

Pervasive Information Architecture and Media Ecosystem: A Brazilian Video on Demand User Experience

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Abstract. This paper evaluates user's consumption and interaction with video on demand focused on the Globo Play app provided by Brazil's largest TV network: TV Globo. Globo Play stands as an answer to the video on demand request addressed by Globo in a market scenario filled with world competitors like Netflix and Youtube. Cooperative evaluation and SUS results pointed out that there still is much to do in order to improve and to meet user's requirements in what concerns quality of interaction, according to pervasive information architecture guidelines. User sessions indicated non-attendance to some usability issues as well. We came to the conclusion that the new world of ubiquity and pervasiveness probably does not make the traditional aspects of usability and user's experience disappear.

Keywords: Brazil · Media ecology · Pervasive information architecture · TV · UX

1 Introduction

Brazil is a country with continental proportions and a huge population (206 million people). In 2015, 39.3 million households (57.8% of all) had internet access, of which 99.8% had broadband connection, according to the Brazilian Institute of Geography and Statistics [1]. Nearly 102 million people are internet users and 139 million people have a mobile device for personal use. 97.3% of private school students and 73.7% of public school students use internet. The digital TV signal reaches now 49.4% of urban households and 17.6% of rural households.

Brazil is the third country in the world to spend a large amount of time on mobile phones [2]. Brazilians spend about 3 h 40 min online on cell phones and watch 6 h of TV shows in a daily basis [3].

This paper studies the user consumption and interaction of video on demand, focused on Globo Play app, provided by Brazil's largest TV network, TV Globo. This research regards the user experience of young middle class undergraduate students of

Rio de Janeiro, Brazil's second largest city. We conducted an evaluation of the user experience and information architecture.

TV Globo produces and exhibits a large number of shows, such as soap operas, sitcoms, drama series, special shows, news broadcasting and varieties. TV Globo's network spreads out through a vast ecosystem based on linear TV, smart TVs, notebooks, PCs, tablets and smartphones providing a cross-device user experience. The app provides real-time and non real-time on-demand video through the internet.

In order to collect qualitative insights about Globo Play app utilization a descriptive research based on cooperative evaluation sessions has been driven. Pervasive information architecture and media ecosystem theories were regarded as a fundament to understand the case study as well as usability heuristics.

2 Pervasive Information Architecture and New Media Ecosystem

Rosenfeld et al. [4] emphasize that information has been more abundant than ever due also to many available devices: smartphones, tablets, smart watches, etc. Many artifacts around us are connected to fulfill daily tasks and influence new ways to interact with information. A broader range of interconnectivity takes place, transforming the interaction of humans with isolated computers to a human-information interaction into a dynamic interaction ecology. As an example, Rosenfeld *et al.* [4] mention CNN's responsive adaptations for publishing news through different devices.

Arango [5] emphasizes that information architecture has to start from systemic thinking, since a diversity of products and services interact with each other through several channels. Nowadays, as physical and digital environments are integrated experience, information architecture needs a holistic approach.

It is worth mentioning the notion of ecosystem applied to media. The ecosystem idea was first proposed by Marshall McLuhan and Neil Postman in the American and Canadian academia. In 1968, the concept was formally exposed and defined in a lecture as a "study of media as environment". According to Postman [6],

"[...] human beings live in two different kinds of environments. One is the natural environment and consists of things like air, trees, rivers, and caterpillars. The other is the media environment, which consists of language, numbers, images, holograms, and all of the other symbols, techniques, and machinery that make us what we are" [6].

The idea of information architecture as ecosystem is observed in Resmini and Rosatti's [7] pervasive information architecture manifesto. The authors highlight that:

"When different media and different contexts are intertwined tightly, no artifact can stand as a single, isolated entity. Every artifact becomes an element in a larger ecosystem. All of these artifacts have multiple links or relationships with each other and have to be designed as part of one single seamless user experience process" [7].

Another important aspect in the manifesto regards the users' role transformation:

"Users are now contributing participants in these ecosystems and actively produce new content or remediate existing content by ways of linking, mash-ups, commentary, or critique. The

traditional distinction between authors and readers, or producers and consumers, becomes thin to the point of being useless” [7].

