfaces in order to assist users in building their own space of communication [1].

In this paper we address some issues that users can face when using different media, particularly printed and digital media, in order to gather complementary information about a subject. The objective of this work is to observe and discuss user's behavior, needs and difficulties when combining digital and non-digital media for the purpose of getting informed about daily news. To achieve this purpose, an experiment, based on a scenario-driven interview and the talk-aloud protocol is proposed.

2. CONVERGENCE/DIVERGENCE AND CROSSMEDIA

As information and communication technologies became an essential element for performing most of the activities in modern life, people had to deal with different electronic devices and gadgets to access different services and data that were stored in specific format. Telecommunication companies were constantly under pressure to develop innovative services while faced with deploying new technologies to support those new services. In addition, Internet brought changes, such as the definition of protocols and standards, which made possible the interchange of data among different applications and platforms [17]. As a result, a platform designed to handle a specific data format or to run a particular function was empowered with capabilities to deal with new data formats and to run new functions. For instance, the mobile phone has completely metamorphosed its previous function - making and receiving phone calls - adding up new purposes such as notebook, radio, watch, calculator, as show in Figure 1.



Figure 1. New functionalities converging to the mobile phone

Another implicit consequence carried on by the technological convergence is the possibility of exchanging data between applications and navigating between distinct platforms. One example of this situation is web pages that mix different type of data, such as text and video, to provide richer information to the user. Another example is the possibility of navigating a web page that has a hyperlink to a radio transmission, which can be listened to over the Internet. The Marketing departments were the first to seriously consider this feature an opportunity to increase the audience of the marketing promotions and publicity [11]: a marketing campaign initially designed to the radio was supposed to also reach, beyond the traditional radio audience, users that listen to the radio over the mobile phone, Internet and cable-TV.

However, separated platforms, or media, can also coexist, taking advantage of the possibility of sharing and exchanging standardized data between themselves. In fact, despite the proliferation of new media, Bolter and Grusin [2] argue that new media do not replace existing media. Differently, distinct media can be accessed in a simultaneous and complementary way, increasing the exposure time to information and communication application. Considering that each medium has its own language, capabilities and restrictions, an application can migrate from one medium to another, in order to take advantage of the features of each one, characterizing what is called *crossmedia applications*. Considering the mobile phone example, this medium has the appealing feature of mobility, which supports access to an application while in movement, but also has some strong constraints, such as the difficulty to typewrite and the small screen. In a different context, the user would choose a more appropriate medium to access the application, such as the PC - even though this medium has its own restrictions.

In this way, crossmedia applications are closely connected to the concept of technological divergence [8]. The media synergy makes possible, even in a distributed environment, the cooperation between different entities in order to provide to the user a helpful result. In opposition to the convergence phenomenon, the idea of divergence states the distribution of an application for different platforms, as shown in Figure 2.

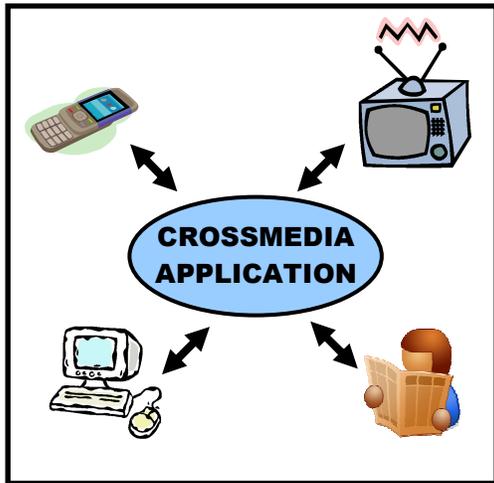


Figure 2. Crossmedia application and the technological divergence context

Essentially, the term crossmedia is used to describe the communication of an overall story, production, or event, using a coordinated combination of platforms [4, 14]. The degree of coordination and intersection between the platforms may greatly vary, but the audience is supposed to experience a sense that each product is a part of a wider mediated universe that is largely constructed in the minds of the audience through the process of grouping the heterogeneous media.

