

The Promotion of Empathy in Intelligent Assistants for iTV through Proactive Behaviours

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The integration of intelligent assistants, in devices belonging to the television ecosystem, has simplified the accomplishment of more demanding tasks (such as content searches). However, these assistants are restricted to purely reactive behaviours and show a reduced human and empathic dimension in relation to the users. However, in other application domains, there has been an increasing integration of proactive behaviours, which can counteract these barriers and, consequently, improve the respective User Experience (UX). It is precisely in this context of proactivity that this research is designed. The goal is to contribute to the advancement of intelligent assistants in the interactive TV (iTV) domain, studying which proactive behaviours can be integrated in an intelligent assistant for iTV to promote its empathy, the associated UX and, consequently, its adoption in a more fluid and massive way.

Additional Keywords and Phrases: Intelligent Assistants, Proactivity, Television Ecosystem, Empathy, User Experience

1 INTRODUCTION

Intelligent assistants, such as voice assistants, have become a prevalent technology in people's daily lives, usually used to help users in their daily tasks, namely in home environments. Being able to recognize and understand user interactions [1], intelligent assistants are able to help users in their tasks such as searching for information, setting reminders [2], [3], or searching for content on television (TV) [4]. However, they still present some usability problems, which may generate some disappointment in users as they do not meet their expectations [5]. As a result, users feel some reluctance to use intelligent assistants to perform more complex tasks [6]. Moreover, despite the wide variety of use cases, intelligent assistants, mostly, exhibit merely reactive behaviours, responding only to explicit user requests [7], [8].

With the increasing advancement of artificial intelligence (AI) and detection technologies, intelligent assistants are already able to predict the user's intentions and preferences, and also to understand their surroundings. This has enabled this type of systems to support some proactive behaviours [3], able to anticipate possible user needs and intentions, after an analysis of their context (schedules, places visited, devices used, and search historic) [8]. For example, commercial solutions such as Google Assistant, proactively sends notifications to the user about flight delays, location of where they parked their car or nearby activities, as well as personalised suggestions for music and podcasts [9].

When considering interactive television (iTV), intelligent assistants came to facilitate users' interactions with devices belonging to the current television ecosystem (Set-top-boxes, Smart TVs and Media Players), allowing them to interact with these systems, and search for television (linear and non-linear) and Over-the-Top (OTT) (e.g., YouTube and Netflix) content using voice [10]. However, despite their significant penetration in the TV market [4], these assistants are merely endowed with reactive behaviours, presenting an interaction that is not very human, friendly and empathetic.

In this sense, it is considered that integrating proactive behaviours (taking an action to assist the user without their explicit request [7]) could reduce assistant-user interaction effort in the TV context and bring an additional "human" layer to assistants [10], with the potential to make them more empathetic, leading to a more natural, friendly and efficient use of these systems and, consequently, to improve the UX. Considering this problematical, the following research question was formulated:

"What proactive behaviours can be integrated into an intelligent assistant for interactive TV to promote its empathy?"

So, with the aim of understanding which proactive behaviours can be integrated into an intelligent assistant for iTV to promote its empathy and associated UX, the following objectives were defined: i) defining, through User Focus, the scope and dimensions of proactivity and empathy in the context of this research; ii) identifying proactive characteristics and behaviours that potentially influence the perception of empathy of an intelligent assistant for iTV; iii) observation of the effects of different proactive behaviours on empathy and UX.

2 BACKGROUND

Technological advances in the field of artificial intelligence, supported by Big Data, have enabled intelligent assistants to evolve from reactive agents, which only respond to users' explicit requests, to proactive agents, capable of anticipating users' needs [8]. This includes the use of anticipatory computing and contextual information (location, time, devices used,...) to predict and respond to user needs without an explicit request [11]. However, an intelligent assistant only truly assists a user if it considers their focus and needs in the short and long term. In this sense, Yorke-Smith et al. [12] proposed a set of guidelines that reflect a user-centred experience to conduct the development of proactive behaviours in intelligent assistants. According to them, a proactive assistant should be: i) valuable, providing information according to the user's interests and tasks, without interfering with their attention or activities performed, unless there is an explicit request from the user; ii) competent within the knowledge and context for which it has been trained; iii) transparent about what it knows about the user and; iv) safe, minimizing negative consequences [7], [12]. In addition, it should also continuously learn and improve the results given by analysing the feedback information it receives regarding the action taken [7]. A recent study [13] revealed that the integration of proactive behaviours more aligned with users' interests implies understanding users' digital habits and behaviours, their personality, mood and (social) context - whether they are accompanied or not; whether they are busy with some important task; and whether they are in a public space