The concept of pervasive information architecture came up as a result of media convergence process. Smartphones, computers, tablets, smart TVs, smart watches, braces, social networks, tend to converge as an integrated system. Each one of these channels helps constructing one whole narrative. There is a complex ecosystem loaded by the production of continuous content that represents the new dynamics of information flow. The thin line between editors and readers cease to exist as well as the boarders from one media to another. Hybrid languages bring everything together.

In a scenario marked by fast evolution of technology possibilities, consumers’ behavior has been transformed. Users not only search, access and use information; since web 2.0, people also cite, create, reinterpret, edit, mix and recreate information through various interconnected channels. Consumers became *prosumers* and information tends to flow as a transmedia narrative.

The renewal of information architecture into new conceptual aspects perceived by Resmini and Rosatti is stressed by Morville [7], who pointed out its new role:

“(...) the design of ecosystems for way-finding and understanding promotes a holistic approach to information architecture and user experience that draws insights from multiple disciplines and historical contexts” [7].

Information architecture reframing led Resmini and Rosatti [7] to present five new principles of pervasive experience: (1) Place making – refers to the capacity to build a sense of self-localization. The principle suggests that architecture reduces the possibility of user disorientation. The heuristic interconnects conceptually with notions of space, place and context; (2) Consistency – refers to a model of pervasive information that attends goals, contexts and users, keeping the same logic in different medias, environments and necessities; (3) Resilience – refers to the capacity of the pervasive information model to adapt to specific users, their needs and search strategies; (4) Reduction – refers to the capacity of managing a huge quantity of information and organizing it for easy access which minimizes cognitive stress and frustration; (5) Correlation – refers to the relevant connections between pieces of information, services and products to help users reach objectives or stimulate latent needs.

3 Aspects of Brazilian TV System

TV broadcasting system was launched in Brazil in 1950, in São Paulo, and rapidly became reference for the population behavior, profoundly influencing the country’s politics and cultural trends. TV Globo station was founded in 1965 and soon become one of the biggest references in Brazilian teledramaturgy [8]. In the 70s, the company stood out bringing one of the major commercial products of the Brazilian TV, the soup opera, and shortly after, in 1982, the company dazes competitors expanding to successful mini-series. In 1995, TV Globo retained Latin America’s biggest TV production, as 90% of its TV shows’ schedule were produced in-house. The Globo Group incorporates TV Globo, GloboSat (cable channel), Globo.com (internet portal), Editora Globo (publishing house), Som Livre (record music company) and Zap (real state

portal), among other companies. Nowadays, TV Globo produces 3,000 h of entertainment as well as 3,000 h of sports related shows and news per year, with international award winning contents. It is a huge corporation with 119 affiliated broadcasters through open TV, covering 99.5% of Brazilian population. In 2016, the company reached 98.44% of the country's territory throughout 5,482 cities [8].

However, over the latest years, TV Globo has been suffering strong impact from other TV corporations, as well as digital competitors as Youtube, Netflix, Facebook and Twitter, leading its national influence to a gradual decline.

4 Case Study: The Globo Play App

In order to face adversities, TV Globo recently launched the digital app Globo Play, aimed to several integrated systems that became known as the Globo's version of Netflix. In four months, Globo Play app reached five million downloads on mobile devices. The app is available for iOS, Android, smart TV (LG, Sony and Samsung) and Chromecast. There are development projects for other TV manufacturers and Apple TV. Awarded in 2016 as the app of the year in media and entertainment categories, Globo Play app means to bring ubiquity to the Brazilian TV system.

Globo Play app enables users to watch the national newscast, *Jornal Nacional*, or any other show at any time, out of the official schedule. It also provides TV broadcast in real time to smartphones and other devices connected to the internet. Nonetheless, there are access restrictions to the most awarded and popular shows (soup operas, mini-series sitcoms) and only paying subscribers have access to it.

