Struggling against Social Isolation of the Elderly – The Design of SmartTV Applications

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Abstract This chapter charts a work in progress in the frame of the European project AAL FoSIBLE. Our hypothesis is that virtual networks and online generational communities could offset the lack of relationship, prevent isolation and increase self-esteem for older people living alone at home. Following this purpose, we are then aiming at defining services by rethinking the use of well-known existing technologies and to broaden their scope to be more affordable by older people. This chapter describes related work on the use of the Internet for social interactions among the elderly. The living Lab approach we follow and our results on understanding the actual use and needs of the elderly are presented, followed by the SmartTV platform which is iteratively developed. The analysis of the use of this platform being designed in a user-centred approach will permit us to answer our research issues.

Introduction

For the most developed world countries the chronological age of 60 and over represent the border where is defined an "elderly" or "older person". This definition is in general associated to the age at which people get retired. Europe represents the highest proportion of elderly[1]. In France they represent 22,5% of the entire population[2]. For the next 25 years they are estimated to reach 1/3 of the entire population [1].

Ageing is a new step of life with a lot of changes that could be related with physical, cognitive and social frailty. Physical and cognitive frailties have been addressed in several research and industry initiatives focusing mainly on the development of a variety of assistive technologies for maintaining elderly with disabilities at home as long as possible. These technologies mainly offer services for

[1] http://www.who.int

[2] http://www.france24.com/fr/20100119-647-millions-fran-ais-plus-500-millions-deurop-ens

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health monitoring and security, and are designed to give the elderly a means of living independently while being able to rely on help in case of emergency.

From our point of view, even if these technologies are interesting and useful for the security of elderly people, they have two kinds of limitations:

First, all those technologies are often considered as intrusive and raise ethical, psychological and social issues [2, 3]. The more the disability and loss of independence faced by the elderly is great, the more is the need of private information by these new systems to be more effective. Caring for older people while taking into account their concerns about their privacy and the social isolation they suffer still represents a major research issue. Secondly, successful ageing cannot be reduced to being in good health and has to take into account well-being and self-esteem.

Rather than addressing autonomy and dependency, our aim is then to define how ICTs could alleviate isolation and loneliness, in order to cope with social frailty which is however an important health-related issue. Indeed, the diminution of social ties with former colleagues after retirement, the loss of spouses, friends, distance from children and the gradual reduction of the mobility and autonomy can contribute to isolation, depression and may have negative impacts on elderly' general health status. A recent study [4] has even showed that the lack of social relationships influences the risk of mortality of ageing people.

Our hypothesis is that virtual networks and online generational communities could offset this lack of relationship, increase self-esteem and prevent isolation for older people living alone at home and who want to stay at home like the majority of them [5]. Having access to social support from their peers online and anytime, could enable elder people to talk about their problems rather than letting worries accumulate for a long time before they find a hearing, especially for them who are reluctant or unable to participate in face-to-face discussions or to go and see a professional caregiver.

This chapter starts by describing existing work on the use of the Internet for social interactions among the elderly. We then list our research issues linked to the creation of services for the elderly by rethinking the use of well-known existing technologies and to broaden their scope to be more affordable by older people. In order to create these services, we have adopted a Living Lab approach in the frame of the European project AAL FoSIBLE[3]. After describing this approach and our results on understanding the actual use and needs of the elderly, we present the platform which is iteratively developed. The analysis of the use of this platform being designed in a user-centred approach will permit us to answer our research issues.

[3] Fostering Social Interactions for a Better Life of the Elderly

Related Work

Several online services dedicated to social networking among elderly exist, most of them aiming at finding companions (Netsenior[4],Voisin-Age[5] …).

Elderly also participate into online discussion forums. Some studies on this phenomenon have been conducted recently, for instance comparing online and offline settings. For instance, Pfeil et al. [6] highlight that older adults' perception of social support in online settings (such as online forums, chat rooms and social networking sites) is different comparing to their offline experiences; On one hand physical co-presence is very important for older adults for disclosing one's feelings to others and establishing a level of trust, which is a prerequisite for exchanging personal information in online settings. But on the other hand, the concern of being a burden - which is a reason for elderly' reluctance to talk about their problems - does not exist when disclosing information about oneself in online settings due to the anonymity and the fact that people do not have to face the other person directly when writing a message.