Frequently, the sense of homogeneity and seamlessness in the ubiquitous environment is not achieved as expected, mainly because of media limitations. For example, when a person is listening to music on the radio and wants to get more information about the song and the band, the medium *radio* imposes the restriction of delivering only sound and, in most cases, does not support a more complex interaction. In order to get more information about the song, it is necessary to use another medium, such as the mobile phone or the Internet. When designing crossmedia applications, the primary rule is to consider, from the beginning of the application process development, the arrangement of different media, which means defining the option that will be offered to the user, if it will have rules that must be obeyed when browsing the application, for instance *after using medium A the user must go to medium B*. Moreover, if one of the most important aims of a crossmedia application is to offer a holistic and uninterrupted user experience, it must provide its audience with resources that eliminate or deal with the limitations that belong to a certain media and platforms by nature. Such a desire may be reached by guiding users to an upper alternative, i.e., a step forward that can expand the interaction capabilities

providing them with features that could not be delivered by other modest media options [4]. In the example of the user listening to the radio, in a crossmedia perspective, the announcer could address the user's needs to another media that will handle them.

Merging digital and non-digital media, crossmedia applications open the possibility to explore how human activity takes place in these kinds of mixed reality environments. In addition, users are allowed to access content and services through linked information in a non-sequential way, as well as they can be forced to obey some constraints, such as business rules, in a sequential way [12]. In spite of the fact that crossmedia works are constructed by the user, as they assemble the distributed pieces or information and services across media, applications designers can mitigate the effort users employ to go from one medium to another.

In sum, *crossmedia* applications are not only a matter of having the same content delivered over parallel channels, which can be both digital and non-digital – such as printed materials. Designers have to worry about how to make the movement from one medium to another the less traumatic possible, or *call to action*. The *call to action* moment, when the user is guided from one media to another [5], can be decomposed into three phases: 1) Primer: prepare and motivate the audience to act; 2) Referral: provide the means and instructions on how and when to act; 3) Reward: acknowledge and reward action. So, designers must be mindful of developing context-aware applications and supplying users with seamlessness [13].

3. METHODOLOGY

We were faced with some challenges when selecting and defining the evaluation protocol for the use of printed and digital media in a crossmedia scenario. The first was that, even though several crossmedia initiatives can be found inside magazines, newspapers, web pages and billboards, we were not sure that users faced these separated elements as complementary parts of the same service or if users faced these elements as completely isolated components.

Also, when users have to interact with two or more different interfaces, some problems may occur [15]: (i) time and effort involved in transition does not advance the task; (ii) moving work from tool to tool dissipates focus; and, (iii) information is difficult to transfer when the focus changes.

Therefore, the evaluation protocol chosen should motivate users to expose their difficulties and thoughts, as well as to try to keep users focused on the task they were performing.

Study Design and Analysis

Traditional methods for observing user's behavior, and even requirements gathering, can be insufficient to the

design and implementation of user interfaces for novel domains. Users are unlikely to have performed the proposed task before, or the new interface provides users with access to an information space that they are unfamiliar with. In both cases, users have a hard time wondering how they might want to use or interact with such an interface [9].

As our literature review has not identified a previous study analyzing the combination of digital and non-digital media in crossmedia applications, we propose workshops that are composed of the following parts:

- Scenario-driven interview [18];
- Think-aloud protocol [7].

Workshops can fill the missing knowledge of both user and designer providing a more focused view of the phenomenon that is being studied. User and designer may involve mutual enquiry in which they attempt to understand the application context from each other's point of view [6]. The designer asks the user about the environment and the way tasks are usually done, while the user can ask the designer about technology and features that may be available.

First of all, participants were informed: (i) about the scope of the study; (ii) that the focus of the study was the to evaluate the mechanisms of indicating the linkage of a physical medium to a digital medium, and not the participant's abilities to perform this task; (iii) that all their personal information should be kept confidential and protected; and (iv) that the results of the study should be used for academic researches.

Scenario-driven interview was chosen for the first part of the workshop because of the fact that scenarios can concretely describe, even in early phases of the development process, the use of a future system [3]. In this work, a text with a scenario description was presented to participants to help them to envision an episode where they could use non-digital and digital media in order to gather more information about a subject. As Figure 3 shows, the scenario used in this work focuses on the application of functional and timing behaviors, and on its interaction with the users and the environment, and not on the resources required by the crossmedia initiative.