In this sense, although the relevance of proactive behaviours in an intelligent assistant depends on the value they bring to the User Experience (UX) [7], [12], it is considered that the integration of proactive behaviours could bring an additional "human" layer to assistants [10], with the potential to promote their empathy, improve the associated UX and, consequently, to lead to a more fluid and massive adoption of this type of assistant. As revealed in a study by Ochs et al. [14], when empathic responses are appropriate to the user's situation, the user has a more positive perception of the assistant when it expresses empathic emotions, whether positive or negative, as long as they are congruent with user's situation. Another study [15] showed that empathetic assistants are perceived by users as more trustworthy, pleasant and attentive, in comparison with assistants who do not demonstrate empathy.

3 METHODOLOGY

To operationalise the research a development research method is used. This is oriented towards developing, in an iterative process, innovative and practical solutions that provide transferable and generalisable data to solve problems and improve prototypes [16]. This requires the conceptualisation, development, implementation, formative evaluation and iterative analysis of a proof of concept, where the "knowledge is inductively extracted from the experience of using and evaluating a prototype developed for the study" [16]. This method is combined with a user-centred design approach [17], focusing on users' needs and requirements to achieve a more effective UX with an interactive system. So, each step of the research plan is focused on users' needs to: i) understand their context, characteristics, habits and preferences regarding television consumption; ii) establish their requirements to conceptualise and develop prototypes in conformity with it; and iii) evaluate the prototypes according to their context and requirements, assessing the inherent users' feelings.

4 INVESTIGATION PLAN

Considering the research problematic, it is intended to conceptualize, prototype, and evaluate a set of proactive scenarios, framed in the context of an intelligent assistant for iTV (described in more detail in the stages of the investigation). Followed by a user-centred approach and an iterative process (of continuous improvement), the scenarios will be conceptualised to meet the characteristics of potential users and their preferences regarding the consumption of content available on iTV. Given the greater tendency of young adults to adopt voice technologies more quickly [18], the sample (by convenience) will be composed of young adults, of both genders, aged between 18-34 years, with previous experience in the use of intelligent assistants (such as voice assistants, smart speakers, ...) and with different habits and consumption behaviours regarding TV. The research plan presented below (Figure 1), contains the stages carried out, in progress and yet to be carried out. To date, stages 1 and 2 were concluded.

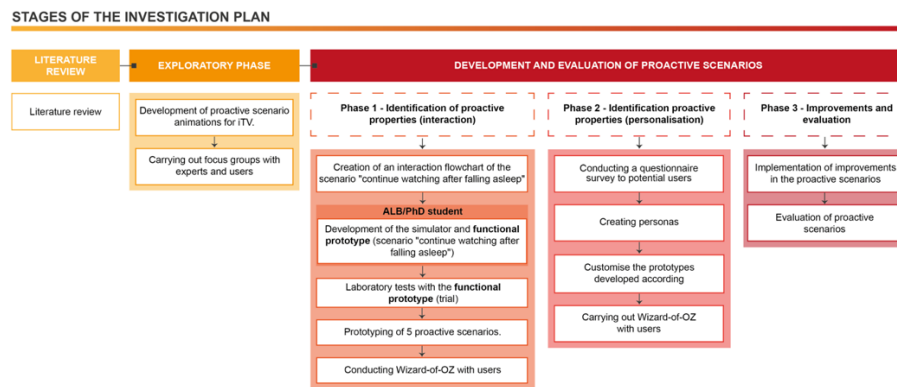


Figure 1: Main steps in the investigation plan

4.1 Stage 1 - Literature Review

Stage 1 consisted of analysing the relevant scientific literature on the main key concepts of the research problematic: proactivity, intelligent assistants, empathy and television. Through these key concepts we intended to obtain some clues on how to conceive proactive scenarios for iTV that can be relevant and empathetic to users, in order to provide a more natural, efficient and friendly interaction with TV. To carry out the literature survey, four databases were used, Science Direct, ACM Digital Library, IEEE Explore and Web of Science, in which search criteria and keywords were established, and inclusion and exclusion criteria defined. This stage contributed to the development of the theoretical framework of the thesis – see section “2. Background”.

