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Designing, building and evaluating a social news curation environment using the action design research methodology

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Abstract In this paper, we describe the second design cycle of Acropolis, a social computing platform that allows citizens to build and share their own narratives about complex or long-term news stories, by involving them in collaborative processing of news data called social curation. Experimental results produced through quantitative and qualitative evaluations have shown, by positive evidence, that our proposed approach was able to support citizen engagement in collaborative curation of news content. Using the action design research methodology, we concluded the second design cycle of the platform with a set of design recommendations for building similar platforms.

Keywords Social curation · Collaborative processing of news data · User-distributed content · Action design research

1 Introduction

Social content curation is a new trend that emerged in the context of the mobile and social web revolution and has attracted the attention of many scholars who are interested in different issues. Content curation may be described as the process of collecting, organizing and displaying information relevant to a particular topic or an area of interest, and this can be carried out either manually or automatically [1].

Rotman et al. [2] claim that social curation platforms have emerged as large-scale crowdsourcing endeavors that aim to curate media content into a single repository. These systems allow the users to subscribe to predefined topics and provide the users with specific tools for annotating web pages with corresponding topics: "The users somehow form a group linked to a given topic, where they can push and pull appropriate contents" [1].

Social curation is the core practice of citizen journalism and social news sites, since both are based on material already published by news sites. In contrast to the professional journalistic curation—which is based on the strategy of "pushing" the news, keeping the reading public in the decision making within the land boundaries of pre-structured text [3]—social curation requires the active strategy of "pulling" the news, inviting citizens to search, filter, select, organize, interpret, reframe and finally distribute the collected content.

The focus of social curation platforms is not creating, but rather selecting, organizing, and distributing content published on other sites and platforms. These environments face different challenges to social creation/production platforms (e.g., Wikipedia), because curation and creation involve different tasks and require different behaviors and requisite skill sets, even though both require a crowd of contributors to help organize content [2]. Nonetheless, social curation technology is still in its infancy and there is scope for designs that may lead to more engaging experiences which also take into account a complex and diverse set of curated streams [4].

One key example of these platforms is Pinterest, a site that allows users to store and categorize images, which are called "pins" and organized in the so-called "pinboards". Pins can be created by either importing images from an external URL, which is known as pinning, or by repinning from an exist-

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ing pin. The site also provides users with facilities for liking and commenting on pins. Other examples include Storify—a platform for collecting and publishing social media stories, Scoop.it—a site for curating content around a particular topic, Togetter—a Japanese curation website for collecting Twitter messages, and Last.fm—a website for the social collecting, recommending, and distributing of songs.

A notable fact is that the existing academic research on social content curation websites has been almost exclusively directed to Pinterest site so far. A critical look at this narrow focus is to note that, of all possible forms of social curation online practiced, our understanding of this phenomenon is widely informed by studying how people curate content on Pinterest! The goal of many studies on Pinterest seems to be a better understanding of the site itself, rather than the study of social curation as a broader phenomenon. Few studies compare the curation websites to each other and there is a missed opportunity to transfer these findings to other areas of social curation poorly documented and understood. The challenges of comparisons between domains and the global shortage of this type of work have been recognized as an issue of growing concern among social computing researchers [5].

In this research work, the main goal is to address two research gaps. The first one refers to the narrow focus of most studies involving social curation platforms on some sites like Pinterest. To address this first gap, an exploratory analysis of the platforms was performed, under the perspective of Crowd Computing [35–37,39], in search of challenges and research questions [6], which also produced a typology of these applications [7]. This initial research provided a research and design opportunity: the social news curation environments.

The second research gap refers to the lack of constructive research directed to social curation platforms. The way we addressed this second gap was by designing a social computing platform—called Acropolis—which allows citizens to build and share their own narratives about complex or long-term news stories (such as "Global warming"). The design of Acropolis was guided by a set of key issues that were identified through the literature review, which include reducing the gap between curation as a personal activity and as a social activity, citizen engagement with news content, and support for building cohesive and coherent stories and plots [4].

We hold that the goal of engaging citizens in reading and curating news stories could be addressed through a social media environment that would allow each user to contribute with different angles or perspectives of a story in their custom narratives. Using the action design research (ADR) methodology, we concluded two design cycles in this work.

