

User experience of Cuban digital television: Approach to the definition of users and evaluation of the interface in Palmira Municipality

Experiencia del usuario de la televisión digital cubana: Enfoque hacia la definición de usuarios y evaluación de la interfaz en el municipio de Palmira

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Recibido 09 de diciembre de 2024, aceptado 29 de mayo de 2025

Received: December 09, 2024 Accepted: May 29, 2025

ABSTRACT

This research aims to diagnose the user experience of Cuban digital television in the Palmira municipality in the province of Cienfuegos in Cuba. The ethnographic method stands out because it relies on a descriptive qualitative approach and uses theoretical and empirical methods to collect information. Techniques such as interviews, participant observation, and thinking aloud were also used. The population comprises the town of Palmira, with a selection of the sample according to diversity or maximum variation, in confluence with the sample by type of cases. People of different ages and genders, as well as people of various occupations, were included. Persons with visual problems were also considered. The final result aims to identify the patterns and actions of digital television users in the Palmira Sur neighborhoods, specifically young people, adults, and older adults, in terms of their interaction, accessibility, and usability of SET-TOP-BOX devices, televisions, and SmartTV.

On the one hand, the results show that adults and older individuals are the largest consumers of digital television, keeping themselves informed through Cuban television's Noticiario Estelar news program or relaxing while watching movies and comedy shows. On the other hand, young people watch less television, and when they do, they prefer sports programs. People commonly use remote controls, especially for basic actions and connecting USB devices. Although digital signal-receiving devices offer accessibility facilities, they must continue to expand other support services so that people with various disabilities can interact appropriately with digital television.

Keywords: User experience, digital television, Palmira municipality, users definition, evaluation interface, ethnographic method.

RESUMEN

Esta investigación tiene por objetivo diagnosticar la experiencia del usuario con el servicio de televisión digital cubana en el municipio de Palmira, provincia de Cienfuegos, Cuba. El método etnográfico se destaca por basarse en un enfoque cualitativo descriptivo y utilizar métodos teóricos y empíricos para recopilar información. Se utilizaron técnicas como entrevistas, observación participante y pensamiento

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en voz alta. La población está compuesta por el municipio de Palmira, con una selección de la muestra según la diversidad o la máxima variación, en confluencia con la muestra por tipo de casos. Se incluyeron personas de diferentes edades y géneros, así como personas de diversas ocupaciones. Se consideró también a personas con problemas de visión. El resultado final tiene como objetivo identificar los patrones y acciones de los usuarios de la televisión digital en los barrios de Palmira Sur, específicamente jóvenes, adultos y adultos mayores, en cuanto a su interacción, accesibilidad y usabilidad de los dispositivos SET-TOP-BOX, televisores y SmarTV.

Los resultados muestran, por un lado, que los adultos y las personas mayores son los mayores consumidores de televisión digital, manteniéndose informados a través del programa de noticias Noticiero Estelar de la televisión cubana o relajándose viendo películas y programas de humor. Por otro lado, los jóvenes ven menos televisión y, cuando lo hacen, prefieren los programas deportivos. Los usuarios utilizan habitualmente los mandos a distancia, especialmente para acciones básicas y para conectar dispositivos USB. Si bien los dispositivos de recepción de señales digitales ofrecen facilidades de accesibilidad, es necesario seguir ampliando otros servicios de apoyo para que las personas con diversas discapacidades puedan interactuar adecuadamente con la televisión digital.

Palabras clave: Experiencia del usuario, televisión digital, municipio de Palmira, definición de usuario, interfaz de evaluación, método etnográfico.

INTRODUCTION

Today's society is influenced by and has invaded technology. Among the most consumed by persons are those that facilitate multimedia content, such as radio and television, among others. In this sense, traditional television has transcended the postmodernity imposed by Information and Communications Technologies (ICTs), transforming the traditional way of accessing television content and migrating towards new forms and presentation formats.

In recent years, technologies have been developed for digital television, connected or interactive, significantly improving the quality and display of images on television screens. Access and presentation of television content play a fundamental role in its consumption. The creation of friendly interfaces and the insertion of new ways of interacting with the variety of options provided are shown to be fundamental links to ensure that users become consumers of them. A good interface should be intuitive, easy to use, and visually attractive, contributing to a positive user experience.

In Cuba, work is being done on implementing digital television as part of society's computerization process. The aim is to improve citizens' quality of life and achieve significant results. Since 2013, actions have been taken to implement digital television in Cuba. An example of this is the existence of some digital

television channels. However, they offer content similar to other channels that still transmit analog signals. Various projects and initiatives have been developed based on creating and supporting digital content to modernize and improve the quality of television transmission in the country [1], [2].

For technological and content sovereignty, a decoder is being developed as part of a national and inter-institutional project led by the "Marta Abreu" Central University of Las Villas (UCLV): a new smart iDTV receiver (interactive digital television) and associated computing platform for the development of applications oriented to public services supported on mobile devices. It aims to develop actions for Cuban digital television [3].