In your way to your job, you get a free daily newspaper that is usually distributed in the subway stations. Inside the train, reading the daily news, you learn that Japanese scientists have discovered a new drug that killed cancer cells healing patients with cancer. It also indicates that the Japanese scientists have talked to journalists and have shown a video that shows the new drugs destroying cancer cells. This subject really interested you.

Figure 3. Textual scenario used in the first part of the workshop

The textual scenario was employed to explore a specific circumstance of complementary information need – looking for information about the cure of cancer. The scope of this circumstance was expanded more and more, following the order of the questions, until reaching the use of crossmedia initiatives in the participant's routine. Questions were not closed, which means that depending on the participant's answer, the design should reformulate – or not formulate – the next question, for example. For each participant the following basic set of questions was asked:

- *Is the situation presented in the textual scenario feasible for you?*
- *Do you search for more information when you read or listen about a subject that is interesting to you?*
- *How would you search for complementary information in the proposed scenario?*
- *What are the reasons that could discourage you to look for complementary information?*
- *Can you remember some situations in which you read or heard information over one medium that conducted you to another medium?*

Next, in order to observe the participant's behavior while using different media to find complementary information, the Think-aloud observation protocol was conducted. This protocol encourages participants to verbalize their thoughts, feelings, expectations and decisions while interacting with the application. This can enable evaluators to understand the reasons behind users' actions, as well as to explain misconceptions users might have about the system.

We selected the text extracts of two different free daily newspapers of great circulation and widely known that often supply their audience with a crossmedia mechanism of transaction from the printed news to their website content. Rather than elaborating fictitious text extracts, we have decided to present real newspaper texts that could be easily recognized by participants as elements that already exist in the daily press. In addition, a real newspaper text extract should be closer to the scenario introduced in the scenario-driven interview.

Participants were asked to consider a specific page of each newspaper, focusing on the end of the text, where normally the crossmedia transaction is proposed. Each newspaper, *newspaper A* and *newspaper B*, had a standardized way of suggesting this crossmedia transaction, as Figure 4 and Figure 5 show. *Newspaper A* was presented first, and, when participants had found the complementary information for the text in the website indicated by *Newspaper A*, they were then asked to perform the same task considering the text of *Newspaper B*.



Figure 4. Signalization of crossmedia transaction in newspaper A



Figure 5. Signalization of crossmedia transaction in newspaper B

Participants were guided to take an overview of each article and then they would carry on looking for complementary information following the crossmedia transition suggestion provided by each article.

While performing the tasks, the participant's audio was being recorded, the observer also took sporadic notes about the participant's behavior, difficulties and the way tasks were being executed.

Overview of the Participants

Eight volunteers, 5 were female and 3 male, participated in the experiment. Participants, aged 18-30, were university graduate students of various subjects, such as Informatics, Business, Linguistics, Engineering, Journalism, and Pedagogy. Participants were chosen from average to advanced range of experience with electronic devices and modern gadgets, such as MP3 player. All of them browse the Internet at least once a day, as well as intensively use the mobile phone to make calls, to send SMS messages, and to read/send e-mail. Also, all of the participants access a web portal to get the most important headlines of the day.

They also confirm that they frequently listen to the radio and watch video over the internet.

In all, the participants chosen were representative of the diverse individuals eligible to use ubiquitous applications and, specially, crossmedia applications.

4. FINDINGS

Through the scenario-driven interview, the think-aloud protocol and subsequent analysis, several themes have emerged in the use of different media – particularly digital and no-digital media – in the process of acquiring complementary information. This section presents the findings of the experimental study conducted as workshops. Each workshop lasted approximately 40 minutes.

Scenario-driven interview

All participants agreed that when a subject really captures their attention, they try to find more information about it. Reinforcing this feeling of determination, P7 comments that commonly “*don't give up when wanting to know more about something and invariably go looking for further information*”.