The rest of the paper is organized as follows. Section 2 provides some background on social curation and content curation platforms. In Sect. 3 we briefly discuss the research methodology used in this study. Sections 4 and 5 are devoted to discussing the problem formulation and the building, intervention and evaluation (BIE) stages of ADR, respectively. Reflection and learning through quantitative and qualitative data collection are described in Sect. 6. Section 7 is dedicated to the formalization of learning by providing a set of design recommendations for building similar platforms. Finally, in Sect. 8 we discuss the limitations of this study and present our conclusions and suggestions for future work.

2 Background on social curation

Social curation is about people distributing and marketing media content in their networks by making personal referrals and guiding their peers to consume content that they consider interesting and relevant [8]. The social curation trend resonates with the fact that today's social web may be more about user-distributed content than about user-generated content. This is acknowledged in recent work which revealed that only seven percent of content networked by Facebook users was created by them, whereas the most common use for Twitter is networking links to items of interest [9]. Acting as information filters, content curators provide an editorial perspective (highlighting interesting content), which usually involve a social component because users can follow other curators that they find relevant and expose them to new and interesting people and content [10]. What separates social curation from personal curation is the coordinated work that draws content to a shared repository [2].

As advocated by Hermida et al. [11], engaging citizens in social curation is more important than involving them in content production. As an audience, citizens participate in media processes by consuming and distributing media content and linking it with social relationships [8]. According to Villi [8], socially curated content is not only actively produced, it is also actively consumed. A US study showed that when news is passed along by peers, 38% of the audience read the material all or most of the time, 37% read it sometimes, and only 23% say they hardly read it [12]. This finding emphasizes the importance of encouraging and assisting the audience to participate in the distribution of media content.

2.1 Social curation of news stories

Social curation is the core practice of citizen journalism and social news websites, which draw on materials already published by mainstream and alternative news sites in order to curate and comment on them. Some scholars have claimed that, in these sites, citizens watch the gates of news organizations whose content is relevant to their interests (a process known as "gatewatching"), and then capture, compile, and curate such information with the goal of publishing news stories which build on the information [13]. News curators

do not only receive and filter out messages, they are active selectors and shapers of content, searching out news items and engaging in reframing and remixing [14].

Citizen participation in the news value chain occurs increasingly in the forms of content curation through existing social networks such as Facebook and Twitter [15]. In addition to this, a number of social curation platforms have been created for networking news stories (sometimes for producing custom newspapers). These tools have been designed both for the Web and for mobile devices and include applications such as Storify, Scoop.it, Flipboard, and Facebook Newswire. Social news curation platforms essentially support users in collecting and sharing news found on the Web [7].

The emergence of these tools highlights the fact that, although journalism has always incorporated an aspect of curation, more recently the curatorial role of journalists has expanded to include a broader set of actors. However, the aforementioned applications adhere to the single-curator model, and studies conducted on content curation platforms have shown that the majority of users view curation as a personal activity, rather than a social one [10]. Thus, we believe there is potential to evolve the current curatorial technologies to provide richer and more engaging social experiences for readers and curators of news.

2.2 Why do people curate and network media content?

Users collect content for many reasons [16]. According to McIntosh and Schmeichel [17], collectors' motivations range from obsession to investment, enjoyment, and personal expression. Scholars have begun to investigate what motivates people to curate content in social curation websites. Some researchers have demonstrated that curation might provide personal value to content curators because it gathers together items which may be difficult to find by other means [10], thus providing evidence for Clay Shirky's assumption that curation comes to the fore when search stops working [18]. Social serendipity has also been reported in the literature as one of the motivations for participating in social curation websites. However, these findings were obtained from the analysis of the social curation platforms that collect general media content (images, music, etc.).

If we look at the social curation phenomenon particularly from the perspective of curated *news content* in social news sites, some scholars may claim that the ability for the user to be a gatekeeper or source in the communication chain (the so-called *self as source* schema) is indeed the most motivating aspect of curating in social media platforms. According to Sundar [19], technological variables of social media platforms such as interactivity, modality, and navigability enhance user agency, which can have direct effects on psychological responses to mediated content, because the sense of agency will increase attention to content and will positively influence affective responses and attitudes toward the interaction. For instance, by posting a news story for friends on Facebook, people sharing the content may feel a sense of agency or influence over the distribution of the information. Although news items may not have been originally created by the user who curates and networks them, the user is in a position to inform his friends of the content. "Even if one is not the first to break the news, the role of a gatekeeper of information can by itself give users a profound sense of agency" [9].