In Cuba, digital television is generally obtained through SET-TOP-BOX devices (decoder boxes) because ATEC-PANDA and ATEC-HAIER televisions predominate. In addition, it can be accessed through SmarTV televisions with integrated SET-TOP-BOX, which are marketed in a currency different from that in which salaries are received or depend on other means of acquisition. This example influences how the population accesses digital television and its content.

Television programming is transmitted by 12 channels covering informative, interactive, educational, entertainment, sports, and cultural programs generated

and managed by a single provider, the Institute of Information and Social Communication, formerly the Cuban Institute of Radio and Television [4]. Programs are broadcast that interact in some way with the viewer, such as “Ruta 10”, “Al Mediodía,” “De Tarde en Casa,” and “La Neurona Intranquila,” generally through questions of participation and communication through alternative channels such as social networks. These programs are famous among viewers.

On the one hand, most people who consume television programming are older adults and generally do so at night since, in Cuba, a highly aged population is accustomed to watching television after 8 p.m. On the other hand, young people prefer to access social networks as a better means of entertainment. The characteristics of these real users are diverse, including situations of vulnerability such as visual, cognitive, auditory, or motor deficiencies. These conditions affect the interaction, accessibility, and usability of television content.

The Palmira Municipality, in the Cienfuegos province of Cuba, is in line with the conditions presented by the rest of the country, boasting a highly aged population, with older adults being the primary consumers of television content. Therefore, according to their age, they appear to be illiterate and digital immigrants who, for the most part, have not fully adapted to the use of digital television. Consequently, sometimes, it is difficult for them to interact, access, and use the contents and forms of digital television and/or access devices.

This research aimed to diagnose Cuban digital television users’ experience in the Palmira Municipality, Cienfuegos, Cuba. It is derived from the degree thesis Study of Cuban digital television users’ experience in the Palmira Municipality, Cienfuegos [5]. At the same time, it is part of the study of a doctoral topic, in which, in confluence with the present research, both are developed within the context of the national and inter-institutional project led by the Central University of Las Villas (UCLV): “New iDTV smart receiver (interactive digital television) and associated computing platform for the development of applications oriented to public services supported on mobile devices.” Its novelty and importance lie in the fact that it is the first research in the Cuban context that will allow

the establishment of the relationship between UX and digital television and to what extent it has been recovered. It allowed us to learn about the behavior assumed by the municipality’s digital television users and how they use it; this is important because the Cuban population is aging, and the results of this study can be used to improve the interfaces and forms of interaction thinking about the viewers who consume the most television, which would be older people. In turn, considering people with reduced visual capacity can shed light on how accessibility should be an essential factor for the viewers. The above can be translated into usability and accessibility guides for iDTV, starting in Cuba.

This article identifies and describes some UX methodologies, emphasizing Peñeñory’s methods as they apply to the context of digital television. Similarly, the experience of digital television users in Palmira, Cienfuegos, is diagnosed. This diagnosis is presented from the ethnographic research perspective, applying techniques such as semi-structured interviews and direct observation. Several research items associated with the analysis subcategories were analyzed: usability, accessibility, and interaction.

This work is organized as follows: First, a section on the literature review addresses concepts and methods in UX and digital television. Then, there is the section on the diagnosis carried out, which includes the application of methodologies such as ethnography and interviews, among others. Finally, the conclusions of the work are presented.

REVIEW OF THE LITERATURE ABOUT THE USER EXPERIENCE

User Experience (UX) is a person’s perceptions and responses to using a product, system, or service. It includes all emotions, beliefs, preferences, perceptions, physical and physiological responses, behaviors, and achievements of users that occur before, during, and after use [6].

UX is a discipline that focuses on improving the interaction between users and digital devices. It is based on interdisciplinarity, combining knowledge from different areas such as computing, psychology, graphic design, and communication. That is why UX design is characterized as a fundamentally interdisciplinary approach. It is related to various

areas and disciplines linked to a product or service and requires effective collaboration between different teams and professionals to achieve success [7], [8]. Designers must use psychology to improve user experience when designing better digital products and services. The application of UX laws makes this easier. Some of these laws are [9], [10]:

1. Hick's Law: Ensures that the user will increase their decision-making time as they are given more options to choose from.
2. Fitts' Law: Refers to the distance and time between objects that are part of a user flow.
3. Miller's Law: The product should not be saturated with information which will confuse users.
4. Jakob's Law: It teaches that before creating something new, it is good to research and look for references.
5. Law of proximity: Objects close or close to each other tend to group together.
6. Static usability effect: It refers to the purely aesthetic sense of the elements; that is, people tend to perceive that those other things that look better or are more beautiful will work better than others with a lesser aesthetic sense.
7. Law of pregnancy: Human perception tends to adopt the simplest possible forms; in this way, the figures that are easiest to interpret are recognized, and meaning or order is assigned to them.
8. Law of similarity or similarity: People tend to easily perceive similar objects, and when they share shapes, colors and sizes, they are perceived as the same or similar.
9. Serial position effect: The way users store information in the short and long term, remembering the first and last elements of a series of things better, is what this law is about.
10. Von Restorff effect: When several similar objects are present, the one not similar to the rest is most likely to be remembered.

