

Innovative TV: From an Old Standard to a New Concept of Interactive TV – An Italian Job

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Abstract. The current market of television services adopts several broadcast technologies (e.g. IPTV, DVBH, DTT), delivering different ranges of contents. These services may be extremely heterogeneous, but they're all affected by the continuous increase in quantity of contents and this trend is becoming more and more complicated to manage. Hence, future television services must respond to an emerging question: in what way could the navigation among this increasing volume of multimedia contents be facilitated? To answer this question, a research study was conducted, resulting in a set of guidelines for Interactive TV development. At first, the current scenario was portrayed through a functional analysis of existing TV systems and a survey of actual and potential users. Subsequently, interaction models which could possibly be applied to Interactive TV (e.g.: peer-to-peer programs) were assessed. Guidelines were eventually defined as a synthesis of current best practices and new interactive features.

Keywords: Interactive TV, IPTV, enhanced TV, media consumers, peer-to-peer; focus group; heuristic evaluation.

1 Introduction

The current market of television services offers several broadcast technologies (e.g. IPTV, DVBH, DTT), delivering different ranges of contents. The direct effect of the introduction of these technologies is the increase of available information in combination with the possibility for future developments and additional content amplification. Previously unrelated communication principles are today merging and giving life to two main types of television interaction namely *information search* (web-like) and *media fruition* (TV-like). The traditional television is moving towards interactivity, although there is a long way to go. To start the journey of designing a new Interactive TV of the future, it's vital to answer the following questions:

- How should the future Interactive TV allow the user to relax and at the same time to interact?

- Is there a communication model to connect the interaction experience (continuous dialogue between user and technology) and the fruition experience (start and stop in user control)?
- In which way may the user be helped in navigating and selecting among the increasing quantity of available information?
- How can the quantity and diversification of contents be combined with good accessibility and usability?
- Who are the potential users of the “new” TV?

As an evolution of previous studies principally focused on technical aspects [1], this paper presents a methodology conceived for the design of a future *Innovative Interactive Television Service* to be offered on the Italian market. As a *first step*, a brief theoretical review was conducted on previous works attempting to define the basic features of “Interactive TV”. The *second step* focused on TV, videogames (VG) and peer-to-peer (P2P) consumption in Italy, in order to draw and compare prototypical users’ profiles for each of these media. It is here hypothesized that the lack of interactivity may be a relevant reason why traditional TV is unsatisfactory to several users; especially to users of Videogames and P2P. The *third step* was to analyze four of the most significant digital TV services currently available on the Italian market, in order to detect *de facto* standards and best practices for design of Interactive TV systems and in general to outline the “as-is” in Italy concerning Interactive TV. To do that, some specific grids to describe functionalities, main usability aspects and offered services were “built” and used. The *fourth step* took into consideration the growing field of P2P applications, which was investigated in order to define the main characteristics of these systems (communication protocol, file sharing, server access, archiving method and so on) and the typical habits of their users. Two sessions of focus groups were conducted, aiming to isolate the interactive aspects of P2P experts’ behaviour and their expectations. Some examples of realistic behaviours were also analysed during the focus groups. Then a heuristic analysis was carried out on the most popular P2P programmes to highlight the main features and their positive and negative aspects from the usability point of view. The aim was to apply the best practices and to avoid the worst ones in designing the future TV system. Following on the results of the four steps, basic guidelines for designing an innovative TV system could be outlined and a new navigation metaphor could be “created”.

2 Interactive TV: User Needs and Technologies in Literature

There are several available definitions of interactive television (iTV) in literature. According to a work by Jensen and Toscan [2] the interactive television may be seen as a “two-way TV”, in which the user produces inputs that will have a remarkable effect on the content which turns the “viewer” into a “user”. According to this definition, what today is sometimes referred to as “interactive television” doesn’t actually show all the features of “interactivity”. As suggested by [3], it would be more appropriate to use the term “enhanced television” (eTV) for the range of television offer that we know today, such as satellite TV, digital TV and cable TV. The

information flow in today's eTV is still linear and unidirectional, from the broadcaster to the receiver but it offers a less passive use compared to the traditional television.

