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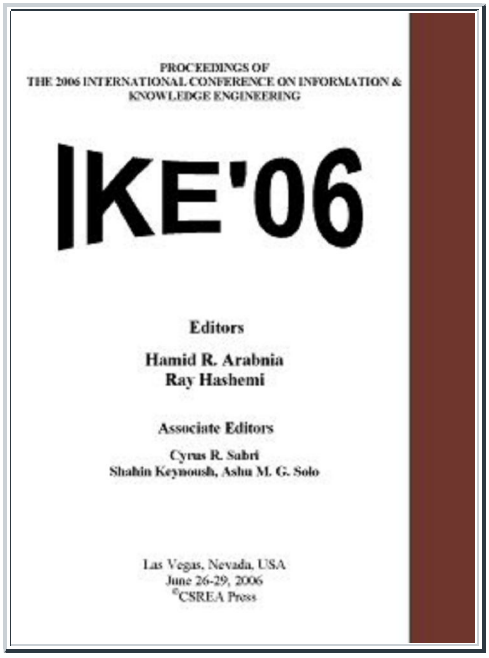

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Consumer information gathering for Convergent Systems Human Centered Design

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The objective of this work is to present a methodology to facilitate the evaluation of consumer reaction to multimedia content-based services over heterogeneous networks.
The human centered design approach traditionally asks for a lot of input on users' needs, requirements and expectations. This requirement gathering process can lead to expensive and time consuming primary surveys, specially when large user groups are targeted.
The present paper discusses the results obtained by applying Scenario-based Data Gathering in an automated fashion to target larger user groups, outlining the challenges and rewards of using web-based tools to simplify and reduce costs of primary quantitative user surveys. The development of the scenarios to be evaluated, the selection of a user sample from the available population, the development of the web questionnaire and its application to users are all presented here.
This research is part of the INSTINCT project funded by the European Commission.

Keywords: Heterogeneous Network Convergent Services**,** ISO 13407, Human Factors, Requirements gathering, web based questionnaire.

1. Understanding of the Situation

To better contextualize this paper it is necessary to consider two important trends: the evolution of Man-Machine Interaction concepts and technologies, and the advanced state of Convergent Telecommunication Services and Networks.

1.1. Man-Machine Interaction

Due mainly to last years' technology advance, research on man-machine interaction has received a lot of attention.

The concept of 'Usability' has become specially popular on several fields of study due to its varied applicability. The Software Engineering Community, for instance, defines it as a "system characteristic". ISO/IEC 9126-1 (Software Product Quality Model) defines Usability through a set of special attributes: understanding, learning, operability and attractiveness. The Ergonomics and Human Factors disciplines, in turn, define Usability as ease of use. [11-14][18][19]

1.2. Services convergence and Next-Generation Networks

Convergent Networks today are a reality, and are evolving faster than ever. These networks aggregate Mobile Telephony, Digital Television and Internet / Data traffic in a single infrastructure and allow the development of a host of new services.[7][9]

In order for a user to feel comfortable consuming these new services, they have to be easy to use. On this new convergent scenario, old questions arise with renewed force:

- How can the service developer know the scale of value of the consumer?
- Which characteristic should the new services possess? How much would the consumer pay for them?
- How do the consumers interact with the new services?
- How to measure customer satisfaction?

2. Motivation and Objectives

This research was originated by the results of the INSTINCT (IP-based Networks, Services and TermINals for Converging SysTems) project, sponsored by the Information Society Technology Program (IST) of the European Community. Its objective is to get the consumer's response to a set of proposed convergence scenarios modeling the interaction between Digital TV and Mobile Telephony.
This paper presents an investigation on that subject; specifically, it discusses the field research realized with a Brazilian user sample using Scenario-based Data Gathering [1-5] [10]and the comparison to similar European results.

3. Methodology and Results

Typically, a users' response field survey is conducted in two sequential phases: Data Gathering and Analysis of the Results. This paper targets just the first of those phases, discussing specifically the Scenario-based Data Gathering technique using the methodology depicted on Exhibit 1.[1-6][10]
The gathering of users' requirements through scenarios has been frequently used on Man-Machine Interaction research [11], becoming a very efficient way to capture, analyze and communicate users need and expectations .
The scenario-based technique basic principle is to present the user with a set of scenarios that simulate the use of present or future technologies. The present work's goal was to validate a set of proposed scenarios in order to guarantee and maximize users' feedback; as such, users were oriented to take the role of consumers and evaluate the services being offered to them.