Interaction patterns are a set of techniques and strategies used to design the way users interact with a product or system, allowing for the improvement of the accessibility and personalization of the product, which increases its usefulness for a broader audience. Some common interaction patterns include [11]:

- Navigation menus: how options are organized and how the user moves through the product.
- Buttons and actions: performing specific actions.

- Accessibility: Ensure the product is accessible to people with different disabilities or limitations.
- Feedback: How the user is informed about system status, error messages, or action confirmations.
- Personalization: Allow the user to personalize the product experience, adjust text size, or change background colors.

DIAGNOSIS OF THE EXPERIENCE OF USERS OF CUBAN DIGITAL TELEVISION IN THE MUNICIPALITY OF PALMIRA IN CIENFUEGOS

User experience methodologies

Currently, there are several methodologies for developing interactive software. Three UX methodologies are the most used: Double Diamond from the Design Council of the United Kingdom in 2004, Tim Brown's Design Thinking in the 1970s, and Lean UX [12]. Hassan proposed a methodology to evaluate UX oriented to the impact of the design's impact on the end user's satisfaction and frustration. It has seven stages: user analysis, task analysis, conceptual design, detailed design, implementation, evaluation, and maintenance [13].

The methodology chosen to carry out this research is that of Peñeñory Cardona [14], which is used to analyze and evaluate the implementation of digital television in a country or region due to its link between the UX as a whole and digital television [14]. Due to temporal limitations that arose within this research and because the objective is the diagnosis of use, only in phase 1 did we develop the actions from U.1.1 to U.1.6, and in phase 4, the actions U.4.1 and I.4.1 were developed. All the phases and actions of [14] are described in Table 1.

Within UX, there are methods and techniques for data collection and user interaction. These are used to improve usability, accessibility, and user satisfaction when interacting with a website or a digital product, and to understand users' needs, desires, and behavior when interacting with them. Likewise, they help designers and developers create easy to use efficient solutions, and meet user needs.

The techniques can be distinguished into two sets; those based on the information search process, interview, survey, and observation, and those used for design, among them the so-called brainstorming,

Table 1. UX Methodology for digital television.

Phases	Actions
Identification of components and definition of the user experience.	In the User pillar there are the following aspects: U.1.1. Definition of the audience, U.1.2. Identification of those involved, U.1.3. Characterization of viewers, U.1.4. Viewer Stories, U.1.5. Analysis of the environment, U.1.6. Context and culture of the viewer, U.1.7. Identification of needs and requirements, U.1.8. Identification of the business model. The following aspects are found in the Interaction pillar: I.1.1. Identification and contextual analysis of tasks, I.1.2. Definition of roles, I.1.3. Identification of use cases, I.1.4. Identification of the platform and interaction devices, I.1.5. Identification of usability and accessibility elements, I.1.6. Analysis and identification of the interaction. The following aspects are found in the Product pillar: P.1.1. Functional and non-functional requirements, P.1.2. Usability and accessibility objectives, P.1.3. Product objective, P.1.4. Identification of the deployment platform and transmission standard, P.1.5. Analysis of content and information. By the end of the first phase, R.1.1. will be obtained as results. Initial prototype and analysis by users, R.1.2. The Identification of the Transmission Infrastructure, R.1.3. Interaction elements, R.1.4. Platform characteristics, R.1.5. Identification of functions and tasks, which will allow us to approach the next phase.
Design and architecture of the platform, multimedia content and interaction.	In the User pillar there are the following aspects: U.2.1. Definition of usability and accessibility aspects, U.2.2. Definition of style guides, U.2.3. Design of menus and navigation maps, U.2.4. Design of metaphors, U.2.5. Information architecture design, U.2.6. Design of user interface tests. The Interaction pillar includes the following aspects: I.2.1. TDi application architecture design, I.2.2. Data model design, I.2.3. Design of multimedia components, I.2.4. Design of interaction style and choice of devices, I.2.5. Definition of accessibility aspects. The Product pillar includes the following aspects: P.2.1. Communication architecture and hardware. At the end of this phase, a design prototype and analysis of the tests will be carried out that will allow obtaining, R.2.1. The Interface Design, R.2.2. Interaction Design, R.2.3. Communication flow design.
Implementation of the interactive digital television application and integration of components.	In the User pillar there is the following aspect: U.3.1. The implementation of the elements of the graphical user interface. The following aspect is found in the Interaction pillar: I.3.1. The implementation of the interaction and data integration elements. The following aspect is found in the Product pillar: P.3.1. The implementation of the elements of communication. At the end of this phase, R.3.1. Functional prototype will be obtained with its respective evaluation and analysis for the next phase.
Functional, usability and accessibility evaluation.	The following evaluation aspects are taken into account in the three pillars User, Interaction and Product: U.4.1. Evaluation of the graphical user interface, I.4.1. Evaluation of user experience and P.4.1. Evaluation of the functionality of the application. At the end of this phase R.4.1 will be obtained. The final product or application to be able to deliver in the last phase.
Application delivery and feedback.	User, Interaction and Product must be carried out , which guarantee the proper installation and transition of the application and its proper use by the end users or viewers. These activities include: U.5.1. Transition for viewers, I.5.1. Feedback from viewers, P.5.1. Installation and activation of return channels, P.5.2. Acceptance check.