Van Dijk et al. [3] suggest four factors defining the level of interactivity, namely: *multi-lateralness* (bilateral information flow); *synchronicity* (real time outputs); *control* (opportunity to intervene and decide on the contents) and *understanding* (understanding of the completed actions). Livaditi [4] suggests a dissimilarity between the television users' *Needs* and *Patterns of use*. In particular, she makes a distinction between *Rational Need* with informative or economic reasons (e.g. shopping, use of programme guides) and *Emotional Needs* driven by entertainment and communication reasons (e.g. videogames, interactive shows). The use models are divided into active and passive; in the active models, the interaction is driven by active user decisions (e.g. use of bank services) whilst the passive models require a guidance for the interaction (e.g. video on demand, personalized news).

In another work by Van Dijk et al. [5] there are some interesting data regarding the level of interactivity of a set-top-box that may be defined as *enhanced TV*. Although the study was performed only on the Dutch market, many of the results and the theoretic models may be used also in other countries. The study examined the need for interactivity expressed by TV-users. Most of the users consider that the offered interactivity level is still too low in comparison with their expectations although the majority is satisfied by the user experience. The authors comment that the interactivity in television services is mainly based on actions such as reaction and selection and the concluding proposal is to give more chances for the users to intervene during the programmes.

In a study on interactive television by Bernoff and Herigstad [6] the users were asked what kind of additional features they would like to see in their everyday TV-systems. It was seen that the most commonly mentioned features can be found in Personal Video Recorders (PVRs). Several other features requested by the users could be connected to the functions of an on-demand system.

3 Interactive TV: What the Market Offers

Several technologies and services developed so far has aimed at or has proclaimed itself as iTV systems: in the following, a prospect of the known interactive (TV) systems.

Hybrid TV is defined as a detached technology that is being used together with the TV set in order to enhance its normal function and increase the interactivity. User participation in shows, live surveys and pay-per-view programs are some examples. The interaction technologies are commonly cell phone texts, telephone calls, web-vote or e-mail messages. Presumably, most of these Hybrid functions will soon be embraced by interactive function integrated into the TV-service.

Internet TV could be described as audio-video streaming on the Internet. It can be used from a broadband PC and the service isn't guaranteed: in fact all data are carried on IP network in a "best effort" way. Since Internet TV cannot be used through a TV-set but only through PC it will not be taken into account specifically in our research.

IPTV, on the other hand, supplies regular programmes, both live or "on-demand", that can be seen on a TV-set. Hence, IPTV is an out-and-out service to transmit TV

on IP-infrastructure. The infrastructure is managed by the telco operator that guarantees the service quality and provides the customer with the set top box.

In general, the interactivity level of these systems is quite low and similar to the generic TV, even if the usage and the technology approach are very different. According to a recent study by “Screen Digest” (www.screendigest.com) the use of IPTV is foreseen to reach nine million users in Europe by 2009. This means almost 10% of the entire market (including cable TV and satellite TV). The study also predicts that the TV operators that don’t want to loose market shares will have to adapt and offer own internet platforms.

Mobile TV, finally, is defined as the use of television programmes on portable devices originally designed for other purposes (e.g. PDAs or cell phones). The present spread of these systems is limited, but according to a research completed by Global Information [7] by 2007 there will be at least 270 million subscribers to mobile TV services in the world. The diffusion of Mobile TV implies some important problems for the development of interactive television applications. Primarily, the use in mobility commonly implies a double task situation where the most common example is driving whilst using a cell phone but the “hands-free” solution would not be applicable to this scenario. Additionally, two different functional areas have to coexist in the interface, namely the navigation of the menu system (of a cell phone or PDA) and the visualization of moving images on a very limited screen. Seeing the increasing quantity of available information, the mobile systems have to be developed with the aim to help the user in managing the complexity of the information.

We are hence witnessing a simultaneous development of several different interaction technologies. The challenge for the future TV is to give those interaction technologies the chance to coexist and to include all possible devices in the design of the TV-experience. The well-known media convergence should therefore go along with the convergence of the interaction devices.

Most of the presented television services have the same limitations as the traditional TV (linear channel contents as opposed to on-demand non-linear content; different EPGs for different channels, generic remote controls not allowing free interaction with the TV etc.) although the quantity of offered contents has increased. Today we therefore prefer to talk about *enhanced TV* and not *Interactive TV*.