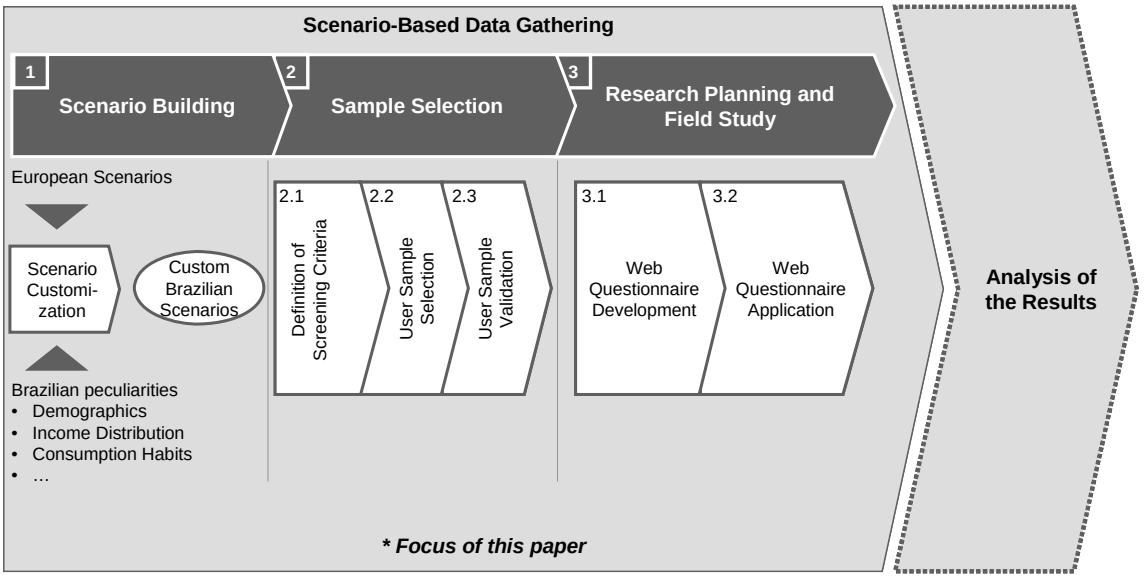

Exhibit 1 - Research methodology

The following pages will briefly discuss each step of the methodology and the results obtained during the research period.

3.1. Phase 1: Scenario Building

The INSTINCT project has prepared three scenarios to model the interactive services: two European scenarios and a Brazilian one. The European scenarios were named John (a Mobile Telephony-based scenario) and Helga (a Broadcasting-based scenario – see Exhibit 2); the Brazilian one was named Maria (a Services-based scenario).
When evaluating actual demographic data from Brazil largest cities, some doubts were raised concerning the 'Maria' scenario: it was not considered a good approximation of a real Brazilian consumer. This analysis lead to the customization of the proposed scenarios: to gather in-depth knowledge of needs, behavior and expectations of Brazilian consumers, it is vital that the services and content being offered are fit to Brazil's current reality.

These scenarios were built as PowerPoint presentations. The content presented to customers showed a combination of Mobile Telephony, Internet (peer-to-peer, multipoint and broadcasting data communications) and Digital Television services. For an actual example of the custom version of Digital TV content, refer to Exhibit 3.

Wants to go on an excursion with her friend. She looks up day trip tips from RBB and reads about ice skating in Brandenburg.....watches a video about it...sees where it is on the section of map supplied.

Exhibit 2 – Original Helga Schmidt Scenario[1] and John Scenario[2]

3.2. Phase 2: Sample Selection

3.2.1. Phase 2.1: Definition of Screening Criteria

In order to select an adequate sample from the available population, a set of screening criteria was defined a priori. Only users who matched these criteria would be considered fit to participate in the study; the users' evaluation was conducted in a previous test (details about this pre-test are out of the scope of this paper).

The final screening criteria are summarized on Exhibit 4, below.

3.2.2. Phase 2.2: User Sample Selection

The two European scenarios were proposed to users belonging to three different communities: Spanish, British and Brazilian, in a total of 66 users initially selected.
The selection of a Brazilian user sample is complicated by the country's heterogeneous demographics. Brazil is a country of continental proportions, measuring 8.514.215,3 km^2 and being composed by 27 Federative Units which comprise 5.507 cities, in a total of 54.265.618 homes [20]. These enormous proportions bring a great amount of cultural diversity, making it more difficult to select a representative sample of the country.

