

A case study analysis on digital convergent design: SkyNet platform

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Abstract. This paper presents the results of the first phase of a three part case study analysis on the new e-business platform SKYNET - a TV centric interactive content format originally developed by BSKYB. The research was conducted in collaboration with BSKYB with the aim of exploring convergent design considerations applicable to interactive television.

In the first phase and throughout this paper we employed a structural interview survey methodology which surveyed peoples' attitudes, perceptions and behaviour toward convergent services in general. From the data collected we made certain assumptions (based on an established framework of "design as communication") about the results and tried to identify certain criteria that could be used to satisfy the main objective of this paper which is to establish some broad criteria for convergent design considerations.

In conclusion, we summarized the research finding and presented some general comments and guidelines about convergent design considerations in general.

Keywords: Convergence, Convergent Media Design, Semiotic Engineering, User Interfaces, SkyNet

1 Introduction

1.1 What is Convergence?

The concept of digital convergence is not new and has long been associated with developments in the digital revolution. For decades many academics, scientist and media theorist have tried to assess and forecast the implications of digital convergence on industry and society (Baldwin & McVoy & Steinfield, 1996; Yoffie,1997). However, only until recently digital convergence started to gain practical importance, this phenomena is mostly prompted by current development in technology, creative management and government deregulation (Yoffie (1997).

Traditionally, communications media were separate and their services distinct. Broadcasting, voice telephony (fixed and mobile) and online computer services were different and operated on different platforms. Convergence is ushering in a new epoch of multimedia, in which voice, data and images are synergistically combined onto a single network to render better, more efficient and more innovative services to users.

Digitisation enables convergence by representing all forms of information in the same abstract form - the digital binary format or bytes. According to Stuart Brand, “ with digitisation, all of the media become translatable into each other - computer bits migrate merrily - and escape from their traditional means of transmission ...”

Another significant driver of convergence is device technology. As mediated devices become more pervasive they are also becoming convergent, that is to say, these devices are becoming capable of handling and displaying a variety of different media beyond the primary function of the device e.g. PS2s, I-pods, mobile phones etc.

1.2 What is Convergent Media Design?

As pointed out by Pemberton (2001), although convergence has been a popular topic of discussion within the field of HCI for more than a decade, very little empirical data has been reported on the use of converged solutions.

To be clear, we first identify “convergent media” as cross-platform media - that which was conventionally associated with a particular platform or device but through convergence can now be distributed and accessed through another device or platform - conventionally associated with a different media e.g. IDTV, mobile TV, and VOIP etc.

From this definition we define Convergent Media Design as a design strategy that focuses on identifying and providing solutions to implications of convergent media systems and the challenges of convergence. Because of the subjective and qualitative nature of “design” we felt it was important to introduce certain concepts that constitute our framework for thinking about design criteria. This criterion (presented in the following section) we felt provided a good framework to interpret, evaluate and present the data we have collected in a consistent manner.

1.3 A framework for Design: Semiotic Engineering

We start from a semiotic understanding of design i.e. Design as a form of communication between two actors (the designer and user). This is an idea introduced by Clarisse de Souza in her book “Semiotic Engineering” and further promoted and expanded upon by Don Norman in his book “Psychology of Everyday Things”

The dialogue is initiated by the designer (it is a meta-communication); he must first envision and construct a conceptual model of how the system functions and how it is likely to be used. If the designer is aware and perceptive he will consider the potential

users of the system (archetypical users) and the context of usage (scenarios of how the system will be used by the users). This approach can lead him to identify the user requirements and help him to interpret the user problems. It can also allow him to walk through the conceptual model as an archetypical user, potentially uncovering natural clues in the system or opportunity where clues can be integrated into the system that would guide the user towards understanding and conceptualizing how to use the system. The designer can create clues that naturally guide the user to “perceive-able action” through “perceived affordance”.

These designed clues are what Norman refers to as “perceived affordances” (POET) and are an essential part of the design communication. The word “affordance” was originally introduced by the perceptual psychologist J. J. Gibson (1977, 1979) to refer to the actionable properties between the world and an actor (a person or animal). To Gibson, affordances are properties of the natural world that are compatible with and relevant for people's interactions. When affordances are perceptible, they offer a direct link between perception and action.