A qualitative change in the interaction between user and system is necessary for the future TV: this will involve an interface redesign and a completely new paradigm to access, to navigate and to explore contents. First and foremost, this transformation will need a completely new navigation paradigm. It would be clearly unfeasible to adapt the current interface style to an Interactive TV since it was designed for a limited range of information and without interactivity. Moreover, the average television user has low acquaintance with computer-like devices and it would therefore be unwise to use web navigation models for the new Interactive TV.

The development of new television technologies has interested several researchers to study and to prototype alternative ways of interaction with the medium exploiting these new opportunities. Most of the studies are focused on the user interface and the improvement of the traditional EPGs that don’t appear suitable for large numbers of contents. Video Scout [8] for example, shows contents in a graphical way, as raindrops that fall down the screen depending on their scheduling hour; Time Pillars [9] introduces the concept of 3D environment where TV channels are symbolized by

pillars and the contents are placed on their surface. Other studies try to introduce very innovative form of interaction. Zimmerman et al. [10] propose touch screen devices in which users can act directly on the medium with their hands; Diederiks [11] underlines the importance of introducing animated characters in the television interface because they can help user in the interaction with the medium (giving him or her information and suggestions). The characters can be controlled both by the traditional remote control or by vocal commands (e.g. Bello). Joly [12] introduces “Toupee”, a prototype of an interactive application developed for children, where a virtual pet helps in navigating and interacting with games and applications. The suitability of animated characters for iTV applications is confirmed also in Chorianoopoulos [13] that analyzes MTvBoX, an interactive application where an animated character presents video-clip information. In [14] usability evaluations sustain the theory that animated characters in Interactive TV interfaces could enhance the user entertainment.

These studies refer in particular to the problem of choosing among a large number of contents; in fact they present innovative interfaces (possibly linked to recommendation systems) and they don't examine all the aspects related to the Interactive TV. Anyway they contain interesting innovative ideas and their study represents an important step in order to design a new Interactive TV.

4 Consumer Analysis

To have a general picture of the context in which new Interactive TV systems find its place, a consumer analysis on the Italian television users was carried out. Particular attention was paid to analyse the characteristics of the consumer and especially the needs or requirements of the so-called “unsatisfied consumers”. As a large share of “unsatisfied” TV-users was found, further consumer analyses were conducted on other domestic entertainment. In particular videogames (VG) and peer-to-peer systems (P2P) were analyzed to understand if some of the unsatisfied users are going towards other more interactive systems. At the end of the analysis some astonishing similarities between the unsatisfied TV-users and the latter two groups could be outlined, suggesting that traditional Italian TV lacks of interactive features which may be of interest for VG-and P2P-users.

Firstly, television users were analyzed. A Censis¹ survey [15] completed in 2005 shows that 95.4% of the Italian population regularly watches television, which is an increase of 1% since the 2001 survey. In spite of TV is the most used media in Italy, a survey by Livolsi [16] exposes great differences between user groups. In particular two main groups were identified, namely the *quantity-consumers* (poorly selective consumers) representing 60% of the Italian population and the *quality-consumers* (highly selective consumers) corresponding to 35%. The *quantity-consumers* are generally women, elderly with a low educational background and limited economic means. These consumers commonly follow their deep-rooted habits when selecting TV-programs and are poorly selective which may be seen by the low zapping frequency. These users watch a lot of TV (up to three hours per day) but they are

¹ Censis is an important socio-economical research institute in Italy.

found to be scarcely selective and critic to what they watch. The *quality-consumer* group, on the other hand, is mainly composed of persons between 20 and 45 years old, mainly men, with higher education (high school or university) and with greater economic means than the average *quantity-consumer*. In general, this group is highly selective and critic to what is broadcasted and a decrease in the TV consumption has been seen in the group during recent years. A high percentage of the *quality-consumers* are found to search for news and entertainment from alternative sources.

The features of the videogame² (VG) users turned out to be of particular interest since this group has some astonishing similarities with the group of quality-consumers of TV. According to the annual report of the Italian Videogame Industry [17] 43% of the Italians over 4 years of age regularly use videogames. Apart from the big group of underage users, the majority of the VG-users have a high educational level. Above 60% are men and most users are between 18 and 44 years old. Hence, a significant part of the VG-users may presumably be found in the group of quality-consumers of television. This would show that an important part of the Italian population is poorly satisfied with what the traditional TV has to offer. This group is used to interact with more complex systems like videogames and might be more attracted by an Interactive TV than by the traditional TV-services.