2.3 Social content curation platforms

Social media networks are playing increasingly prominent role in people's daily life [33]. With the development of the Internet and particularly the Social Web, users have been spending more and more time in online social networks to communicate with others. As a consequence of the proliferation of social networking services, more data is being created in real-time [34]. In this context, digital artifact collections are becoming increasingly common. Jones [20] sustains the existence of an ecosystem of content curation that brings together people, content, and technologies, in which strategic relationships are maintained throughout the life cycle of digital content. Social media platforms actively participate in this content curation movement by providing tools to users. This applies, for example, to Flickr galleries, Youtube playlists, Google+ collections, and Twitter lists.

In response to this movement, a set of platforms specially focused on social curation has emerged in recent years to allow people to collect different types of content, including photos, audio, videos, and news. One of the most prominent examples of these platforms is Pinterest, a site that allows users to store and categorize images, which are called *pins* and organized into panels called "pinboards". Launched in 2010, the site had about 70 million users in December 2014 [21], and it continues to grow. On Pinterest there is no production of original content; instead, the site supports the collection of content around the web and organizes it in a convenient place for users.

This trend has provided many opportunities for researchers to enhance the understanding of individuals and groups via analysis on different platforms. Most of these research works focus on the analysis or prediction of many aspects of social networks, including characteristics and evolution of network structure, information cascades, user behaviors, interests, etc. Studying these social networks not only brings large commercial value in relation to viral marketing, social advertisement, and social recommendation, it also creates significant references for other areas including sociology, psychology, and economics [22].

Some scholars state that the emergence of social curation services may be attributed to three important trends [23]: firstly, people create a constant stream of social media content (including updates, location check-ins, and social networking posts); secondly, people use their social networks to filter relevant content by following others who share similar interests; and thirdly, social media platforms also curate content by giving curation tools to users (e.g., Youtube playlists and Flickr galleries), by using editors and volunteers (e.g., YouTube Politics), or by using algorithms (Youtube Trends and LinkedIn Today).

Social curation tools can provide a wealth of data related to users' interests, through the collaborative processing done by the crowd. Big data techniques such as the analysis of texts and images, if employed effectively in this context, can extract important insights derived from data related to users' interests. With this type of analysis it is possible to infer, for example, dissatisfaction with corruption and individuals' viewpoints in issues of great repercussion.

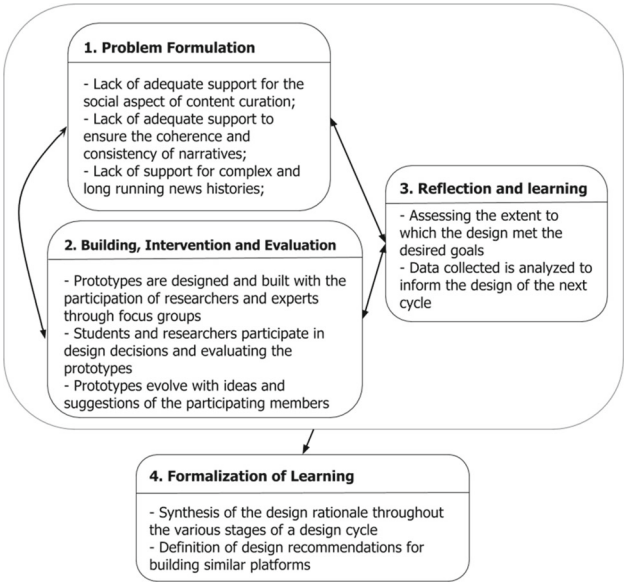

Fig. 1 Acropolis design through ADR

3 Research methodology

Like other initiatives [30] conducted by our research group, this project has been conducted as a case of Action Design Research, a method that combines research through design and action research [24] and consists of the following steps: (1) problem formulation; (2) building, intervention and evaluation; (3) reflection and learning; and (4) formalization of learning. Proponents of the ADR method claim that the approach allows the creation of an IT artifact that can improve its efficiency through the repetition of several cycles of design and evaluation.