The designer must map his conceptual model of the system onto a physical artifact/device. In a software system, the designer might create a graphic user interface GUI that will allow him to map his conceptual model. Graphic User Interfaces are the part of a computational system that users interact with. It is through this interaction that users grasp the functionality of the system. This is another important consideration in the design communication process; as constraints exist that might affect how that communication can be carried out and expressed.

According to Norman there are three basic categories of constraints: physical, logical, and cultural. Physical constraints are closely tied to real affordances e.g. it is impossible to move the cursor outside the screen. Logical constraints use reasoning to determine the alternatives, and are valuable in guiding behaviour. Finally, cultural constraints are conventions shared by a cultural group e.g. QWERTY keyboard.

In the context of convergent media design it is necessary to introduce another category as a slight variation of a physical constraint. The device itself can impose constraints on the design communication. “Device constraints” we describe as the technological limitations of a particular device in being able to accommodate another medium not conventionally associated with that device. A device may be designed to challenge the technological limitations of an intended medium but unable to adapt to accommodate another medium so easily.

Finally, the user enters the dialogue of the design communication; he does this with a preconceived, constructed mental model of how the system works. This mental model is based and conditioned on experience, perception, and inference. Some devices have inherent mental models e.g. the TV is traditionally perceived as a passive, linear medium based on a push strategy, while the computer is perceived as multi-linear, lean-forward, interactive medium.

As services attempt to traverse platforms seamlessly, implications and design considerations will begin to surface. These implications will in some way be

associated to poor communication somewhere in the design communication process and will be manifested in the system design. The designer is faced with the challenge of creating a conceptual usability model of the application and then building an interface that communicates to the users; in a way as to increase the users' chances of understanding the message being sent. It is important that the convergent media designer narrows the gap between the conceptual model of the system and the mental model of the user; while trading-off against constraints - functionality and usability.

2 Survey Design

2.1 Research Aims/ Criteria

The main aim of the surveys was to gain an understanding of people's perceptions, attitudes and behaviour toward convergent media. In order to determine the questions that needed to be asked, the research aims were further broken down into three categories from which question were constructed around. These categories are:

1. Competitive/complementary category: This category surveyed participants' exposure to various media technologies and their preference in using a convergent service.
2. Behaviour category: This category surveyed the behaviour of participants. It considered frequency of usage and the context of that usage.
3. Perception category: This category surveyed attitudes towards usage and the potential context of usage. It surveyed potential and asked if people "would?"

2.2 Data collection strategy

A pilot test with 19 participants was conducted so that problematic areas could be uncovered and corrected before data gathering. The method of data collection adopted for the survey was a structured interview; where the data is collected by an interviewer rather than through a self-administered questionnaire.

Interviewers read the questions exactly as they appear on the survey questionnaire. Comments and responses to open-ended questions were written down to produce field notes at the end of each data collection event. These field notes were aggregated along with the reflections of the interviewers to form a field report. The field report allowed us to complement quantitative data collected with qualitative insights from our participants and interviewers.

All participants were given incentives as a reward for their time. T-shirts were given to participants who filled out the General Questions section and Demographics alone and Sky Navigators (remote control with keypad embedded) were given to Sky users who filled out the General Questions, Specific Questions and Demographics.

2.2 Demographics, Population and Target sample

The population size of the data collected for the survey was 89 people; these people were randomly selected from members of the general public. Among the 89 people surveyed 21 people or 24% of those represented our target sample of sky users. 43 % of the participants asked were female and 57% male. The range of age in the population was between 16 and 65 years with a more or less bell shaped normal distribution.

3 The Results, Findings and Assumptions

3.1 Competitive/complementary Technological Category

89% of participants surveyed responded YES when asked, “Do you use the internet?” Among these, 94 % accessed the internet at home, through a broadband connection. This would suggest that participants have experienced with the active interaction model. This percentage of participants should be at least familiar with the lean forward model of viewing, “interactivity”, non linearity and the pull model associated with interactive TV.