Source: Based in [14].

focus groups, scenarios, and people, among others. It is necessary to understand the needs and expectations of users to improve the UX in digital television; this involves user market research techniques are used, such as surveys, interviews and usability tests. With this information, more intuitive and easy-to-use

interfaces can be designed and adapted to the needs and preferences of users [15].

In the present research, the user experience in digital television in the town of Palmira Sur was diagnosed using the ethnographic method.

For the application of this method, the stages were defined according to García, Gil, and Rodríguez [16]: Stage 1. Negotiation and access to the field; Stage 2. Fieldwork and Stage 3. Data analysis.

Characterization of digital television in the Palmira municipality

Since 2013, digital television has begun to be transmitted in Cuba using the Chinese Digital Terrestrial Multimedia Transmission standard (DTMB). In the beginning, demonstrations were carried out in 45,000 homes. Thus, Cuba entered the world of digital television, and starting in 2014, high-definition technology was introduced.

It is transmitted over the air on a total of 12 channels, of which 8 have a standard signal (Cubavisión, Tele Rebelde, Educativo, Educativo 2, Multivisión, Infantil/Canal Habana, Cubavisión Internacional/Caribe, Canal Clave) and 4 on high definition (Cubavisión HD, Telerebelde HD, RussiaToday and Canal Caribe). However, fiber optic cable or satellite has not yet transferred it. It has 191 transmitters (141 standard definition and 50 high definition).

It is necessary to have an antenna, a suitable coaxial cable, a television compatible with SET-TOP-BOX devices (better known to the population as “boxes”), and SmartTV with an integrated SET-TOP-BOX (Figure 1) to access digital television in Cuba.

In Palmira sur town, digital television began to be consumed several years ago by selling the first “KONKA” brand SET-TOP-BOX devices, which are still present in homes. Then, with the arrival of

SET-TOP-BOX with a High-Definition (HD) signal and Smart TVs with integrated SET-TOP-BOX, its use has been increasing.

Although the devices exist in homes, there is no Standard Definition Television (SDTV) or High-Definition Television (HDTV) transmitter center in the municipality. Where there is only SDTV is in the city of Cienfuegos, which is why the antennas in the homes point toward the south to capture its signals. When there are bad weather conditions in Cienfuegos, and the quality of the signal tends to decrease, viewers position their antennas towards the north to capture the signal coming from the province of Villa Clara, partly because there are 4 (SDTV) transmitter centers there and 1 of (HDTV). A belief that exists among the viewers who make up part of the sample is that in Santa Clara, there is a better antenna because the signal with which they receive the HD channels is better, as stated by Aldiel, a viewer *“turned the antenna for Santa Clara, which seems more distant to me, but well, I capture it better there”*.

The bandwidth through which digital television is transmitted in the town is 60 Hertz (Hz) and 5-10 megabytes per second (Mbps) for each HD signal, the same as in the rest of the country.

Concerning television content, among the benefits of using digital television is that it offers greater image and sound quality, allowing you to tune in to a greater number of channels and, therefore, available programs. However, a deficiency is that, in some cases, there is weakness in the signal, mediated by different factors, among which are bad weather, obstacles that interfere with signal reception, poor condition of the antenna or coaxial cable, and locating said antenna without seeking specialized help from professionals on the subject, that is, locating in a place without carrying out a coverage study before installation and not taking advantage of its optimal location as is common in the town.

Negotiation and access to the field

This research is derived from two aspects. Two of the authors of this research, since 2021 and 2022, belong to the project associated with the national program (PAP): A new smart iDTV receiver (interactive digital television) and associated computing platform for the development of service-oriented applications

Source: Adapted of [17].

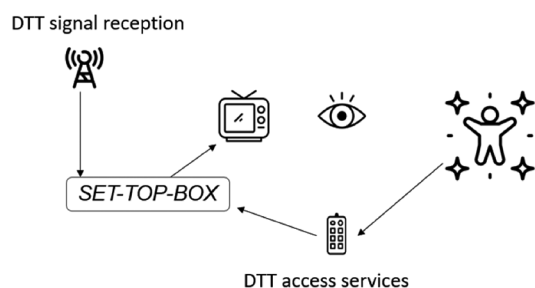


Figure 1. Hardware, accessories and equipment that allow access to DTT in Cuba.

publicly supported on mobile devices that exist in the Faculty of Mathematics, Physics, and Computing (MFC) together with other faculties and areas of the Central University “Marta Abreu” of Las Villas. Within the project, they were assigned to the team for creating the SET-TOP-BOX user interfaces, which were developed in the initial stages and served as usability engineers for heuristic evaluation and error correction. Likewise, one of the authors is working on a doctoral thesis titled “Conceptual Model of Human-Computer Interaction for Interactive Digital Television in Cuba from the Informational Perspective.”