This finding is in line with other studies, such as the qualitative analysis of Israeli retirees by Blit-Cohen and Litwin [7] which suggests that the virtual world is a potentially important arena for the production of social capital among older adults. They have showed that elderly connections occur in both physical and virtual world, and that the participation in cyberspace allows elderly persons to develop social ties, to strengthen the flow of information and to enhance norms of reciprocity through computer mediated networks.

For Wright [8] friendship on the Internet network enables older people to bond with different kinds of groups. They thereby create and develop relationships not only with other elderly people, but with members of different backgrounds and different generations as well. The expansion of elderly persons' interpersonal environment by means of virtual communities enables them to feel more integrated into society. Elderly' social worlds do not necessarily reflect participatory decline and social isolation. They could be engaged in strengthening or enlarging their networks, both the physical ones and the virtual ones. Internet interaction is then one of many types of social interaction, such as meetings in local communities or clubs. Wright [8] has also showed that the amount of time older adults spend in an online support community has a positive impact on their network size and the satisfaction with the received support. Respectively, older adults who spend less time communicating with online community members rated their satisfaction with support from their offline network higher.

Lepa and Tatnall [9] have analyzed the formation and operation of virtual networks of older people using the GreyPath community portal. The major component of the portal is the Village, an innovative virtual community. Communities of interest such as book or art lovers are established when accessing the chat facili-

[4] http://www.netsenior.fr

[5] http://www.voisin-age.fr

ties and message boards. The findings are that GreyPath is a technology that has the potential to strengthen the bonds between older people living in a region that may be geographically far-flung, to make it into a virtual community.

Older adults could be concerned about misbehaviour and misunderstandings in virtual communities based on the fact that online interaction is generally text-based. Kanayama [10] studied an online community for Japanese older adults with a focus on self-disclosure and the exchange of social support. She states that text-based online communication for older adults, much like writing letters, is enhancing rather than limiting their ability to interact on a personal and emotional level. She also mentions that older adults perceive the asynchronous nature of online communities and the possibility to edit messages before sending them as beneficial.

These studies about the use of the Internet by elderly people, the complementarity between online and offline interactions, the features which are the most interesting for this populations are very fruitful, but few of them include implication for design, questioning the medium and ergonomical concerns; many questions still remain to be answered about how to design systems for social interactions among elderly.

Research Issues

Our researches are devoted into creating services for elderly by rethinking the use of well-known existing technologies and to broaden their scope to be more affordable by older people.

The questions are: (1) could we consider the development of innovative services based on an interactive Smart TV platform as a solution for elderly' social isolation issues? (2) Acknowledging that the development of online applications for supportive ties among older people by interaction on the Internet is technically possible, will the feelings of mutual trust and of belonging be sufficient to build virtual community between elderly who are used to face-to-face interactions? (3) Will they be more willing to stick to virtual groups if they have less reluctance about using TV than computers? (4) Older people tend to have particular problems with the interaction of new technology because devices are not designed to accommodate their special needs [11]. How could we adapt existing interfaces and interaction modes to fit their needs and enhance communication and social support?

A Living Lab Approach

A living lab is a real life experiential environment which allows all stakeholders to concurrently consider both the performance of a service and its adoption by users at the earlier stage of research and development [12].

Various models of User Centred Design, such as Cooperative Design [13], Participatory Design [14], Contextual Design [15] and Experience Design [16] are intended to consider user requirements right from the beginning. These are considered as development processes and not innovation systems. The basic ideas might be similar, but they do not cater for the systematic foundation of an innovation system [17]. However, Living Labs as new paradigm are operating as a User Centred Open Innovation Ecosystem [18], to promote a more proactive role of users from User Centred Design and User Experience towards user co-creation. Living Lab is defined as an experimentation environments in which technology is given shape in real life contexts and in which (end) users are considered 'co-producers' [19] or co-creators involved in all of the product or service development lifecycle [20]. Living Lab is more than experimental facility as its philosophy is to turn users, from being traditionally considered as a problem, into value creation [21]. Living Lab represents a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts. The key aspect of differentiation regarding Living Labs is the involvement of the users as stated in [22], "the real challenge may lie in involving users in a sociological sense, that is to say, by taking into account the micro-context of their everyday lives". The development of Living Labs is supported by the belief that the full potential of ICT today is not in the continued innovation of new technical products with superior technical performance, but rather the understanding of the user situation and innovation of solutions to match those in a changing society [17].