Like other cases of ADR, the Acropolis project had two parallel goals: to make an intervention in the design space of social curation platforms of news content (aimed at engaging citizens in complex or long-term stories) and to create theoretical knowledge by putting into practice and evaluating the design principles embodied in the platform.

With respect to the problem formulation (first phase of ADR), Acropolis design was informed by a comprehensive literature (described in [4]). With regard to the second phase of building, intervention and evaluation (BIE), the project adopted the "user-centered design" paradigm, which puts the needs of end users in the forefront of the design, treating them as informants in various activities without requiring, however, that they are involved in design decisions. In addition, we relied on the collaboration of students, teachers and researchers of PESC/COPPE/UFRJ, and a group of researchers from the School of Communication at UFRJ (ECO)—who supported this work both in the initial exploratory phase and in the confirmatory phase at the end of second design cycle.

The third phase of the ADR—reflection and learning—was conducted through ongoing discussion and reflection on the effectiveness of the design decisions in addressing the problem (reflected in several features designed in the platform), since at some point of the cyclical process of ADR we focused our efforts on a specific set of features to which we wanted to give more prominence. Finally, in the fourth and final phase of the methodology—the formalization of learning—we articulated a set of design recommendations that reflect the knowledge acquired throughout the process.

In each design cycle, we performed an experiment and collected and analyzed the data to inform the design in the next cycle. This paper addresses the second design cycle. We conducted two focus groups during the first two design cycles: an exploratory focus group in the first cycle, and a confirmatory focus group at the end of the second cycle. An exploratory focus group is used to provide feedback to be used on the design and improvement of the IT artifact, while a confirmatory focus group is used to provide evidence of the usefulness and efficiency of the artifact [25]. Figure 1 depicts Acropolis design process as guided by ADR.

4 Problem formulation

The central problem that motivated this research through design can be formulated as: "How can a social web application engage citizens, especially the younger generations, in social and collaborative curation of complex news stories?" In the first design cycle, we chose the application niche of political stories while testing the Acropolis prototype, believing that this choice would be timely. We argue that this choice

was right, motivating participants who were involved in the experiment. The first design cycle is described in detail in [4].

In the second design cycle, we extended the focus of the stories portrayed by users also including other types of stories beyond those of political nature, which was emphasized by the slogan displayed on the platform home page: "Talk about politics, economy and environment without being a politician, economist or environmentalist".

4.1 Theory-ingrained artifact

The goal of this subsection is to describe the theoretic models that informed the research conducted with the aim of addressing a set of key issues described in the introduction and also in [4]. Considering each of the models listed below, we derived a set of design requirements used in the platform conception. The first requirements (listed below) were derived from a survey conducted on social curation platforms as well as from the literature on online collaboration.

(R1) Stories of news content should be created by the users themselves.
(R2) Users should have the option to subscribe as readers or curators of each story of interest.
(R3) The public image of a story should be shared and socially constructed by the curators interested in the story.
(R4) Users should be able to view the latest updates of stories of interest.
(R5) Users should be able to view the recent activity of other users.
(R6) Users should be warned against the informational obesity problem (they should be "updated" by the system on the unfolding of the stories they follow).

4.2 Self-agency

The agency model of customization [19] associates "agency" to the idea that the "self" acts as the source of communication. Higher interactivity can lead to a greater sense of self as source, which leads to greater cognitive involvement and greater engagement with content. To the extent the user is able to see his own "self" in the interface and/or the content generated via that interface, it leads to a satisfying interaction [19]. In other words, it is not just interactivity, navigability or the modality of media environment, but the realization of a "self-agency" in the generation and dissemination of mediated content. From the agency model of customization we derived the following design requirements:

(R7) Curators should build their own customized versions of the narratives of the stories of interest.
(R8) Stories should allow variation in angle or perspective, allowing curators to emphasize their particular positions.
(R9) Narratives of stories should be remixable and contemplate curated content of all kinds, modalities and sources, and be navigated in a customized manner.

4.3 Elaboration and engagement with content

The cognitive mediation model [31] states that people do not learn directly with media exposure, but that learning is mediated through elaboration or processing strategies, such as connecting new information to other information stored in the memory, including prior knowledge, personal experiences, or the connection of two new bits of information together in new ways [31]. Strategies of elaboration following exposure to news could also include more active strategies like discussing the news, or even passing the news story to one's network. From the cognitive mediation model we derived the following design requirements for Acropolis:

(R10) Readers and curators should be encouraged to discuss the contents curated in every story of interest.
(R11) Readers and curators should be able to raise questions in the context of a story.
(R12) Readers and curators should be alerted when other users provide feedback to their contributions in the context of a story.
(R13) Curators may receive contributions from other users in building their custom narratives, but subject to their approval.