4.2 Stage 2 - Exploratory Phase

Aiming to understand the users' interest to proactive scenarios for iTV, 6 animations were developed that demonstrate possible proactive scenarios in the context of an intelligent assistant for iTV. For the conceptualization of the set of scenarios (animations) in this first phase, researchers in the iTV area and professionals from the largest IPTV operator in Portugal contributed with their experience in the identification of potentially relevant and interesting scenarios for users. Preference was given to scenarios framed in daily situations, where the assistant (integrated in iTV) is able to anticipate possible user requests by, for example, suggesting to the user to continue watching an interrupted content or

recommending a content related to what was previously watched. In a second phase, two Focus Groups were carried out with users and experts from different areas (artificial intelligence, UX and iTV application developments), with previous experience in the use of voice interaction systems. The Focus Groups were carried out with the following objectives: i) to identify the most relevant proactive scenarios for users in the TV context; ii) to obtain suggestions on proactive scenarios for iTV; and iii) to assess the dimensions of communication (features on the voice and interactions of the assistant with the user) and intrusion in the different scenarios. In view of the pandemic circumstances (COVID-19), the Focus Groups were adapted to remote sessions, in which Zoom was used as a videoconferencing platform. The dynamics of the Focus Groups was based on the presentation of the animations of 6 previously developed proactive scenarios and, in turn, on the debate about them, following the objectives outlined for these sessions.

The results obtained from the In Vivo transcription of the data collected from the debates held in the Focus Group sessions, showed that the participants considered more pertinent the scenarios in which the viewing of related content was suggested and in which the continuous watching of interrupted contents was suggested. In terms of communication and intrusion, the participants, suggested that there should be the possibility to pre-configure the TV system, regarding the levels of formality and cordiality of the assistant's communication, as well as the data to which the TV system has access, and the opportune moments for the assistant to interrupt the user. The implementation of sound/visual notifications to attract the user's attention and the use of shorter sentences were other aspects suggested by the participants to improve the interaction with the intelligent assistant.

4.3 Stage 3 - Development and Evaluation of Proactive Scenarios

Since this stage will follow an iterative process of continuous improvement of the scenarios, through cycles of prototyping, evaluation and improvement, 3 phases were defined.

4.3.1 Phase 1 - Identification of proactive interaction properties

Given the information collected in the previous steps, a [functional prototype](#) of one of the scenarios considered most relevant in the Focus Group sessions was developed. The prototype consists of a system (integrated with a voice assistant) that detects the moment in which the user fell asleep (through a SmartBand that collects biometric data) while watching a content available on iTV, in order to suggest the resuming of the interrupted content the following day. The development and implementation of the functional prototype took place within the CHIC project scope (024498), which made it possible to count on the help of a programming team from the largest IPTV operator in Portugal in this task.

After the prototype development, it was individually tested in the UX laboratory by 5 participants, with previous experience in using voice interaction systems. The reduced number of participants was due to the constraints faced by the pandemic state (Covid-19). The laboratory tests aimed to contribute to a preliminary analysis of the participants' receptivity to this type of scenarios. To this end, the following objectives were defined: (i) to understand the usability and usefulness of the functional prototype; (ii) to understand the emotional reactions provoked in the user, in terms of motivation, satisfaction and control; (iii) to identify specific properties of proactive interaction, both regarding the interaction modality and the mode, when and number of times a proactive assistant should interrupt a user to provide a proactive suggestion; and (iv) to know the participants' opinion about the empathy of the prototype.