Living Labs move research out of laboratories into real-life contexts to stimulate innovation. A Living Lab instruments and stimulates users to drive and take active part in research, development and innovation, in their normal real-life environment. The approach is intended to [18][21], 1) Engage all stakeholders, especially user communities, at the earlier stage of research and innovation for discovering emerging scenarios, usages and behaviours; 2) Explore, experiment, and evaluate (including socio-ergonomic, socio-cognitive and socio-economic aspects) new ideas and innovative concepts as well as related artefacts in real life situation; 3) Observe the potentiality of a viral adoption of new artefacts through a confrontation with user's value models. 4) Result in more accurate and reliable products and services. As an example of a living lab used for developing solutions dedicated to elderly "Caring TV" is the Finnish Well Life Center. It was established by the city of Espoo and Laurea University of Applied Sciences [23] Caring TV is a television functioning as a user interface designed to improve the quality of life of elderly. The TV is controlled by a touch-screen. Through the TV one can broadcast programs meant for elderly, for example physiotherapeutic advice, rehabilita-

tion programs and cooking tips. In addition Caring TV enables elderly people to communicate with health care professionals, who in real-time through a view phone give advice in areas concerning healthcare and well-being[6].

Current technological advancements promise very exciting opportunities that seek to address different areas in the lives of the elderly. Overall, there are many successful systems. However these are mostly health systems, ambient technologies, or monitoring tools. Through the living lab approach and the fact of integrating end-users on the development process, we are not just attempting to provide solutions by addressing issues related to aging (general health situation, security, ergonomic…) but to provide social support and a higher quality of life for the elderly based on their expected needs.

As the integration of users and stakeholders is crucial in setting up and running a Living Lab, for the FoSIBLE project stakeholders from both the public and the private sectors are currently involved. We are adopting the living lab approach to explore new ideas and concepts on creating innovative applications based on existing technologies to foster elderly quality of life, experiment prototypes and evaluate breakthrough scenario that could be turned into successful innovations. The experimentation and evaluation of the resulting scenarios and smart TV applications are driven by users within a real life context.

In order to be able to design services which will be usable and useful for elderly staying at home, we need to clearly understand how do they live, what are their actual interactions and communication modes and to explore in what areas of their social life digital technology could bring a meaningful contribution.

10 end-users were recruited in France by the intermediary of elderly associations for recruiting end-users. We organized a meeting with the help of our partnership Les arcades (a gerontology prevention centre financed by the Malakoff Médéric group which is one of the biggest players in complementary medical insurance in France). Two brochures were made for this occasion and given to the participants. One gives a general overview of the project and the other includes a set of usage scenarios of social television, so that participants can get an idea on some potential opportunities for using the system that we intend to design. The selection was made upon their age and familial situation. The volunteers are 8 women and 2 men aged between 65 and 90 years and showing no apparent health problems that prevent them from leaving or being in contact with their friends and family. However, one woman suffers from arthritis affecting her hands and feet, which forced her to stop working 10 years before retiring.

Semi-structured interviews were used to understand participants' daily practices, how do they live and what are their actual needs in relation to the use of TV as a medium of communication and collective activities. We conducted the interviews in the participants' homes, which was an opportunity to observe the environment in which participants live. Each interview lasted between one and two hours.

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[6] http://www.caringtv.fi/

Daily activities and expected needs

The social network of participants interviewed in the project is limited to their families and to some friends. Most of them use the telephone to communicate and do not feel isolated as long as they can travel to visit them or to participate in group activities organized by Les Arcades: roundtable discussions organized by the psychologist of the centre, philosophy-coffee, theatre, yoga, annual travel, embroidery ... Unfortunately, recently all of these activities are no more organized by Les Arcades but by an independent association. This change affects the people we interviewed and as a result, they do not participate so often.

The participants receive regular visits from members of their families (mostly children) to help them for shopping, to do some work in the house (mowing the lawn, cleaning the gate ...), or to accompany them on journeys. They had no contact with their neighbours, however some of them said that they know that they can count on them in case of problems or if she needs help.