4.4 Curatorial inquiry learning cycle

The curatorial approach embodied in Acropolis has also been informed by the curatorial inquiry learning cycle, which is described in [26]. From this model we derived the following design requirements:

(R14) Curators should be able to search and select the contents to be curated to the stories, both inside and outside the platform.
(R15) Curators should be able to annotate individual contents of each story of interest.
(R16) Readers and curators should be able to easily view the annotations of the same content curated in the personalized narratives of the various curators.
(R17) Curators should be able to annotate the links between individual contents curated on each story of interest.
(R18) Users should be able to "watch" the presentation of a public or personal narrative of stories of interest.

4.5 Curated flows

The curated flows model [32] highlights the nature of the information space network where individuals are at the center of a variety of "flows" of content of different types. According to the model proponents, the metaphor of the flows emphasizes that in different contexts, different individuals (and not only social elites) can become opinion leaders and interpreters of political information [32]. The proponents have also stressed the existence of five different types of curation: personal curation, social curation, journalistic curation, strategic curation and algorithmic curation. From the curated flow model we derived the following design requirements:

(R19) Users should be able to register (virtual representations of) public figures who exert the role of strategic curators.
(R20) Users should be able to "monitor" public figures registered on the platform and that are on their radar.
(R21) Users should be able to curate the messages distributed by public figures in their personal narratives of the stories of interest.

5 Building, intervention and evaluation

Based on this research context, we designed the second prototype of Acropolis, which is available online at http://www.acropolis.cos.ufrj.br/. For each user, the platform features a "start" page (Fig. 2a) that allows the user to keep track of the stories of which he is a reader or curator; keep a list of the public figures being monitored; maintain the user's social network. In another system page, the user can both navigate and curate stories of interest (Fig. 2b). There is also a page dedicated to public figures, where the user can register or edit the profile of strategic communicators (politicians, journalists etc) whom the user is interested in following.

After finishing the first cycle, where we completed the design, development and testing of the first prototype, we used the knowledge obtained at the end of the first cycle to drive the design of the second prototype.

Activity feeds, for example, were very poorly explored, and participants of the first experiment pleaded a more attractive and visual design of feeds. In this sense, an important design goal covered in the second cycle was to turn the feeds more visual, improving the user experience in the perception of the activity of others. Another concern that was emphasized in the interviews of the first cycle refers to the switching between the display of the personal narratives of the curators, and the "public narrative", considered confusing to almost all of the participants. We almost completely redesigned this facility in the system, simplifying this action to the user.

In this second cycle we also sought to significantly improve usability as well as the platform user friendliness. For example, curatorial operations such as "curating in response" had not even been explored in the first cycle, and it is precisely this action that would allow a user to collaborate in the personal narrative of another user (asymmetric collaboration).

On the other hand, the implementation of Acropolis notification scheme was completed and released in the second prototype, and we also sought to evaluate the impact it had on the involvement of users with the platform as well as the engagement with content. Finally, we sought to evaluate the impact of introducing game elements (gamification) throughout the experiment carried out in the second cycle.

5.1 Curatorial approach

In the proposed approach, the user can be either a reader or a curator of a given story. If he is only a reader, then he may visualize the "public narrative" of the story—which contains the contributions of the various curators of the story—and the personal narratives of each curator. If the user wants to