About the way they currently look for more information, most of the participants reported that when they are strongly interested in a newspaper article, they usually go to their preferred website portal to look for complementary information, such as Yahoo, CNN, BBC and UOL. P1 justifies this by saying that “*it is almost automatic, because I visit my favorite web portal several times a day. I feel more comfortable and I do have confidence in the information that my favorite portal publishes*”. The point “confidence” was mentioned by other participants, such as P5 that “*don't use public-made information web sites, such as Youtube, because their content is not trustworthy. Anyone can upload and spread up what they want*”. The use of search engines, such as Google, is also remarked. P4 said that if the subject is not covered by his favorite portal, he would go to the Google web site and look for additional information.

When asked what they would do if the newspaper suggested a link to its website with more information about the subject they are interested in, 7 participants reacted affirming that they would enjoy this cue. Likewise, P2 would firstly visit her preferred web portal, and, in the case of not finding what she wants, she would visit the newspaper web site.

About other crossmedia initiatives currently found – such as television broadcasts, marketing campaigns, and government campaigns - participants could identify several situations when they were conducted from one medium to another, and, in fact they did not even recognize these as crossmedia initiatives. P2 stated to be particularly responsive to marketing campaigns spread up in the

subway and inside magazines. P1 used to listen to the radio when going to work, and was usually conducted to the web site of the radio station to listen again to an interview or article, or to access the interview full version.

The act of looking for complementary information is not always immediate, e.g., it does not happen instantly after having contact with the subject that originated the interest in the specific subject. In order to save the coordinates to access the second media, P7 said “*as I don’t keep the newspaper with myself, I take some pictures with my mobile phone, or when the picture is blurred, I write down the information I need*”. In addition, P8 usually writes down “*the web site address that I have to visit on the back side of my hands*”. Other participants try to memorize crossmedia transaction information, but commonly they later forget to visit the second medium.

Some issues can negatively interfere when users want to make the crossmedia transaction. The context in which the users are is one mentioned by participants. P8 observed that, in the proposed scenario, “*it is too complicated to pay attention to the way and the train connections that I have to take, while trying to use my mobile phone to access more information over the Internet. Moreover, trains are so crowded!*”. For P3, the mass of people moving around inside subway stations disturbs him; that is why “*it is better to seek for more information at home or at my office*”. Participants also mentioned lack of time, frequent hurry, and high costs to browse the Internet over the mobile phone as reasons that discourage them to go through crossmedia recommendations.

Additionally, P1 observed that it is not comfortable to browse the mobile phone due to the difficulty of typing and her vision impairment, which prevents her from reading text on small-size screens.

Think-aloud protocol

The article title of *Newspaper A* was “*Job crisis in the US*”, but at the end of the article, a box suggested looking for another article, entitled “*Soon, the end of the migratory flow*”. Then, participants used the web navigator to reach the address suggested by the newspaper article. The address redirected participants to the main page of *Newspaper A* web site, which contained a list of headlines and a menu with article categories. All of the participants got confused, because the indication of the crossmedia transaction of *Newspaper A* seemed to be incomplete or broken. Most of the participants, in the web site of *Newspaper A*, continued to seek for the first article, thinking that the complementary information, the second article, was included at the end of the digital version of the first article, or, at least, they could find a link to the second article.

After taking a look at the main page, P7 speculated that it should be a matter of the edition of the newspaper, i.e., the

second article was on the main page of the web site during the day; the issue with the crossmedia suggestion to the complementary information was the current edition. The solution found for some participants was using the advanced search engine provided by *Newspaper A* website. Other participants preferred to use the article categories menu, and then tried to find the article by date. And other participants complained about being conducted to the main page of *Newspaper A* web site and preferred to look for the article using other services, such as Google News or other rapid information services, as Twitter.

Indeed, in reason of business model, we understand that this practice could induce users to browse the *Newspaper A* web site, increasing the user navigation and user exposure to banners, and promoting the reading of other articles and information categories. But, in fact, the task of using the crossmedia suggestion of *Newspaper A* was frustrating for most of participants. Some of them spent between 4 and 5 minutes to find the correct article. That really discouraged them. Irritated, P2 confessed that “*I would not waste so much time browsing Newspaper A website without finding what I want*”. P1 noted that in a real situation, it would be easier to find the same information in another web site, while P2 argues that “*this experience can dissuade me from visiting Newspaper A again when looking for complementary information*”. Also, P8 lost the focus when he found an article about Brazil, while rolling up and down the main page of *Newspaper A* website looking for the article suggested for the printed medium.