Because HCI has intrinsic subdisciplines such as UX, it was decided that the research object of this research would be the latter. Furthermore, to develop the model proposal, it was decided to assess the current state of television interaction in Cuba. Likewise, no information has been recovered that demonstrates the existence of initiatives or actions implementing interactive television. Therefore, the diagnosis must focus on digital television, which constitutes the field of research for this study.

It was decided to conduct the diagnosis in the Palmira Municipality, selecting the residents of Palmira Sur town as the sample, as one of the researchers resides in this town. Additionally, there was only a five-month window to conduct the field research. During this period, joint research was interspersed with teaching, so Fridays, Saturdays, and Sundays were available for fieldwork.

The selected sample was chosen according to the following criteria: access to DTT and age strata. According to the literature, this criterion is suggested to influence all three aspects of interaction, accessibility, and usability.

The negotiation was carried out informally, with individual consulting with the residents of Palmira Sur town to gauge their willingness to participate in the investigation. Although there are 44 residents in the town, 5 had to be excluded from fieldwork because they did not have access to digital television. However, an older adult was included because, although her home does not have devices to access DTT, she does access it, as her neighbors invite her to watch television in the evenings. In this way, the analysis subjects who participated in the fieldwork

consisted of 39 individuals, comprising 9 young people, 23 adults, and 7 older adults.

Field work

Field work began in May 2023 and ended in November 2023. Qualitative research techniques were employed to gather audiovisual semantic information from the social units of analysis. The author of this research resides in the same town as the chosen sample, thereby strengthening this link.

They were generally dedicated to applying research techniques on Fridays, Saturdays, and Sundays from 3:00 p.m. to 10:00 p.m. in the afternoons and evenings.

The semi-structured interview was the primary technique used. It was applied over 21 days, with intervals. The interview was prepared with four initial questions to diagnose the number of digital television receiving devices, the preferred audiovisual content of the interviewees, the types of preferred television programs, and the favorite time for television consumption. The application enriched the interview in such a way that it was possible to investigate other items and sub-items, as shown in Table 2.

During the application of this technique, the responses of 8 interviewed viewers (3 young people, 3 adults and 2 older adults) were audio-recorded. For the optimal download and playback of the audio, they were converted to the .mp3 format through the siteweb [18].

In sessions that were not recorded, this technique was applied to the other 31 viewers. Their responses enabled the characterization of the *Viewers' Stories* and the collection of data that facilitated the development of the Person Profile technique.

Participant observation was employed in each exchange with the viewers of Palmira Sur town. The moments in which the semi-structured interview was being carried out were taken advantage of. It was carried out in the same period of days as the interview, although the frequency with which it was observed was enhanced. For example, in house 5, the interview was conducted with 2 viewers in a single session, and this same house was visited for observation in two additional sessions. A total of 39 television viewers residing in 13 homes were observed. Due to the viewers' willingness to contribute to the investigation, a favorable

Table 2. Items and subitems used in the semi-structured interview.

Items used in the interview semi-structured	Subitems used in the semi-structured interview
Identification of those involved.	Number of devices. Digital television receivers that exist in the home.
Characterization of viewers.	Moderate/severe or total disability of older adults, visual, cognitive, auditory disability.
Viewer Stories.	Age, occupation, salary, who you live with, tastes, longings, desires, electronic equipment you own, level of language proficiency, social networks you use.
Context and culture of the viewer.	Types of audiovisual content that they like (novels, movies, series). Types of content used for entertainment (humorous, novels, informative, opinion, educational). Preferred and/or actual schedule. consumption.
Analysis and identification of the interaction.	Most used remote control keys.
Applications of support services that Digital Television receivers have.	Announcement of electronic programming guides.
Voice Control/Voice Synthesis.	Playback speed, level of information.
Easy reading.	–
Screen menus.	–

environment was achieved even though they knew they were being watched. On the other hand, there are good interpersonal relationships between the researcher and them.

The purpose of the observation was to diagnose the actions, feelings, and context of the interaction and usability of viewers regarding digital television. For the observation guide, the items are shown in Table 3.

The other technique applied was *Thinking aloud*. In this, three viewers (1 for each age stratum) were asked to express individually and out loud their criteria and feelings generated by the interaction with digital television regarding the following research items: 1) Applications of support service that digital television receivers have, 2) Electronic navigation guide/Microguide/Miniguide, 3) Playback speed, 4) Easy reading, 5) Use of the remote control 6) Screen menus, 7) Configurable graphic interfaces (color combination, variety of font sizes, automatic hiding of information windows). Only one of the participants in the technique agreed to be recorded on video; the other two expressed sadness and a desire not to be exposed on video.

Data analysis

In defining the audience, 17 homes were initially analyzed. This item was linked to the Identification

of those involved. This last item is the total number of homes and their respective residents. Four homes with five residents were excluded because they lacked access to digital television devices. Therefore, the demographic composition of the entire sample is distributed according to 39 viewers in 13 homes.