In the end, also users of P2P systems were analysed: the phenomenon of file sharing via Internet, also referred as P2P, doesn't seem to decrease. There are few data on the Italian market and a comparison with the TV and videogame consumption is hence unfeasible. Anyhow, according to the 2005 a Cachelogic survey [18], P2P represented 60 % of the world Internet traffic. Italy is the eighth country in the world in using P2P systems. The same survey shows that an average of eight million Europeans are logged on to a P2P network in any given moment sharing 10 Petabytes (1015 bytes). Over 60% of these files are video. The P2P systems may consequently been seen as a concurrent to the television services when it comes to audio-video files. It is presumable to think that part of the quality-consumers of TV may be found in the P2P users. It is possible that unsatisfied people by the TV broadcast coincide with users who are looking for alternative ways to get audio-video material in a more critical and interactive way, like P2P users do.

5 Current eTV-Services: Comparative Analysis

Four enhanced TV services (Alice Home TV, Fastweb TV, DTT, Sky) currently available on the Italian market were analyzed in order to detect *de facto* standards [19] best and worst practices in the design of TV systems. It was carried out a comparative analysis of the four systems from the main usability aspects, functionalities and services point of view. Particular attention was paid to *de facto* standards, which are the most consolidated and widely accepted design features in a given domain. As *de facto* standards are closely related to users' expectations, they can be considered as "cornerstones" in designing new systems' interfaces.

² The data on videogame use was collected through interviews conducted between 18th-26th of May 2006. The sample was 2240 people, representative of the Italian population over 4 years of age (about 53.5 million people).

By means of specific grids for analysing and picking up data of the different interfaces, different design solutions were highlighted to access and navigate the system and all offered services: the solutions were classified into three main levels of standardization as below:

- *Established design solutions or standard de facto*: have to be taken into account in future design.
- *Partially established design solutions*: basic traits of the specific solution are found in the main service suppliers. These solutions may well become base lines for future design.
- *Non-established solutions*: there isn't an unidirectional design line although every interface shows the same functionalities. They concern principally the recent introduced functions.

It is important to underline that this classification is neither definitive nor permanent. A current solution adapted by only one system may be “standardized” with the launch of new services and an established solution may vice versa be transformed by future innovations. It is also possible that future enrichment of the available functions increases the number of standardization levels depicted here. The figure below (Fig. 1) shows a “Stratigraphy” of the three described standardization levels. A geographical metaphor of sand, stone and rock was used to illustrate the degree of sedimentation of the specific design solution we analysed.

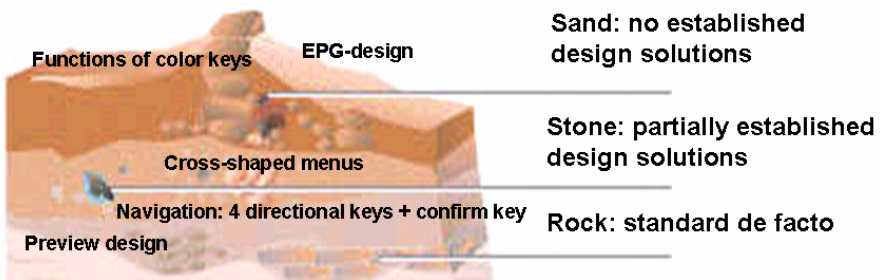


Fig. 1. Stratigraphy of Interactive TV designs

The functions where there are fewer similarities and more frequent changes are shown *close to the surface*. For instance, every system uses color key to activate specific functionalities but every system does it in a different way. Another example of not universally recognised standard in designing is EPG. In fact it can be present or not in the analysed systems and if there's, it is organized in different ways (i.e. integrated in the main menu or in a specific separate area of the interface). The changeability of these solutions is illustrated by the instability of the sand. Meanwhile there is also a tendency of design practices without any evident standard; these solutions are shown in the *middle of the figure*. For example the “cross shaped menu” is going to be a standard (in fact every new interactive interface has this kind of conformation) but it isn't universally recognised. These kinds of solutions are in a

partially stable environment as found in the stone area. At the end the well-established solutions are presented at the *bottom of the figure*. These areas present stable design practices, called standard de facto. The navigation system is one example since they are almost always based on movements in four directions (up, down, left, right) and a confirm command on the input device. Then also the preview of the contents were resulted a standard de facto adopted by all systems. These are clear example of a functionality that's stable as the rock: it can be found in every examined interface.