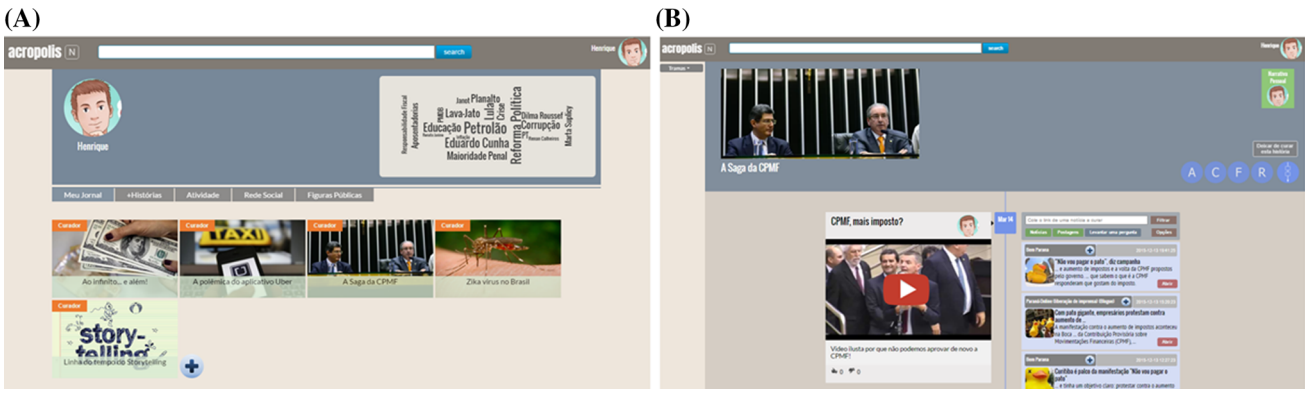

Fig. 2 Two screenshots of Acropolis. **a** *Left* the start page **b** *Right* reading and curating a narrative

be curator of a story, then he may create his own personal narrative. In building a narrative of a given story, contents that have been curated by other curators of the story are suggested to the user, giving credit to previous curators.

Acropolis narratives are therefore remixable. The mechanism of curating and "recurating" content (from other narratives) facilitates and speeds up the building of personal narratives of the various curators of a story, allowing the social curation to emerge from the experience of sharing of curated pieces of content. Since reading and curating are affected by the respective actions of other users, the platform provides an encouraging social experience.

The first step for the curator to build a narrative is to search for content inside or outside of the platform. The selection and collection of content is done using simple drag and drop operations. When adding content to a personal narrative, the curator emphasizes his particular perspective (adding a title and description). The platform offers three alternatives to curate content: curate content to the story, curate in response to other previously curated content, and curate as an alternative to an already curated content [4].

Still in the preliminary design of the prototypes, we conceived several options for the user to add content to his or her narratives: enter the URL of a news story or video to be curated; curate news, videos or posts of public figures suggested by the platform; recurate content previously curated by other users; or search for content within the platform (in order to curate them).

It is important to stress that Acropolis assists users in navigating and in building their narratives, displayed through horizontal and vertical timelines. In addition, the platform provides a facility for narration, which allows the "reproduction" of a narrative, for a better understanding of the story for readers and curators.

Thus, the Acropolis curatorial model essentially follows the stages of the curatorial inquiry learning cycle [26], starting with research, followed by selection and collection of content, and then the interpretation of individual content and a group of contents, then the organization of content and annotations, and finally by the narration.

5.2 Asymmetric collaboration

In the context of a story emplotted in Acropolis, the curator is himself the narrator and "leader" of his narrative: it is he who ultimately decides what happens in the story plots, according to his decisions as the "guardian" of information. Allowing other users to participate in the narrative construction of a curator—sharing gatekeeping decisions with him—goes against the principles that were sustained in this work (such as self-agency and citizens as the guardian of their own content). But why not allow the curator to receive contributions from the rest of the crowd in his narratives, keeping the narrative flow under the curator's control?

Some successful social computing initiatives already separate the roles of the leaders from more general participation of the crowd. The strategy of structuring collaboration, separating the role of the leaders of the other members of a group or crowd, is known in the literature as asymmetric collaboration [27]. In the case of Acropolis, despite the presence of a power imbalance, where the narrator ultimately decides what happens, users can contribute ideas to the progression of a narrative. The goal of keeping the story coherent is reached, as long as the curator manage the narrative flow.

In Acropolis model, the curator of a narrative and other users have complementary motivations for collaboration around the building of a narrative: while curators seek feedback on the collected content, other users will see the asymmetric contributions as an opportunity to use their knowledge and expertise to discuss issues that meet their interests.

Contributing to the personal narrative of a curator in Acropolis is simple: the user simply drags a content to curate (from the "suggested contents" box) and drops it over a content belonging to the narrative of that curator. The content is curated as an "answer" to the original content, included in the "public narrative" of the story, and if approved by the curator who received the contribution, is included in his personal narrative (giving credit to the contributor). Finally, the curator may raise questions in the context of a narrative, and other users can also answer questions with asymmetric contributions.