On the other hand, the reaction of the participants to the box with crossmedia transaction suggestion at the end of the article in *Newspaper B* was more stimulating. The article was an interview with specialists, and the crossmedia transaction suggested accessing the full version of the interview. At a glance, participants were informed about the type of information they were being redirected to. All participants, in their first attempt, reached the desired complementary information. P4 remarked that “*even though Newspaper B has a more complex link, it is worthwhile, because I don’t waste time looking for the right article*”. Other participants deemed *Newspaper B* crossmedia recommendation more clear and straightforward, direct, and easy to understand. P2, for example, considered the URL more readable, in reason of the fact that the URL referred to the main subject of the article. In the P2’s opinion, *Newspaper B* had found a very objective way of informing the user in advance what he/she would find and how easy/difficult this media transition should be.

Most of the participants recognized that the icon that appears inside the box as a reference to hypertext. Other types of content identification, such as icons for video, audio and images should be easily identified by users, which, according to some participants, could work as a

filtering mechanism for accepting or not a suggested crossmedia transaction.

As *Newspaper B* provided a link directly to the complementary content, contrarily to *Newspaper A* that conducted the user to its main web page, participants did not have problems accessing out-of-date information when they were conducted from the *Newspaper B* printed article to the *Newspaper B* web site. Providing a link that is fully and clearly expressed as attached to the content, *Newspaper B* also handled the problem of controlling different version of the content that can be addressed by a link. *Newspaper B* customized its links with words clearly connected to the destination content.

5. DISCUSSION

Users seem to be interested in integrating information about subjects they are interested in. If they fail to find a recommendation they will look for a standard portal they trust in. Also, reinforcing well-known usability studies, if users do not find what they want, they will not take a long time to visit another information source.

Some crossmedia initiatives, such as the one proposed by *Newspaper A*, did not convince the audience, which preferred to look for complementary information in other alternatives, rather than in the suggested medium.

Our study findings confirms experimentally Dena's assumptions [5] and justify some recommendations that should be considered by designers that develop crossmedia applications:

- Offer rich, direct and clear signalization to crossmedia transaction;
- Decrease the user's cognitive load in the moment of changing from one medium to another one providing the more natural, easier, seamless and automatic interaction technologies;
- Indicate the type of information the user will be conducted to;
- Consider the context constraints and the environment where the user is when accessing a crossmedia application;
- Consider media constraints and the special features of each medium;
- Consider user's constraints;
- Make the mechanism of passing through a medium to another easier, ensuring seamless transaction;
- As crossmedia interactions can be expanded along the time, designers must offer a mechanism for providing to the user the correct version that he/she should access relating to the previous component accessed.

Controlling the application component versions ensure that the user will access the appropriate component B, in the further medium, corresponding to the right sequence for the previously accessed component A, even though component B has a newer version available.

Rather than focusing on technological aspects, these recommendations improves the user's acceptance of crossmedia applications and seems to lead to the augmentation of the user's experience on this kind of applications. We have found that simple measures, such as including an icon, which demonstrates the type of information or service that the user will be redirected to, can produce great effects. The conformance to the suggestions of this work should also augment the return of investments of Marketing campaigns and advertisement initiatives that propose to user accessing information and services in a seamlessly ubiquitous environment.

6. CONCLUSION

Crossmedia applications will be components more and more usual in our everyday life. Digital and non-digital media will be combined as a way of offering and integrating complementary information and services for ordinary individuals.

Experiment results have shown clearly that crossmedia interaction must be designed to provide synergy between the several ways users have to corroborate or complement information. Results from the qualitative research also indicate that, because looking for complementary information is not always immediate, better interaction bridges must be designed, in order to provide either immediate or longitudinal connections between several media.

In addition, this study discusses some difficulties that participants of the experiment faced, as well as the good impact experienced by participants as a consequence of a well-designed crossmedia transaction suggestion. Finally, we present a set of recommendations that should be considered by designers when developing crossmedia applications.

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