6 P2P: Behavioural and Heuristic Analysis

The P2P applications are in several ways the opposite of the television services: they are founded spontaneously, purely interactive and offer an unlimited quantity of information. Another fundamental aspect that was analyzed is the different research criteria used for searching a content on TV and searching it using P2P. In the first case the user can choose only between a program list or an on demand content, in the second case the user can also access niche and not pre-coincided contents. As seen from the number of P2P-users there is a call for this kind of systems and data about this group was therefore considered crucial in the perspective of television experiences which will depend on the user's decisions, instead of *ex-ante* programming. In order to understand and to analyse the user's behaviour in using P2P systems and in particular in looking for the most common searching, archiving and sharing methods of the P2P users, two focus groups with "experienced" users of P2P systems were carried out; one with students and one with gainfully employed. All 18 participants were expert users and the majority was men. The users turned out to have very different approaches to the search activity and the use of the contents but one aspect that all users appreciate about P2P systems is the vast quantity of available material whilst the feature that annoys the most is when there are limits in the freedom of access, search and use in addition to the "fakes", e.g. corrupt files. It's important to highlight that "fakes" is the negative side of serendipity: in fact the possibility to find contents the user didn't look for has a double value: if the user finds something more that is interesting it is "serendipity", but when the user finds something boring or unpleasant but still unexpected it is "fakes".

Additionally, initiatives that offers hints on what to download, that directs the user toward the material to download or that proposes ways to catalogue the material are not popular among the experienced users. The P2P users generally prefer to search without constraints although they appreciate the change to followed search paths they didn't expect. "To find what you weren't searching for" pronounces the richness of the P2P world. Consequently, in order to satisfy this user group, the "serendipity" or the phenomenon of finding something whilst searching for something else should be a key-concept in the design of future TV-services. To design for the serendipity means to overturn the traditional perspective of the TV paradigm which is based on the predictability of the TV use.

Since the P2P systems have several characteristics that may be positively implemented in the design of future Interactive TV services, a heuristic analysis was conducted on three different systems that according to the results of the focus groups are the most widely used in Italy namely eMule, BitTorrent and Direct Connect. The dissimilarities were found in different approaches for file sharing, downloading and

archiving digital material. Some of the most important issues that came out from the focus group and heuristic analysis were “transformed” in input for new navigation model of a more interactive future TV.

7 Conclusions: Guidelines to Design a New Interactive TV Interface and Future Steps

According to the results of the enhanced TV analysis and the focus groups and heuristic analysis on P2P systems, some issues and drivers for designing new future TV interface were found out. Firstly, the interface design should *encourage the “serendipity”*, which means that the user has to find more than he or she is looking for, avoiding the risk of “fakes”, i.e. non-wanted contents. It’s important that user doesn’t “receive” or “see” non-wanted contents. Hence, the system has to limit the frustration arising from unexpected contents: a content preview or an online community could help the user in finding only wanted contents. Another requirement is that the system should be perceived as *non intrusive*: the user should get the chance to choose whether he or she wants to be profiled when accessing the system. Additionally the interface has to be *adjustable to different kind of users* so as to respond to different requests and profiles (e.g. expert or non expert but also “P2P like” or TV like). Moreover, the remote control of the traditional TV is not suitable for an interactive interface and therefore the *input device has to be reconceived* to allow a straightforward interaction with the content (e.g. joystick, mobile phone, avatar, etc.).

Some more general issues in designing the new user TV interface are given in the following. *Active navigation* implies that the user should get the chance to freely explore the contents (as on the web), without being obliged to select contents from a list. The *time-dependency* should be loosen up and the attention has to be moved towards the user-requests to obtain a change from “when and where” to “what and why”. This implies a change of the traditional organization of the TV where the programmes are ordered according to start time and channel (EPG). *Multiple TV design* means that the same content has to be usable on several different devices. This requires a major flexibility of the contents (e.g. small displays).

Starting from these drivers and guidelines, our research is now focused on the definition of new concepts for a new iTV experience. We are working to find out more effective metaphors for the interaction process and the graphical TV interface giving “feeling” to the interaction, with the aim of leading the passive user to an active experience. The definition of alternative ways of navigation, different from EPG, is our first step to offer a growing interactivity that could merge the TV viewer and the prosumer in today’s era of social media.

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