The app's information architecture categorizes its content in seven major topics: soup opera and mini-series, sitcoms, variety, reality shows, news, sports and specials. There are three different levels of users: (1) the anonymous user – watches the news broadcast, parts of sports, variety and reality shows; (2) the logged on user – watches the TV shows on real time; and (3) the paying subscriber – watches soup operas, mini-series, sitcoms and has access to all archive of older shows. Besides the direct use, there is a social network layer that enables likes, comments and sharing.

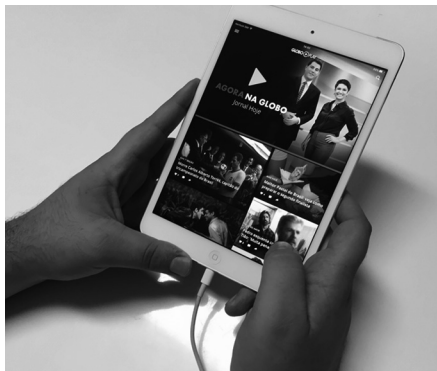


Fig. 1. Home of the app Globo Play for Ipad (photo: Luiz Agner).

The Globo Play app goal is to bring a multiple device experience to users, in a cross-channel interaction journey, as it can start with video consumption on tablets, followed later on with smart TV or on the website. The [Globo.com](#) portal is a technological partner, responsible for the system's infrastructure and front-end interaction. Apple TV, Android TV and videogames are part of future developments for the app (Fig. 1).

5 Research Method

In this research we applied cooperative evaluation method and System Usability Scale (SUS) to evaluate the Globo Play app user experience. As Monk et al. [9] explain:

“Cooperative evaluation is a procedure for obtaining data about problems experienced when working with a prototype for a software product, so that changes can be made to improve it. What makes cooperative evaluation distinctive is the collaboration that occurs as users and designers evaluate the design together. [...] This makes the procedure seem very natural to the users and requires fewer resources than more formal testing methods” [9].

The goal of an interface is “to communicate with its users, however sometimes there is a problem of communication”. According to Monk *et al.* [9], cooperative evaluation can be seen as a method that brings together evaluators and users “in a cooperative context where the user completes work and is encouraged to think aloud about problems experienced”. Evaluators allow users to make mistakes and, from user's questions, are able to take the investigation deeper in order to get further information about the interface. When a user finishes the set of tasks, the evaluator interview him/her about the session to deepen the investigation and clarify any mis-comprehended observations. This is called a debriefing interview.

Cooperative evaluation should be applied agilely, with low cost procedures and conducted as a natural process. The interaction sessions used in this research were recorded by Lookback tool, using a MacBook Air and a Mini Ipad.

The cited authors [9] expose that cooperative evaluation sessions provide two kinds of data about the user experience: unexpected behaviour and user comments. User comments are important subjective evaluations of the interface. They reflect the user's experience with the system and may be recorded in audio or video format during a debriefing interview. It is basically a qualitative research.

Most tasks we proposed to Globo Play app users involved finding video on demand using the app's categories, as well as interacting with the social layer. The following examples are tasks presented to users during the cooperative evaluation sessions (Table 1):

Table 1. Some of the tasks proposed to users during the cooperative evaluation of Globo Play app.

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| 1- Using the app, access the “Small Business, Great Business” video and watch the story on the US market for smartphones |
| 2- Share this story in your Facebook timeline |
| 3- Indicate that you liked a video from the TV comedy show “Zorra” |
| 4- Send your comment about the video “Malhação - Pro Dia Nascer Feliz” |

In order to get a quantitative score, we applied the SUS scale as a post-test questionnaire before recording debriefing interviews. These responses helped guiding the interviews. According to Brooke [10], SUS questionnaire is a tool that aims to measure people’s subjective perceptions of a system, during short period breaks within evaluation sessions.

SUS scores can vary from 0 to 100. The value 68 is considered the average score for a SUS questionnaire. Any scores above 68 would be considered above average and scores below 68 are to be considered below average. SUS has become an industry standard, with references in over thousands of articles and publications. One benefit of using SUS is that it can be used on small sample sizes with reliable results (see Sauro) [11].