At home, the days of our participants are mostly organized the same way. They share their time between cleaning the house, reading, playing crosswords, arrow words, coded words, sudoku ... and especially watching TV programs by selecting them from a program guide or a magazine. However, the time they spend affront television varies from one participant to another. Some of them watch television at specific times (noon for news, series ...), while others say they keep it on to have a kind of presence in the background even they are not watching it.

The phone is still their main communication medium. They mainly call their children, grandchildren and friends, especially when they cannot see them. All the participants evoke the lack of communication with their grandchildren, and the fact that they miss sharing moments of their lives or seeing them growing.

Some of them expressed problems using remote controls: when they have a separate remote for the TV and for the TNT decoder (for digital TV which became mandatory since September 2010), some features suddenly become redundant (such as volume control for example which can be provided by the two remote controls). The participant suffering from arthritis also has difficulties pressing buttons that are too small and with the confusion to select channel numbers with more than one digit (for example channel 32 which is the one for the local TV where she lives). Most of the participants usually use the remote only to turn the TV on and off, to control the volume and to change the channel. They do not use advanced features.

Participants have expressed many wishes. Their first needs were communication-oriented: they would appreciate more communication with family member and friends, especially for those who have friends at the retirement house (which main occupation is to watch TV).

In terms of sharing, our participants also proposed virtual guided tours on TV for cities and museums, attending courses (computers, cooking, gardening, foreign languages …), sports sessions, playing remotely games (crosswords, sudoku, bridge ...), online book club exchange, online round table, sharing a TV program,

having a photo album on TV and being able to annotate the photos to remember the context in which they were taken.

Participants also expressed the need for more accessible and less complicated interfaces than computers. About control interface, participants who do not have disabilities think using a keyboard would be possible but not very practical. They prefer a digital tablet, even if they find that the voice control is also a simpler interface than the keyboard. The digital control interface could be used for collective games as crosswords, puzzles or sudoku, and to exchange drawings with small children....

Personas, storyboards and scenarios

Elderly people have limited experience with information technology, which implies that the perception of their needs in this term raises special design issues; likewise designing for them cannot be made just through common methods such as the application of guidelines.

Based on the data collected during the interviews, a set of personas have been created [24]. Although personas are fictional, they describe attributes of our real users. Each persona has a name and a picture. They are carefully described in terms of needs, goals and tasks. Two primary personas were created for each participating country of the project (France, Germany and Austria). Such detailed personas are a key to avoid tendency for the developer to usurp or distort the real end-user. To enhance the presence of users in the development process instead of talking about “the users”, technical partners develop for these personas as real persons. The persona must be a concrete individual in every one's mind. These personas are the link between designers, developers and end-users. Figure 1 represents the FoSIBLE personas panel.

Fig. 1. FoSIBLE Personas

Scenarios and storyboards are used for describing how the personas can use the defined services. They allow rapid communication on the potential uses and needs and especially about the technical feasibility. We have also presented scenarios to end-users to enrich and refine them iteratively during the development process. The analysis of the first scenarios by the developers revealed that not all the features can be implemented. The decision was made to consolidate and specify all scenarios to fit the potential of the selected Smart TV platform (HBBTV) and control interfaces (gesture recognition and tablet). Here is an example of a consolidated scenario:

François is staying on his armchair watching a literary program "le bateau livre" on "France 5" channel. He likes to be abreast of literary news. The show discussion was about Jonathan Franzen's new novel "Freedom". He activates his buddy list and sees that Madeleine is online, watching "Arte" channel. Using his tablet, he activates the chat box and sends her a message by typing on the virtual keyboard to invite her to switch to "France 5" channel. On Madeleine's TV the chat box appears on the corner of the screen highlighting the message of François. Then they start to exchange messages about the TV show. Madeleine says, "This is a great show I did not hear about it before". François is very happy that he can find someone who shares his passion for books.