Regarding the characterization of the viewers, it was found that 21 are men and 18 are women. Concerning the age range, 9 are young people between 15 and 30 years old, 23 are adults between 31 and 59 years old, and 7 are older adults between 60 and 89 years old. Regarding physical disabilities, 3 of them are visually impaired, 2 are moderate, although 1 of them does not wear glasses, and 1 is severely disabled. No hearing or mobility disabilities were detected. Regarding work occupation, 6 young people are students, 1 is a self-employed worker, 1 is an accountant at AZCUBA, and the other is a Physical Culture teacher at a primary school. For its part of the adults, 1 is the Director of Human Resources at the Meat Shop, 1 housewife, 2 custodians, 1 Industrial Engineer, 1 Hygiene and Epidemiology, 1 X-ray, 1 Lawyer, 1 economic, 2 self-employed workers own, 1 financial accountant, 1 Bartender at the “Faro Luna” Hotel, 1 warehouseman, 2 computer scientists at ITH and CUM, 1 from LabioFam, 1CDO, 1 Electrical Lineman, 1 Electrical Engineer at the Electrical Company, 1 nurse, 1 School teacher

Table 3. Distribution of items for participant observation.

Purpose and Observed Items	Observed subitems	Amount of viewers and/or homes	Frequency
Define the audience.	Number of people residing in the home, sex.	17 homes	1
Identify the context and culture of the viewer.	Type of content they use for entertainment. Actual consumption schedule.	15 viewers	4
Analyze and identify the interaction with DTT devices.	Number of times you touch a button on the remote control and/or DTT receiving device to make a task.	6 viewers (2 for each age stratum)	1
Identify the Hardware, accessories and equipment used.	Type and brand of DTT receiving devices.	17 homes	1
Identify the existence and satisfaction of use of the support service applications available to DTT receivers.	Dubbing, audio description, subtitling, closed caption, sign language window, voice-over of electronic programming guides.	6 viewers (2 for each age stratum) 3 homes	1
Identify the presence of contrast between the colors of the user interfaces of the devices, as well as the accessories.	–	3 homes	1
Identify the existence and level of use of Voice Control/Voice Synthesis.	Playback speed Information level.	3 homes	1
Identify the existence and satisfaction of use of the Electronic Programming Guide/Miniguide/ Microguide.	–	39 viewers 3 homes	1
Identify the existence and level of use of Personalization of Subtitle.	Transparency level of the subtitle box, position on the screen, font size and type.	6 viewers (2 for each age stratum) 3 homes	1
Describe the Analysis of content and information.	Voice and tone of content and topical level of textual information.	1 home	4
Describe reading on device user interfaces, as well as of accessories.	–	3 homes	1
Describe the use of remote control.	–	39 viewers 3 homes	1
Describe the Screen Menus.	–	6 viewers (2 for each stratum) 3 homes	1
Identify the existence and level of use of configurable graphical interfaces.	Color combination, variety of font sizes, automatic window hiding of information.	6 viewers (2 for each stratum) 3 homes	1

Special, 1 doctor. For their part, of the older adults, 5 are retirees, and 2 are homemaker.

There is an average of 3 people per home, and the average acquisition level is medium. In the town, a person does not have access to digital television, although some neighbors invite her to go to their homes at night to watch the soap opera together and then discuss it. Furthermore, young people meet to discuss the programs they prefer once they are finished; however, when watching the programs, each person watches them alone in their homes.

A total of 11 SET-TOX-BOX devices were identified, including 2 HD models and 4 SmarTV models with integrated SET-TOX-BOX.

For viewer stories, everything said by each of the subjects of analysis was faithfully respected. Since the techniques shared similar objectives, the information was triangulated to contrast similar information or identify links between them, thus developing the person profile technique based on three viewer archetypes.

The first profile addresses the entire population of the town's young people, most of whom are students with varied economic backgrounds, who are sensitized to the intensive use of Information and Communications Technologies and, to a small extent, digital television in the country (Figure 2).

The second profile addresses the entire adult population in the town. An economic variety is



Figure 2. Personal profile of young people who consume digital television in Palmira Sur, Cienfuegos, Cuba.

reflected, although a minimum salary of 6,000 Cuban money stands out, and there is variety in their job occupation. Due to their occupations, they are typically well-informed and utilize Information and Communications Technologies extensively. Figure 3 shows the profile of adults.

The third profile addresses the population group of older adults in the town who experience visual difficulties in this case. With the variety in their economic situation, all retired and supported by their relatives abroad. They spend an average of 4 hours in front of the television, consuming it for their entertainment and to stay informed (Figure 4); this was evidenced by the older adult Marisol *“to be aware of the news and be informed, so as not to be left behind and then I debate them when I take Samuel to the day care.”*

In the results achieved on the Context and culture of the viewer, they highlight that the audiovisual content that they most like to watch are series, soap operas, sports, and informative and interactive

programs, that the most significant consumption of digital television is at night to entertain yourself Likewise, regarding weekdays and weekend evenings and nights, Maritery states that *“Saturday is the day I use it the most and Sunday too.”* Some young people report that they do not enjoy watching all the content available on digital television. They prefer sports on the Telerebelde channel, the series that are shown on the Multivisión channel, and the novels on the Cubavisión channel; as Yisel reflects, *“I try to bathe and eat early so after I finish, I watch television until approximately 10 at night which is time to sleep,”* this refers to the time of television consumption.