[1] Font: Raquel Navarro- INSTINCT
[2] Font: Raquel Navarro- INSTINCT

Exhibit 3 - Access to Pushed Broadcast Portal (based on INSTINCT project): scenario customized to Brazilian reality

User sample description	**Screening criteria for participants in the study**	**Screening criteria for participants in the study**
Young users, com independência financeira	Age: 25-40	Age: 25-35. Participants older than 20 years old would be accepted if they are living independently and mach all the other criteria.
White collar	Use IT (i.e. PC or laptop) to perform their work and/or their personal lives	Use IT (i.e. PC or laptop) to perform their work and/or their personal lives
Expend a lot of time in transit: trains, car, airports, etc	Have a commute of more than 30 minutes	Commute for more than 30 minutes Have to travel for work at least once a month
Very experience in email and Web usage (chats, news, games, download of video clips, etc)	Uses email for business and leisure purposes Almost daily usage of email Downloads video and/or software over the Internet at least 2 times a month	Use email for business and leisure purposes Almost daily usage of email Download videos and/or software over the Internet at least 2 times a month
Very experience in reach multimedia usage (TV, video and audio streams)	Watches TV and/or movies at least 2 times a month Watches streaming video and/or listens to streaming audio over the web at least 2 times a month	Watch TV and/or movies at least 2 times a month Watch streaming video and/or listen to streaming audio over the web at least 2 times a month
Mobile technology users	At least one year of using a mobile phone Using a PDA or any mass memory system (e.g. iPond) is a plus	Have used a mobile phone for at least one year Use of a PDA or any mass memory system (e.g. iPod) is a plus
Needs to organize or conduct group Activities while traveling (conference calls, plan social events, etc.)	Additional criteria, nice to have but do not exclude participants from the study	Additional criteria, nice to have but do not exclude participants from the study

Exhibit 4 - Screening criteria for the user sampler (font:Navarro)

To cope with this diversity, 2 Brazilian cities were selected to represent the country: São Paulo and Manaus, two very different state capitals.
São Paulo has an estimated population of 10.405.867 citizens and houses the 1 million citizens who own 49% of Brazil's wealth [21]. It is South America's most important business, economic and industrial center and measures 247.898 km^2.
Manaus, on the other hand, measures approximately 5 million km^2 [8]. Additionally, Manaus houses the most part of Brazil's native population: around 256.000 indians speaking between 170 and 180 different languages. In 2005, Manaus had a record economic activity, with its GDP growing approximately 29% [22].
It is the authors' understanding that these two cities capture the essence of Brazil's enormous cultural diversity, representing both the most and the least advanced areas in the country.
After applying the screening criteria to the available population (composed mostly of undergraduates and other university students), the researchers selected a sample of 20 people in São Paulo and 26 people in Manaus.

3.2.3. Phase 2.2: User Sample Validation

Comparing the Brazilian users (specifically those who live on urban centers) to European ones, it is possible to conclude that they are basically compatible economically-wise, with a few relevant differences. These differences are summarized on Exhibit 5.

	Sample Spain	**Sample Brazil**
Place where s/he prefers to consume the digital services	▪ At home ▪ Bus/train ▪ At work ▪ On-going	▪ At home ▪ On-going ▪ Bus/train ▪ At work
Type of services that s/he would like to consume	▪ News ▪ On line purchases ▪ Movies ▪ Weather information ▪ Traffic ▪ SMS ▪ Information storage ▪ Pictures/Photos ▪ Documentary ▪ Music ▪ Localization to the base of the information ▪ Cultural information ▪ Travel information ▪ Sports ▪ Interactive (chats, quiz, voting)	▪ Movies ▪ Traffic Jam ▪ On line purchases ▪ Weather information ▪ News ▪ Documentary ▪ Music ▪ Cultural information ▪ Localization to the base of the information ▪ Travel information ▪ Pictures/ Photos ▪ Group call ▪ Sports ▪ Trailers channel ▪ Interactive
Scenes totally validated by the participants to whom the portrayed services had been considered useful and attractive to be used in many situations	▪ Service Portal ▪ Alerts notification ▪ Alerts format configuration ▪ News alerts ▪ Weather alerts ▪ Traffic alerts ▪ Profile configuration ▪ Authentication before access ▪ On line purchases ▪ Forums ▪ Cultural and tourist information ▪ Mobile TV ▪ Interactive activities/voting services ▪ Newspaper and magazine subscriptions/download	▪ Service Portal ▪ Alerts notification ▪ Alerts format configuration ▪ Traffic alerts ▪ Weather alerts ▪ News alerts ▪ Profile configuration ▪ Authentication before access ▪ On line purchases ▪ Forums ▪ Cultural and tourist information
Scenes validated with restrictions		▪ Newspaper and magazine subscription/download
Scenes validated by only part of the participants	▪ Video downloads ▪ Chats	▪ Mobile TV ▪ Video downloads ▪ Chats

Scenes not validated by the participants to whom the portrayed services had not been considered attractive or useful	▪ Sports alerts	▪ Sports alerts ▪ Interactive(chats, quiz, voting)

Exhibit 5 - Results: Brazil and Spain

Concerning the genres of the select users, the sample was well balanced: 46% of female and 54% of male users.
Average participant age was 36 years (varying between 25 and 47 years old), with most users (62%) falling on the 25-35 years range. This average age is higher than the corresponding age on the European sample, due to Brazil's particular social conditions: Brazilian consumers who fit the defined Screening Criteria (PC usage, Internet access, gaming, file transger, complex multimedia applications, mobile phone usage and financial independency) belong to privileged social segments and are in general successful professionals, a situation only attained in a more mature age.