51% of those that have access to interactive services represent our target sample of SKY users. 56% of the participants who had access to interactive features (NTL, Sky) responded YES when asked, “Do you use the interactive features on your digital television?” These participants represent 25% of our population.

The 44% of participants who have access to interactive features on their digital television do not use them is a significant amount. This suggests that even though technologically the television is in transition (transforming to incorporate a new active mental model) people’s perception and mental model of television were not changing. Various reasons may account for this. The field notes suggest that:

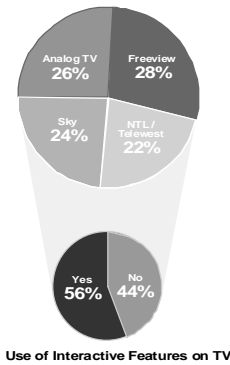
- Many participants received digital TV as part of a Triple service (telephone, internet and digital TV) and are genuinely unaware of these services.
- Some participants have not made the mental model shift or are reluctant to and just prefer to watch television, ignoring these services.
- Some participants prefer to perform internet related activities on the internet (where they have broadband/wireless access) and not through their televisions.

Everyone in our survey population owned and used a mobile phone. Many of the constraints and affordances of the mobile phone are also inherent to the interactive television platform e.g. bandwidth is scarce in both environments and user input handset device lacks a full keyboard interface and mouse pointer capability. Familiarity with the mobile phone device and the mental model of that device could translate to and be applied to interactive services on the interactive television platform.

3.2 Behaviour Category

When participants were asked to select how often they use certain services on their mobile phone. The most infrequently used services were: (a) “Watch TV”, which only 5% of participants used and (b) “Browse the internet” which 21% of participants used. However, of those participants 53% use it once per month, a further 26 % once per week and 21% daily. It is worth mentioning that 68% of the people who browse the internet on their mobile phone do not use the interactive services on their TV even though they have the access to them.

TV Reception and Use of Interactive Features



Use of Interactive Features on TV

Behaviour vs Perception Interactive Television Activities

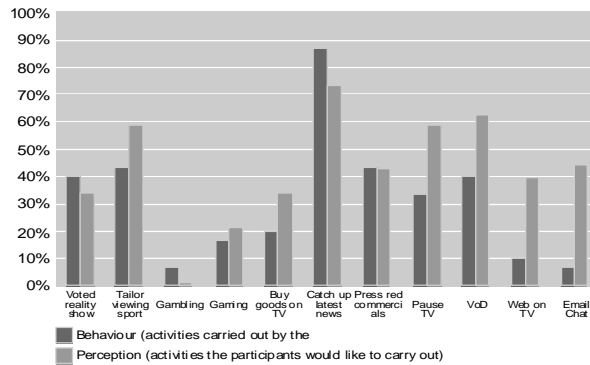


Fig. 1. (Left) TV Reception and Use of Interactive Features

Fig. 2. (Right) Behaviour vs Perception. Interactive Television Activities

The most frequently used interactive services were: (a) Catch up on the latest new stories, (b) Tailor viewing of a major sport event, (c) Press red on commercial, (d) Voted on an reality dating show and (e) Video on demand. When participants were asked, “how often they use interactive service on their television” none of the participants responded YES to using it “frequently”. A high percentage of those that use interactive services responded to using them fairly infrequently. However, the interactive services most frequently used on the television were those mostly associated or directly related to TV show content. Most of these services either allowed the user to access TV content more easily e.g. catch up latest new stories or enhance the viewing experience of show content.

The most infrequently used interactive services were internet related service such as gaming, web on TV, T-commerce, email and chat messaging. These can be considered “full” convergent service. These services require active engagement and often interrupt the primary mode of television viewing.

When participants from our target sample of Sky users were asked, “Do you ever press the red button on the sky remote?” 65% of them responded YES. When they were further asked to specify on which occasion they were likely to press the red button, the most frequent responses were: (a) To access show related information, (b) To tailor viewing of show, (c) During an advert to get more information and (d) To vote on a reality TV show

This finding is also consistent with our target audience of Sky Users that mostly press the red button to go interactive when it was associated with enhancing the TV show they were viewing. This suggests that people are fairly reluctant to engage with the active lean forward model of interactive television. In instances where they do lean forward, it is most likely to enhance the experience of the content they are viewing.