François has an idea: "it will be nice to recommend this book to my book club community". He activates the FoSIBLE widget. To have access, he does not need to identify himself as he chose to connect automatically by saving his login and password. Once connected, François uses left and right gestures to navigate and find the "Clubs" service. Existing clubs appear and with the tablet he chooses the "Book Club". François can see on his main page persons who joined the club recently, the most recommended books and the last active discussion(s) on the forum. On his tablet, he clicks on "Recommend a book" icon. A recommendation form is represented. He fills in the form using the virtual keyboard on the tablet - with the book title and author name. From the "Share Book Recommendations" space, François can see what his friends are reading now, and he can keep track of what he would like to read by marking some recommendations as "book to read". As François wants his best friend Pierre to be notified of this recommendation, he sends him a dedicated message "A really good book! Come this weekend and we can discuss around a cup of tea". Pierre receives the message instantly on his "Stay in Touch" space with a notification displayed on his tablet.

To help the members of the "Book Club" to stay in touch and being aware of the activity of the community, a monthly letter is sent to them by the system on their "stay in touch" inbox. This monthly letter is a kind of newsletter that contains book reviews from the club members and the most recommended readings.

Mockups have been defined to illustrate scenarios and help in collecting feedback and comments concerning the services and interface development. They are used as a way to test end-users abilities to interact with specific devices and technologies and imagine alternative design features. It is also a way to focus on problem areas of the project and verify the feasibility of design choices.

We have defined 4 services that users can select when looking at their TV set: WatchTV, Play, Stay in Touch, Participate in clubs:

- If the user selects Watch TV, s/he will be able to watch any program (like in a traditional TV), but also to see her/his buddy list, to interact with her/his buddies, to recommend programs and to look at recommended programs.
- If the user selects Play, s/he will be able to play games, to invite others to a game, to compare scores...
- If the user selects Stay in Touch, s/he will have the access to all the materials that her/his relatives want to share with her/him (photos, videos, drawings), s/he will be able to send/receive message, etc.
- If the user selects Participate in clubs, then s/he will see existing clubs (yoga, philo cafe, cooking, poetry, reading ...), and s/he will be able to create a new one.

The FoSIBLE Platform

Different existing TV platforms and user interfaces have been analysed to choose the more adapted configuration. According to the goals of the FoSIBLE project and the competitive analysis that was done to compare existing social TV systems, the standard HBBTV (Hybrid Broadcast Broadband TV) was chosen. This choice was motivated by the fact that HBBTV is an open platform that provides an alternative to proprietary technologies on the European market.

The central element of the FoSIBLE platform (Figure 2) is the Smart TV system using the standard Hybrid Broadcast Broadband Television (HBBTV). Smart TV[7] is a set of web-based services running on an application engine installed in digital TV connected to the Internet. A Smart TV application is a special type of widget that is implemented on a browser and runs on the TV screen. Viewing an application is very much like viewing web pages using a web browser on an ordinary PC. Screen resolution, hardware specifications and remote controller make differences between applications and web pages. An application is a web page consisting of HTML, CSS and JavaScript. The HTML page shows the structure of the application, the CSS file does the style, and the JavaScript file controls the behaviour of the application. The smart TV service makes possible to extend the functions of the TV, so that users can obtain useful information and interesting contents on their TV screen. Applications implementing social features and functionalities requested by our users are developed on a social media platform (JoomSocial). In addition to traditional manufacturer-specific remote controls, gesture recognition and tablet PC are implemented and completed by sensor information to detect the presence of the user. The gesture recognition modules are used to generate commands to control the menu of widgets (see scenario). Users

[7] http://www.samsungdforum.com

will be able to use a tablet PC as an additional input terminal, which they can use to navigate on the TV, but also to enter text (e.g. during chats or when writing a short article). The tablet can additionally be used to display messages, when the TV is switched off or to be able to read messages in another room (e.g. read a recipe sent by a friend in the kitchen). Central orchestration of the system is guaranteed by the use of a web-based data-broker. It provides an easy integration of new data sets from various devices or software e.g. vital data, gestures…