Young people like sports on the Telerebelde Channel and the Havana Sports Channel to enjoy soccer mainly, as Bryan reflects, *“to watch the sport, soccer, you see? my favorite team is Barcelona. I like to see how the statistics are, and so.”* Once they finish watching the soccer games, all the young people who consume this content go out to share joy, and cheer each other up, or, as Carlos declares,



Figure 3. Person profile of adults who consume digital television in Palmira Sur, Cienfuegos, Cuba.



Figure 4. Person profile of older adults who consume digital television in Palmira Sur, Cienfuegos, Cuba.

“afterward, you know, no, one goes to the corner to fuck with the partners make a joke.”

In this same case, adults like informative and participatory programs such as Buenos Días magazine. Aldiel explains: *“Since I get up in the morning with Buenos Días magazine, to listen to everything [...] what has happened previously that day, I really like the reports on electrical energy, there to know the national electrical situation”*.

In the afternoon and evening hours, they enjoy watching “La Mesa Redonda” and “Noticiero Estelar de la Televisión Cubana” to stay informed. *“In the afternoons, while I am working in the kitchen and doing housework, I listen to the Round table that interests me sometimes there are particular topics that I do sit down to listen to because it is a way to stay updated on all the new issues that arise regarding the situation we face today, everything can be seen through the Round table Round and then later I always watch the Cuban Television News, eh?... those are the ways.”* Another program of his preferences is “La Neurona Intranquila;” Aldiel says, *“I like it, many times in the questions we have sent ‘o over there and we participate, or I participate.”* For their part, women watch movies and soap operas on Saturdays, as well as “Between you and me,” “In 3D,” and “23 y M” on Sundays. They enjoy watching movies and soap operas on the Cubavisión and Multivisión channels. They like the Russia Today channel. Maritery expresses, *“On Saturdays, we watch Entre tú y yo, the program’s film in 3D, at 6:30 p.m., 11:30 p.m., and at night, movies and soap operas.”*

Meanwhile, senior citizens tend to enjoy informative programs such as Noticiero Estelar de la Televisión Cubana (Cuban Television’s Evening News). Griselda likes it because *“I am well-informed about the news and that.”* Others like Marta like the *“La Mesa Redonda, el Noticiero”* In addition, they enjoy interactive programs such as “Al mediodía,” “De tarde en casa,” “Entre tu y yo,” and other humorous programs such as “Vivir del cuento” and “Juntos pero no revueltos.” They also watch Cuban and international soap operas, as well as musicals such as the Nocturno program. Likewise, they like the Teleavances program. Regarding this criterion, it was not recorded in a recorded interview, although the majority of adult viewers did express it.

Other types of viewers state that *“they don’t watch television much.”* Some, usually young people, when they do not tune in to their favorite programs or the news, access this content through the Internet, specifically through social networks such as Facebook, X (formerly Twitter), and YouTube,” *to follow some channels that program content from the box”* like Carlos.

Regarding the analysis and identification of interactions, young people tend to experiment extensively with remote controls, as they are very curious and use them to turn the TV on and off, change channels, adjust the volume, and perform manual and automatic searches. of the channels, change the memory and to record a program or program the device to record it later, as Yisel refers *“In the case of recording, I put the programs to record on occasions where I cannot see them so that I can enjoy them later, too When I am not at home my relatives record them so I can access them.”*

For adults, the most common uses are changing memory settings, turning on the radio for entertainment while doing household chores if they cannot watch TV or listen to music, or searching for channels to reset the tuning. When there is no signal, or it is very weak, and the electronic program guide is your only source of information, this is how Tania describes it: *“actually when I go to locate the USB which is the memory and change the channel, sometimes I also go to listen to the radio.”*

In the case of older adults, they only interact with the remote control to turn it on and off and execute the basic actions of lowering/raising the volume, changing the channel, opening the USB memory, and turning on the radio, Marta expressing herself like this: *“the turn on the television, to turn down the volume and change the channel.”*

On average, in all cases, to perform each action, they interact with 2 to 4 keys on the remote control. The buttons most used on the remote control of the devices by the viewers, subject of analysis, to access DTT are: turn on/off, change from one channel to another, increase or decrease the volume of the television, access the options menu and settings, go back or return to the previous screen and confirm.

As a generalization, the characteristics that define the interaction, accessibility, and usability of young

people, adults, and older adults, respectively, regarding access devices and digital television content in Palmira Sur are presented.

Young people make little use of television, although they do consume sports programs that emphasize international soccer broadcasts. Regarding this aspect, it should be mentioned that contrary to what happens in other countries, football matches are broadcast live through Streaming channels that must receive payment fees from viewers. In Cuba, the same does not happen; however, the Cuban Institute of Radio and Television has a mechanism in place that allows them to access the live matches and transmit the video, although not the original audio, resulting in the narration of the matches by Cuban narrators. Likewise, they broadcast football matches from various competitions on a delayed basis. In Cuba, there are no payment mechanisms or access to streaming channels; to access this type of content, young people depend, to a large extent, on Cuban television programming. The difference between digital and analog television, in this case, is that the match's quality is better when broadcast on Telerebelde HD than on the Telerebelde channel.