3.3. Phase 3: Research Planning and Field Study

3.3.1. Phase 3.1: Web Questionnaire Development

3.3.1.1. Motivation

Selected the user sample, a first round of interviews was realized with a reduced (8 users) sample from São Paulo users. Every interview counted with the presence of a psychologist in order to minimize the effects of any adverse psychological condition present.
The results of this initial interview cycle showed mainly two facts:

1. Most of the users validated the scenarios and responded well to the new services proposal;
2. The results from this reduced São Paulo user sample were not representative, given the country's enormous demographic diversity: the need for a broader user sample was now obvious.

This need to target a broader user base pointed the researches in the direction of finding an adequate method to substitute the direct interview approach; this lead to the development of the Web Questionnaires – a set of web pages specially designed to gather user's input, maintaining the quality of answers generated by the interviews but greatly reducing the data gathering effort.

3.3.1.2. Web Questionnaires Building

To apply the Scenario-based Data Gathering ideas in an automatic fashion, a set of web pages was developed. These pages simulated every proposed scenario (see section 3.1) and gave the user the opportunity to evaluate every screen on the interface of the new service being presented to him.
At the right side of every new service simulated interface, question with five possible answers [11][15] were put to the user (refer to Exhibit 6). These questions were elaborated with the support of the psychologist who reviewed the results from the first round of interviews (see 3.3.1.1), and were designed according to the standards proposed by [11][15][16][17].The results from show that this method allows the user to give its opinion to the researchers, not restricting him to the imposed answers.
The questionnaire's questions were based on the questions posed during the first round of interviews, but were adapted to fit the web context with the support of a psychologist specialized on Human Factors[10].

3.3.2. Phase 3.1: Web Questionnaire Application

The scenarios' presentation follows the following sequence:

1. Presentation of an initial screen with information regarding the objectives of the research. This intends to motivate the user and incentive his /hers participation, as well as give basic instructions to the participant;
2. Presentation of the simulated service scenarios [1—5][[10];
3. The objective questions about the proposed services are formulated;
4. A user satisfaction questionnaire is applied to measure the quality of the interaction between the user and the web scenarios. This satisfaction survey uses the concept of the satisfaction scale [15][16].

4. Discussion of the Results

The results of the application of the Web Questionnaires were favorable to the researchers' expectations about user diversity, confirming the importance of regional differences when developing new services. An example of these regional differences was the interested manifested by São Paulo users on metropolitan traffic information – in Manaus, this kind of service was considered irrelevant.
The questionnaire's open structure allowed users to freely express their opinions on both the proposed services and the way they were displayed, giving the researchers feedback on the methodology.
Most of the users criticism centered on Man-Machine Interface issues regarding the web questionnaire. Specifically, the following points were recurring:

Scenarios

- The 'Helga' scenario presentation was confusing (refer to Exhibit 2), presenting to much information on a single screen
- Some parts of the scenarios were not adequately explained, confusing the participant
- The users should be allowed to customize the scenarios, tailoring them to their actual needs

Interaction

- Navigation was not user friendly
- It would be desirable to interact with other participants during the research

INSTINCT Portal:

When accessing the INSTINCT Portal, a welcome screen is displayed. After clicking 'OK', the user is directed to the questionnaire's first screen

A tela inicial do portal INSTINCT é:

- ❑ Bastante agradável e atrativa
- ❑ Agradável, com informações adequadas
- ❑ Adequada, mas poderia ser mais atrativa visualmente
- ❑ Agradável, mas poderia conter mais informações
- ❑ Inadequada e pouco atrativa

Os serviços que à princípio são mostrados,em sua opinião são interessantes de serem acessados a partir de que tipo de equipamento?

- ❑ celular.
- ❑ TV.
- ❑ Lap top
- ❑ PC
- ❑ Palm top

Com que freqüência você acredita que acessaria esse portal?Guia de TV

- ❑ Nunca
- ❑ Ocasionalmente quando precisasse de algum dos serviços
- ❑ Algumas vezes ao mês
- ❑ Algumas vezes na semana
- ❑ Diariamente

Qual(is) destes serviços seriam mais utilizados no seu dia-à-dia?_____

Exhibit 6 - Web Questionnaire Sample

In general, the results were very good, leading to the continuity of the research and prompting new efforts to improve the methodology on the Man-Machine interaction issues.

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