The seven participants invited for the cooperative evaluation and the SUS were young students of Social Communication selected from a college in Rio de Janeiro city. They were between 18 and 35 years old, with moderated or moderately high experience with information technology and with experience in apps like email, entertainment (audio and video), news, social networks and instant messengers.

6 Observed Interactions

Table 2 shows, in a condensed form, commentaries from users regarding their experience using the Globo Play app (for Ipad) while trying to accomplish pre-determined tasks as well as their profile. The goal was to register problems that could be related to the fundamentals of pervasive information architecture and interaction experience associated to the SUS score. Considering the most relevant, this paper presents data from four sessions (Table 2), with two Globo Play paying subscribers and two non-subscribers.

Table 2. Highlighted comments on Globo Play app based on users speeches collected during cooperative evaluation sessions, associated to each individual profile and SUS score.

| User | User profile | User comments | SUS score |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 3 | 15–19 years old, female. Undergraduate student Technology experience: moderate Daily internet access: more than 8 h Operational system experience: Android Globo Play app experience: some previous experience Linear TV: 4–6 times a week TV experience on mobile devices and PCs: moderate Preferences: series, soup operas and movies | Do not intend to use the app in future experiences because she got disappointed. She believes that Globo Play app could be much better She believes that the app enables only a small part of TV Globo content Her evaluation points out that the app is time consuming because it demands users to figure out where preferred content is located. The app lacks objectivity, as content identification is not obvious to her There is a fake look of simplicity provided by colorful nice displays She reported that quitting out would have happened if there had not been a continuous encouragement by the moderator The app’s functions are not integrated because they don’t make sense for her It has inconsistencies, irrelevant search results and lack of related content (as it would be expected in any website) She said that it is an awkward app. She got irritated with the waste of time Although she considers herself a young and technological driven person, she found herself “beating her brain out”. Her | 30.0 |

(continued)

Table 2. (continued)

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| | | self-confidence status got lower and she thinks that the app should be released “with a user manual” | |
| 4 | <p>25–29 years old, female. Undergraduate student Technology experience: high-moderate Daily internet access: more than 8 h Operational system experience: Android, Windows and Apple iOS Globo Play app experience: high-moderate experience Linear TV: everyday TV experience on mobile devices: high-moderate TV experience on notebook and PCs: some experience Content preferences: soup operas, mini series and varieties Paying subscribed user</p> | <p>She is a paying subscribed user for about a month and used the app in her Android smartphone and smart TV. She watches Globo Play content after her daily classes’ routine at night She considers the app “quite confusing” and should be “more organized”. She thinks the content categories should be available at the side menu She wouldn’t take it as an easy going app and states that her mother would get lost It presents an excess of fragmented featured shows that brings confusion and a lot of scroll downs is required The user complained “the comment button is decorative”. The insert comment task was blocked by a security issue. The app demands a validation login code sent through SMS, which the user included twice with no success. “Anyone would quit... It takes so much to comment.” She thinks that it is a non-friendly app because it doesn’t provide search field throughout the pages Although she already knows how to use the app, she doesn’t have confidence. For her, the best improvement should be a side menu with video categories</p> | 32.5 |
| 5 | <p>30–34 years old, female. Public relations bachelor Technology experience: moderate Daily internet access: more than 8 hours Operational system experience: Windows and Apple iOS Globo Play app experience: high-moderate experience Linear TV: 4–6 times a week TV experience on mobile devices, notebook and PCs: moderate Paying subscribed user</p> | <p>She is a regular Globo Play paying subscriber (US\$3.00 per month). She uses the app on a daily basis in order to keep up with the soup operas at night and weekends, using a HDMI connection to a regular TV She said that there is a different experience in each device: tablet, notebook and smartphone. She adds that there is no consistence among these devices. The user pointed out divergences on the Globo Play ecosystem. The version for desktop (GloboPlay.globo.com) was considered the best experience She criticized the fact that there is many featured content and said that it would be much easier if users could find all categories on the top of the display. This would avoid the over scrolling down to find content Her assumption is that the app would automatically recognize the user’s preferences and load up the full content She points out that users like her mother would have a hard experience with Globo Play app. She did not like the experience with the app tablet version She had difficulties to find specific shows, as the interface interaction is very different from the other options. “It has too much content at the same time” For the app tablet version she would eliminate the featured shows and leave only the live stream as well as the main shows categories She didn’t understand why she could not include a comment, since she is a paying subscriber. “Some kind of error did not let me comment, nor read other users comments”. “I have never noticed the social layer” She insisted on fulfilling this task but verified that the add comment icon did not work, the sharing icon showed no problem, and the like icon asked for a subscriber login confirmation</p> | 57.5 |
| 6 | <p>20–24 years old, male. Undergraduate student Technology experience: moderate Daily internet access: 3–8 h Operational system experience: Windows, Android and Apple iOS</p> | <p>Considers that Globo Play app is not easy to use, compared to Netflix and Youtube. “When using Youtube, I easily search through keywords, while here I put every all information possible, but the results are not-related. It was hard to understand its logic. If I use Youtube to find a specific scene, probably I will find it faster than using Globo Play app.”</p> | 42.5 |