The moments of television consumption among young people are not abundant; in general, they spend little time in front of the television. Instead, they prefer to watch television programs, although through alternative channels available on social networks.

Another distinctive element of this stratum of viewers is experimentation with the remote control, specifically to expand their knowledge of the menu options offered by digital television receiving devices in order to interact refinedly with them.

For adults, watching television is a quintessential option for staying informed, with specific available such as the informative magazine *Buenos Días*, *Mesa Redonda*, and the *Noticiero Estelar de la Televisión Cubana*, better known as *NTV*. In the case of channels that are only tuned through the digital signal, they prefer *Russia Today*. However, they also enjoy other content that is transmitted through talk shows and movies. Despite their television tastes, they do not have defined consumption schedules; these correspond to the transmission schedules of the programs they enjoy.

They use the remote control to perform basic actions, including those shown on digital television, such as tuning the radio and connecting a USB memory device.

Concerning senior adults, in terms of television use, they are similar to adults in that they like to watch informative programs, such as *NTV*, and also use the program of their choice, *Teleavances*, to find out about television programming. It also differentiates them in terms of preferred programs, specifically the participatory and humorous ones, distinguishing between them based on the interaction they carry out with these programs, even if it does not occur in real-time.

The use of the remote control is minimal, only for basic actions such as turning on and off, increasing and decreasing volume, and changing channels, which was not explored as the root cause of this issue during the investigation. However, it is assumed that this is due to the characteristics of interaction with technologies that correspond people to the age stratum of these digitally illiterate viewers.

Young people, adults, and senior citizens share a commonality: the exclusive use of the remote control to execute interaction tasks with digital television. Furthermore, the most frequently used actions are consulting the menu of external devices such as USB, activating subtitles, manual and automatic search, and consulting the microguide.

Meanwhile, in terms of digital television facilities and services, set-top boxes are the most common devices used to receive digital signals, present in 10 out of the 14 households surveyed. Among the strengths that all the devices observed have are the presence and activation of subtitles and closed captions as support service applications, specifically for people with disabilities; this is also the case with the electronic guide, the micro, and the mini guide. At the same time, another strength is the color scheme established in the interfaces, which facilitates readability and provides adequate visual contrast.

Among their weaknesses is that they do not offer other disability support services, such as control and voice synthesis or subtitle customization.

Among the aspects that it has and is considered to be perfected are the audio description service,

dubbing, and sign language, which, although they exist in some programs, are not services they provide on digital television but are part of the intention of specific programs only. They should also improve the voice and tone of the content's writing of the devices, which presupposes a challenge to approach and be more empathetic with viewers, taking into account that the age group that consumes the most television is senior citizens. Therefore, closeness, friendliness, and informality in the topics discussed, as well as in the voice and tone, would allow senior citizens to interact more easily and gain a better understanding of digital television receivers.

In conclusion, adults and senior citizens are the two age groups that use and consume digital television the most, although it has generally benefited the population and been positively received.

This work has some limitations. For example, the municipality under study is Palmira, with 17 participating homes. It would be interesting to validate the findings further if the study could be replicated in other municipalities, considering the different age strata. In turn, the sample could be expanded, and a survey could be used to collect quantitative information in a complementary manner.

CONCLUSIONS

The user experience in digital television is of utmost importance since it considers aspects such as interaction, accessibility, and usability by viewers and how these elements influence the quality of their experience.

The interaction with devices to access digital television in Cuba is evolving positively. It provides the opportunity to enjoy a variety of channels and content, as well as a better visual and auditory experience, especially for adults and older adults, who constitute the main viewers.

Digital Television offers disability support services that guarantee accessibility for people with certain disabilities, although others must be implemented to facilitate access for many more hearing and visual disabilities.

This study found that adults and older adults are the two age strata that most use and consume iDTV. Regarding the usability of digital television in Cuba,

it has the availability of intuitive interfaces based on the use of colors with adequate contrast, as well as specific information messages such as guides and the opportunity to perform tasks through remote control. However, customizing menus and devices correctly is still a weakness. Also, we found that they do not have other support services for disabilities, such as voice control and synthesis or the personalization of subtitles. Among the aspects that they have and are considered to need improvement are the audio description service, dubbing, and sign language, which, although they exist in some programs, are not services provided on digital television. What is considered to need improvement is the voice and tone of the content writing of the devices, which presupposes a challenge to get closer and be more empathetic with the viewers, taking into account the age stratum.

This research will serve as a source of consultation for carrying out subsequent work on the topic and an example for ethnographic studies within Information Sciences. As far as it has been recovered, it is the first research in the Cuban context that will establish the relationship between UX and digital television. Its application will have important implications in the Cuban television industry since it will lay the foundations for adapting the content and the forms of presentation according to the users' experience. It will make television devices more accessible and easier to use for all consumers.

ACKNOWLEDGMENTS

To the project of the Central University of Las Villas (UCLV): New smart TVDi receiver (interactive digital television) and associated computing platform for the development of applications oriented to public services supported by mobile devices.

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