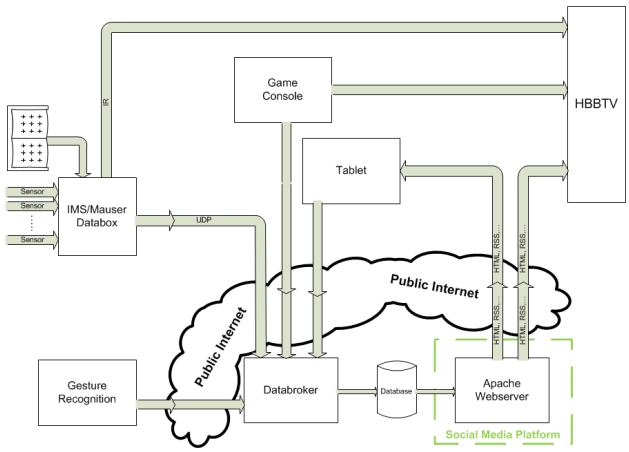

Fig. 2. Overall FoSIBLE Platform

The FoSIBLE platform is accessed by the end users by widgets. The background is slightly transparent so the image of the TV can still be visible.

The blue button of the remote control makes appear the “online friends” widget which lists all the friends who are watching TV at that time, with the channel information and their recent activities on the platform (figure 3).

Fig. 3. “Online Friends” Widget

Chat can be opened and closed via the red button on the remote control. It allows sending short messages to the online friends for instance to initiate a discussion when watching a TV program. The messages are typed on the tablet (figure 4).

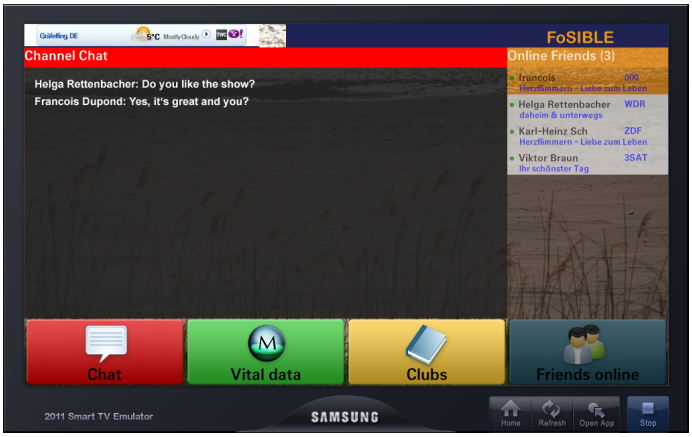

Fig. 4. "Chat" Widget

The yellow button lists existing clubs (figure 5). Either with the gestures or by using the tablet, the user can select the club s/he wants to participate in.

Fig. 5. "Clubs" Widget

After looking at all the topics in a club (figures 6, 7), s/he can comment or create a new topic by using the tablet.

Fig. 6. Browsing reviews in the Reading Club

Fig. 7. Reading a review and a comment in the Reading Club

The last widget called “Vital Date” is based on sensors data (blood pressure, blood sugar measurement, and weight measurement…) and depicts an “Activity Index” – this is another part of the FoSIBLE project which we do not focus on.

Focus groups will be organized in one month to allow users to develop their own ideas on the applications they will evaluate and control interfaces. The focus group will include ten end-users; with the support of a group leader, the participants will be able to speak freely about the system during a session lasting about two hours. The objective will be to collect data on how users perceive the system, and therefore to obtain their feedbacks, initial reactions to the design and to examine their preferences. After implementing focus groups results into the platform, participants will be equipped at home with the FoSIBLE system, and we will follow their use during one year.

Conclusion

Monitoring is a solution for older people to be able to live in their environment as long as possible, especially for those suffering from disabilities related to age or diseases. However, we believe that we need to take into consideration the quality of their life by improving their well-being and self-esteem. Based on the fact that social isolation due to loss of relatives and week social network could contribute to depression and may have negative impacts on their general health status, we would like to allow them to interact with their peers. To address this challenge, we have adopted a Living Lab approach consolidated by the use of personas, scenarios and mockups to define TV services. We have iteratively designed SmartTV applications to support socially oriented activities for older people. They are actually being developed and the household rollout will start in three months and will last one year. The use of these applications by the elderly will help us to asses if virtual networks and online generational communities could offset elderly' lack of relationship and social isolation by creating new ties among peers.

By inviting the future users to participate actively in the creation of the future services, in the early stages of design, bringing their ideas from their experience, practice, desires and frustrations, we expect significant impact of the qualitative work on the development, acceptance, appropriation, and usage of our technology in fostering the social life of elderly.

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