5.3 Data collection

We invited the twelve students of the "Computer Supported Cooperative Work" graduate course at PESC/COPPE to use the Acropolis prototype. Participants used the prototype for 14 days, and at the end of the experiment, answered a questionnaire and participated in a personal interview. Each interview took about half an hour, and the set of interviews allowed us to gain a better understanding of the use of the features designed in the platform.

Participants were invited to contribute daily in content curation for stories of interest. Similarly to what we did in the experiment of the first cycle, we sent a daily email reminder during the study, reminding participants to add more content. In addition, in the daily email we often reported the new features (such as gamification incentives, which were released gradually) or we included tips or suggestions to encourage the contributions.

During the interview, we asked participants about their general behavior on news consumption, participation in social media sites, and their overall perception and experience with the platform. In addition, we asked each participant

to describe how the platform was used during the experiment, illustrating the main usage scenarios. We also took the opportunity to answer any questions or difficulty on the main features designed on the site, while also collecting suggestions from each participant to improve the platform in the following design cycles. Each interview took about half an hour, and the set of interviews allowed us to get a better understanding of the use of the features designed on the platform.

6 Reflection and learning

While the first design cycle focused on the collection of qualitative exploratory data, in cycle 2 the evaluation mixed both qualitative and quantitative data. Such an approach is in line with the proposal of Zimmerman et al. [28], who argues that the emphasis on the application of quantitative methods is the path to move to more mature forms of theory originated from research through design.

6.1 Demography and participation

Among the participants of the experiment, nine were male students and three were female students, as shown in Table 1. Eleven students were masters and one participant was a doctoral student; ten students had graduated in Computer Science or Engineering or Information Systems, and two students had basic grounding in Electronic Engineering.

The table shows that the participants varied in the number of days they used the platform, in the number of read and curated stories as well as in the total of contributions (depicted in the last three columns by the number of curated contents, the number of posted comments, and the number of raised questions).

6.2 Qualitative evaluation

As already emphasized, at the end of the experiment conducted during the second design cycle, in addition to answering to a questionnaire, participants took part in an interview that, combined with data obtained from questionnaires, allowed us to conduct a qualitative assessment of experiences with the prototype. Reflection on this evaluation is discussed in the topics presented below.

6.2.1 Curatorial approach and overall user experience

The first point we sought to address in interviews concerns the curatorial approach proposed in the platform. We asked participants how they evaluated the approach proposed to guide content curation around news stories created by the users themselves.

All 12 participants positively evaluated the proposed approach, although 3 of them (P4, P6 and P12) have done some caveats. Among the main positive points highlighted by the participants are the possibility for each user to tell their own version of stories adding his viewpoint to curated news, access to different views of the same story, the freedom to direct subjects of greatest interest within each story, and access to news issues and events with little or no major media coverage. This last point was illustrated by P5: "In the case of the Swiss Leaks story, this subject had not even come up to me. Someone created (a story dedicated to the topic on the platform), and I ended up looking about it as well".

Some participants stressed the importance of the "agenda" set up by the users, as can be noted in P5's statement: "Media tends to have a very focused agenda on certain issues they want to address and highlight. In Acropolis, we are to do our newspaper with our affairs and interests". On the other hand, P7 specifically praised the feature of "creating stories" on the platform (defining title, background picture and keywords):

Table 1 Demography and participation in the experiment

ID	Sex	Days	Read stories	Curated stories	Curated	Comments	Question
P1	M	12	13	5	85	4	1
P2	M	10	12	4	12	14	3
P3	M	6	14	14	53	1	1
P4	M	13	6	2	25	10	1
P5	F	14	24	18	178	5	4
P6	M	9	7	2	6	3	1
P7	M	10	25	17	298	28	5
P8	M	11	25	25	548	97	5
P9	F	12	18	13	211	20	3
P10	M	11	5	3	30	2	0
P11	F	10	15	10	29	2	0
P12	M	11	26	22	557	109	15

"by adding an interesting title to talk about a particular subject, you can attract more people to read the story".