Another finding to support this assumption is that most participants when asked to describe their usage of interactive services responded that they were most likely to use them “between commercial” and “while waiting for my show to start”. This suggests that interactive services were always considered secondary to the primary activity of watching TV. It also implicitly implies that people were more likely to use an interactive service if it didn’t interrupt the primary activity of watching TV.

When participants responded NO to pressing the red button they were asked to specify why not? The most frequent responses were: (a) I’m afraid I can’t get back to my show, (b) Can’t be bothered, (c) It is too slow! Take forever, (d) Tried once and had a bad experience, (e) every time I connect they charge me and (f) I never have the remote to myself

43% of Sky users have Sky ++ an advance set-top box which allows user to access additional interactive PVR services, like: pause/ rewind TV, one touch recording, record one programme and watch another, record every episode of a series. Most Sky++ users frequently use all of the features of their Sky++ box.

Sky ++ users are more likely to use interactive services. This might suggest that exposure to some interactive features on the system might lead to further exploration of other interactive features of the service. This might also suggest that once people adopt a mental model of certain features of the system they might apply them to related features.

3.3 Perception Category

When participants who don’t use or don’t have interactive services were asked what services they would like to use on their TV, most of them selected those that were directly related to TV show content: catch up on the latest news stories (73%), VoD (63%), to tailor the viewing on a major sport event (59%) and pause TV, record to play back later and skip commercials (59%). Only 20% of respondents said that they “just want to watch TV”

The perception of respondents towards the services they would like to use on their TV and the services actually used is very similar. However, there is an important difference between the behaviour and perception towards the categories “web on TV” and “email, chat”. While 10% of participants who have interactive services declared that they use web on TV (behaviour), 39% of participants who don’t have interactive features said that they would like to use this service (perception).

When participants were asked about how they perceive finding information on their TV 57% responded that they believed that it would be relatively easy to find, 36% said that it would take some getting use to and only 7% believed that it would be difficult. 40% of the people who perceive that finding information on their TV would be relatively easy to find are young people from 16 to 25 years old, whereas most of the people who think finding information on their TV would be difficult are aged from 31 – 50.

Most of the participants think that finding information on their TV would be easy even though they haven’t tried it. This suggests a mental model and a preconception related with the device. The television is a familiar device and very easy to use and most participants expect that all things related to the device to be easy to use. An interesting comment from the field supports this: “Yes! I go interactive on TV but I’m too old to learn how to use a computer”

Regarding purchases, 64% of participants wouldn’t be comfortable giving their personal details or credit card information to make a purchase via television. This percentage represents a relatively high number of participants who are unwilling to buy goods on TV. This is an interesting statistic because 71% of these participants do buy goods via the Internet. This suggests a mental model and a preconception related with the device. The television is a familiar device and very easy to use and most participants expect that all things related to the device to be easy to use. An interesting comment from the field supports this: “Yes! I go interactive on TV but I’m too old to learn how to use a computer”

87% of the participants would not use Online Banking on their TV. It is worth saying that from those, 55% use Online Banking on the Internet at the moment. Participants in general don’t think the TV is secure or private enough to perform transactions. Some comments extracted from the field notes support this finding “I would if it was secure”, “I don’t think it is secure enough yet”.

79% of the participants said YES when they were asked if they would be comfortable using the keypad on their remote control to create and send messages to friends and relatives and 83% of those send SMS daily. We can observe a correlation between both mental models supported by the affordances of the input devices.

4 Conclusions and Guidelines for Convergent Media Design

In their book remediation, Bolter and Grusin pronounced that “Convergence is remediation under another name, and the remediation is mutual: the Internet

refashions television even as television refashions the Internet” (Bolter, J. & Grusin, R. 1999) This process of remediation described by Bolter and Grusin exposes the need for new design considerations, convergent design considerations.

Convergent design should consider the medium the service is converging towards. A service that has been designed for one medium then transferred directly to another, particularly between two platforms that offer different device constraints and affordances, is likely to fail in the design communication.