(continued)

Table 2. (continued)

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| <p>Globo Play app experience: some experience</p> <p>Linear TV: everyday</p> <p>TV experience on mobile devices: some</p> <p>TV experience on notebook and PCs: moderate</p> | <p>“The search presents three results for subscribers, despite the fact that I am not a subscriber...That’s kind of stressful”. “Most of the featured scenes are just for subscribers. This sucks.”</p> <p>The user added that the keywords search doesn’t present the results in the alphabetical order, nor in chronological order. “The first top result is not the most relevant and it brings too many exclusive results to subscribers – this is a dangerous strategy because it could lead to the belief that most part of the content is reserved for subscribers only”. “This dynamics could drive users off”</p> <p>The user tried to include a comment with no success. He considered the app hard to learn. “If I had given this app to my mother, it would have taken her two days at least to completely interact with it”</p> <p>The app has too many steps before it is possible to reach the category menu, causing cognitive overload: “It is different from Netflix, that presents featured content options based on your previous preferences, instead of putting upfront what Globo thinks is the most important”</p> <p>“Youtube and Netflix have an interaction that I am already used to. With this app, I didn’t have confidence to enter too much further and leave the chance to go backwards all over again. You get apprehensive”</p> <p>“On the release week, I downloaded the app to try it out, but right on the first experience, I thought it complicated and deleted”</p> <p>The user suggests some improvements: the main category menu should go the top or side position. “Soup operas and mini-series have some free content, but scenes are too short”. “There could be a map to help navigation”</p> <p>“How to become a subscriber? The app doesn’t explain...”. “I was upset because the app said: <i>This is an exclusive content for subscribers</i>’”. “But there is no option to become a subscriber. It seems like the message is: If you are not a paid subscriber, get out of here!”</p> |
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If we take into account the average of all SUS score generated through the cooperative evaluation it would point out the 59.64 score, which is considered to be a low score in the System Usability Scale. Furthermore, if we take the SUS average only regarding the paying users subscribers, we would get a 45 score, which is even lower than the first one. These are not a good results, considering that the average score with SUS studies is 68 [11]. Below this value it is advisable to promote new studies over the detected problems in order to ensure an optimised system usability.

7 Discussion and Conclusion

Globo Play app stands as an answer to video on demand requests addressed by Brazil’s main TV network in a market scenario filled with competitors like Netflix and Youtube. It also represents an attempt to reverse the downward trend in linear TV audiences as well as in the decrease in publicity income, driven over the last years by social media and other internet services.

This has been Globo Play app’s goal since it was launched by TV Globo station as a cross-platform software. Aimed at the young public in order to gain contemporary

and future audiences, Globo Play app designs an ecosystem that offers a cross-channel experience.

Globo Play app faces the huge challenge to be competitive within well-established practices that take place with public use of other apps and social media like Facebook, Netflix and Youtube. Competition gets even more difficult taking into account that TV Globo is a traditional open TV station. Broadcasting business and content production are its main features.

The cooperative evaluation and SUS results pointed out that there still is much to do in order to improve and to meet the user requirements in what concerns the quality of interaction according to pervasive information architecture guidelines.