The results from the data collected from the semi-structured interview and administered questionnaire (which included the SUS scale [20] to assess the overall usability of the prototype and the SAM [21] scale to assess the emotional reactions provoked in the user, in terms of satisfaction, motivation and control) during the laboratory tests showed that the prototype proved to have a good usability and is considered useful for the daily lives of the participants. They were

satisfied and motivated to use it and considered the devices integrated into the iTV system and the interaction modalities provided appropriate. They also revealed that they considered that proactivity contributed to a more empathetic system. However, they also mentioned that there should be the possibility to configure the proactive suggestion in advance, to not interrupt the user at inopportune moments or in the presence of other people.

As the tests with the functional prototype served as a trial for a preliminary analysis of the participants' receptivity to this type of scenarios, at the moment more scenarios for the iTV User Interface (UI) are being prototyped in an agile way, namely those that were considered more relevant in the Focus Group sessions and some suggested by the participants in the previous tasks. The mid-fidelity visual prototypes being developed will also be tested in a laboratorial context, using the Wizard-of-OZ (WoZ) method, in which participants are led to believe that they are interacting with a functional prototype, but in reality, it is being controlled by a researcher from behind the scenes [22]. The intention is, with a larger and heterogeneous sample, and with more diversified scenarios, to identify the proactive interaction properties of each of the scenarios and to obtain some more clues about the participants' opinion regarding the empathy of the prototype.

4.3.2 Phase 2 - Identification of proactive personalisation properties

With the purpose of personalizing the proactive scenarios (visual medium-fidelity prototypes) developed in the previous phase, to be aligned with users' behaviours and characteristics, it is intended to gather 20 participants with distinctive characteristics, habits and television consumption behaviours, and with previous experience in the use of intelligent assistants, to integrate the activities carried out in this phase. In an initial moment, a questionnaire will be made available to the participants which will make it possible to identify their daily practices, preferences, and television consumption habits, as well as their personality traits. The data collected in this questionnaire will allow creating personas with distinct profiles, in terms of characteristics (of the user) and TV consumption behaviours, which will be useful to make design decisions that will allow personalizing the proactive suggestions according to the participants' personalities, preferences, needs, daily practices and TV consumption habits. At a later moment, according to the personas created, the five visual medium-fidelity prototypes previously developed will be adjusted and personalised. In view of identifying the proactive personalisation properties, the prototypes, after being personalised, will be tested in the UX laboratory, using (once again) a WoZ. The data collected in this phase will also provide information on possible improvements to be implemented in the prototypes.

4.3.3 Phase 3 - Improvements and evaluation

In this phase, it is initially intended to adjust and improve the prototypes of the proactive scenarios developed, according to the results obtained in the previous activities. After this process, already with 5 prototypes of high visual fidelity, the Woz technique will be resorted to again, using the same participants of the previous phase. This is because the scenarios developed were customised considering the personas created from the participants' profiles in the previous phase. The purpose of this Woz is to evaluate the proactive behaviours and empathy of the prototypes and UX, to obtain an answer to the research question.

5 FINAL CONSIDERATIONS

As users increasingly seek personalised interactive media experiences according to their needs and preferences, it is considered that integrating proactive behaviours in intelligent assistants for iTV, which take into consideration users' characteristics, behaviours and daily practices, as well as their preferences, TV consumption habits and contexts of use,

can be an added value to make the UX more enticing. By anticipating the user's needs and intentions without the user making a request, this type of behaviour can also reduce the user-assistant interaction effort, making the interaction more fluid and bring an additional "human" layer to assistants, with the potential to make them more empathetic and friendly.

Since this is a research theme that is still little explored, as the main result of this project, it is expected to conceptualise a set of guidelines that can be used as a reference for different players (academia, industry) that are involved in the design of proactive behaviours for the television context. It is also intended to contribute to the identification of user characteristics (e.g. personality and mood traits) and characteristics of the assistant's (proactive) behaviours that may influence the user's perception of the empathy of a proactive assistant for iTV.

ACKNOWLEDGMENTS

This paper is a result of my PhD research scholarship (grant agreement number 2020.08009.BD), funded by the Foundation for Science and Technology (FCT) and the European Social Fund.

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