Because convergence challenges all the constraints - physical, device, logical and cultural, convergent service must be design to be intuitive to understand, easy to use and valuable to the user. Identifying constraints and opportunities where perceived affordances, metaphor and narrative (design dialogue) can be created to guide the user becomes one of the most important tasks for the convergent designer.

Creating rich user experience is a very important convergent design consideration; as convergence in networks, services, media and technology is also enabling diverse media technologies to share common functionality and features. It becomes essential in this competitive environment to match the potential users’ expectation with the functionality of the convergent system. However, mere functionality isn’t enough to attract and retain users to convergent services. Content that enhances or complements the existing service will add value and create rich user experiences.

User centred design is another important consideration for good convergent design. Understanding the user can help the designer to create a conceptual model that is consistent with the users’ needs and requirements. It can also allow the convergent designer to understand the context of use of the system; creating a more effective design communication and narrowing the gap between conceptual model and the user mental model.

Understanding the mental models of the user specific to a particular device and identifying transferable effective aspects of that mental model in another device can help users to understand and potentially accept the convergent services. Because convergence challenges all the constraints - physical, device, logical and cultural, convergent service must be design to be intuitive to understand, easy to use and valuable to the user. Identifying constraints and opportunities where perceived affordances, metaphor and narrative (design dialogue) can be created to guide the user becomes one of the most important tasks for the convergent designer.

Promoting convergent features is also a part of convergent design considerations. In both mobile phone and interactive TV devices many participants were unaware of convergent features. There are several ways to approach the promotion of convergent service. Promotion can be considered from a marketing approach. Marketing that connects to the user centred methodology through persona development and scenarios can be very effective in identifying criteria for effective promotion.

Branding is also very important to consider as brand strategy and communication are essential parts of creating user experience. According to Pemberton & Fallahkhair “Physical branding then becomes a part of the drive for usability, as we try to help the user answer questions about what the service offers, who is providing it, what its relationship is to a broadcast programme, who, if anyone, is asking for payment and so on. In other words, clear branding may help the user develop a clear mental model of the service, which will enhance usability.”

Promotion can also be approached through the design process. This point is a re-iteration but creating pleasurable services that people enjoy using and can emotionally connect to can generate positive promotion. This can be facilitated through effective interface design that employs information architecture, navigation and interaction design principles. Visual design can also be effectively used to communicate aesthetics and emotional affects to the user. The focus should be on making services that are easy to use and invite users to engage.

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References

1. Baldwin, Th. F., McVoy, D. S., Steinfield, C, *Convergence Integrating Media* (1996)
2. Bolter, J. & Grusin, R. (1999). *Remediation: Understanding new media*. Cambridge, MA: MIT Press.
3. *Convergence*, in: Yoffie, D. B. (Ed.), ‘Competing in the Age of Digital Convergence’, Boston: Harvard Business School Press 1997, pp. 1 - 35.
4. Fallahkhair, S., Pemberton, L. & Masthoff, J. (2004). A dual device scenario for informal language learning: interactive television meets the mobile phone. In Kinshuk, Looi, C., Sutinen, E., Sampson, D., Aedo, I., Uden, L., and Kahkonen, E.(eds). *The 4th IEEE International Conference on Advanced Learning Technologies (ICALT 2004)*. pp.16-20
5. Foddy, W. (1994) *Constructing Questions for Interviews and Questionnaires*, Cambridge University Press
6. Kaluza, B., Blecker, T., Bischof, C., *Implications of Digital Convergence on Strategic Management*
7. Norman, D. Affordance, conventions and design. *Interactions*, 38-43 (1999)
8. Norman, D. *The design of everyday things*. New York, NY: Basic Books (2002)
9. Oliveira Prates, R; Cavalcanti Leite, J & Sieckenius de Souza, C. *Semiotically Based User Interfaces Design Languages*, Departamento de Informática, PUC-Rio
10. Pemberton, S. Did convergence kill the clock? *Interactions of the ACM*, 8(6), Nov-Dec, (2001)
11. R. Earnshaw (Eds.).*Digital convergence: The information revolution* (pp. 3-12). U.K.: Springer-Verlag.
12. Yoffie, D. B. Introduction. *CHESS and Competing in the Age of Digital*, (1997)