The cooperative evaluation sessions with young users indicated the non-attendance to some pervasive information architecture and usability heuristics as follows (see Table 3).

Table 3. List of problems based on users comments on Globo Play’s cooperative evaluation associated with heuristic categories based on Resmini and Rosati [7], Nielsen [12], Norman and Nielsen [13], and Oliveira *et al.* [14].

| Heuristics | Insights/Observations | References |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Consistency; Standards | <ul style="list-style-type: none"> - Inconsistency in the search field application (search fields on all pages were required by users) - Absence of upper global navigation bar or side menu with IA categories. The web version has this function (as a side menu) but tablet and smartphone versions do not | Resmini and Rosati Nielsen |
| Match between system and the real world | <ul style="list-style-type: none"> - Taxonomy categories do not reflect the user’s mental model. Users have difficulty in finding videos by browsing the categories proposed by the app | Nielsen |
| Reduction; Aesthetic and minimalist design | <ul style="list-style-type: none"> - Excessive featured video scenes in the homepage leads to extra scroll down procedures. The attempt to find anything is difficult and disturbing | Resmini and Rosati Nielsen |
| Resilience; Flexibility and efficiency of use | <ul style="list-style-type: none"> - Contents are not loaded according to the logged on user’s profile. - Previous content experiences are not loaded in the navigation history. The absence of history also does not help in the cross-platform continuity throughout devices, as Netflix does | Resmini and Rosati Nielsen |
| False affordances | <ul style="list-style-type: none"> - The comment icon isn’t actionable - Categories labels are taken for affordances - The label See More Scenes is taken for affordance | Norman and Nielsen |
| Resilience | <ul style="list-style-type: none"> - Comments are not allowed in some videos - Non-subscribers have more difficulty to post their comments | Resmini and Rosati |
| Interoperability | <ul style="list-style-type: none"> - SMS validation code is requested to approve comments insertion in the cross-platform experience. Interoperability among devices is reduced by the rigid security that breaks the flow of experience | Oliveira et al. |
| Correlation; Recognition, diagnosis, and recovery from errors | <ul style="list-style-type: none"> - The interdiction message Content Available to Paying Subscribers Only does not help the user on how to become a subscriber, breaking the flow of the experience | Resmini and Rosati; Nielsen |

The Globo Play app performance for Ipads as part of a media ecosystem proved to be unsatisfactory taking into account that the usability and UX requirements in the new pervasive scenario increased. New information architecture guidelines are related to a network that had incorporated complexity based on ubiquity and heterogeneity.

People inhabit this media ecosystem where prosumers, a new kind of user, also wish to participate, to share, to comment and to produce content. The needs and goals of a prosumer call for a more rigorous set of requirements of experience to which all ecosystem components should fit in.

With various emerging device/interaction paradigms, platforms like Globo Play app are emerging from tools to ecosystems. This context brings new horizons for IA: according to Rosenfeld *et al.* “what is needed is a systematic, comprehensive, holistic approach to structuring information in a way that makes it easy to find and understand – regardless of the context, channel, or medium the user employs to access it” [4].

However, the cooperative evaluation sessions conducted in this research produced results that highlighted some experience aspects which are not reflected upon pervasive IA heuristics. Some traditional usability, IA and experience problems were not overcome yet and they need to be taken into account also in the pervasive information scenario. We are talking about problems such as a match between system and the real world, hidden affordances, usable categories, interoperability or recovery from errors.

Regarding ecosystems, as users mentioned in their interviews, insights force us to conclude that probably the new world of ubiquity and pervasiveness does not make some traditional aspects of experience disappear. On the contrary, these aspects are enhanced. Much of the experience can be impacted by generic problems, as Renzi [15] has already pointed out when proposing his heuristics for cross-channel scenarios.

Our observations also made us perceive that pervasive information architecture heuristics should probably be expanded to address, explain or reflect ancient problems of user experience which are still there. New research must be carried out in this direction.

Acknowledgements. The authors are grateful for the support of Faperj - Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (APQ1/2014).

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