P4 questioned whether the approach would be effective if a large number of users were collaborating on the same story. We told this participant that, in a massive collaboration scenario involving a potentially large number of curators, each user would only see the contributions (in a particular story) of the users he or she added to his/her network of people "followed". P6 considered positive the Acropolis approach, while he seemed confused while navigating and trying to contribute to stories: "What I did the most was to read the news. I was a bit lost on the platform, but I confess that I was not the most participative user. I was afraid to get in the middle of the conversation, and not knowing where exactly the story was". We told this participant he could have explored the activity feed of a story, which showed the progress of the contributions of each participant in a particular story. Finally, P12 admitted he was more accustomed to a kind of passive new consumption: "I prefer the RSS approach in which you subscribe to the kind of news you like, and from time to time you receive the feeds. But the Acropolis approach worked as well, because I signed in and and read the news and stories I was interested in".

6.2.2 Participation

Over the 14-day experiment, 137 personal narratives were built from a total of 26 stories created by the participants themselves. Of the twenty six stories, only one of them did not fit the criteria of being a "complex or long-term" story. The complete list of stories is illustrated in Table 2.

In order to evaluate the extent to which participants were involved in the major features of the platform, we ran a query to the log of user actions (stored in the platform database) considering the following actions: login on the platform; read the contents of a story; curate content for a story; comment on some content; raise a question. The results were used to generate a graphic visualization of the participation of all 12 participants in the 14 days of the experiment (illustrated in Fig. 3). The figure depicts a special notation to represent the actions (or combinations of actions), synthesized in the legend on the right of the figure.

When we look at this chart, one can draw some key conclusions. Excluding P3 and P6, the other ten participants had an active participation in the platform. P3 used the platform in only 6 of the 14 days of the experiment, and in only half of these days he curated content (on the other days he was just reader). Already P6 used the platform for 9 days, and curiously ceased to curate content the 4th day of use onwards, which is consistent with what was reported by him in the interview: "What I did the most was to read the news. I was a bit lost on the platform, but I confess that I was not the most participative user. I was afraid to get in the middle of the conversation, and not knowing where exactly the story was".

In general, the predominance of blue circles (compared to the green circles) shows that the most common users' behavior was participating not only as readers, but as curators of stories, although the graph does not illustrate the number of stories read and curated by day. To a greater or lesser extent, all participants were involved in a debate about the stories—both through comments (illustrated by the red background in the circles), and through questions they raised during the experiment. Just see that all the twelve participants contributed comments, and only 2 of the 12 participants did not raise any questions.

The degree of user involvement in curatorial activity is illustrated in Fig. 4, which shows the total number of curated contents for each participant. This chart is very representative of what social computing researchers call the "power law of participation": a small group of users does the "service", and the vast majority do not have a big involvement, assuming the role of "free riders", hitching a ride on the work produced by others. In addition, 54% of the contents curated during the experiment were collected by only two users (P8 and P12), and 95% of the curated content were collected by half of the participants (the other half collected less than 5% of content).

We also measured the time (average and total) spent by each participant using the Acropolis website over the 14 days of the experiment (Fig. 5). The charts are also close to a power law curve, illustrating that the site usage varied considerably between participants. For example, while P6 spent an average of 9 minutes per day on the site and a total of 1h and 25min throughout the experiment, P5 spent an average of 66 minutes per day and more than 15 hours using Acropolis during the 14-day experiment. The time spent using the platform was estimated by a query to the database, which keeps a record of all user actions on the site in a log table.

Finally, we computed the total number of curated contents per day by all participants, shown in the chart of Fig. 6.

As the chart depicts, the number of curated content per day shows an upward trend until the 10th day, at which time there is a peak (with 524 curated contents), followed by a fall in values (on the last four days of the experiment) closer to the levels of the period prior to the tenth day. Interestingly, the participants themselves claimed in interviews that the significant number of curated contents on day 10 was motivated by the release (on this day) of a "counter of curated contents" on the Acropolis website—a component which displayed in real time the number of contents curated so far. In the opinion of the respondents, this component encouraged participants to engage in building narratives.

Table 2 List of stories created by participants of the 2nd design cycle experiment

#id	Story	Curators	Readers	Visualizations	Cu rated	Re cu rated	Votes	Comments
28	Enem	4	7	829	249	17	0	49
15	Operação Lava Jato	7	9	526	227	32	19	15
16	Ao infinite., e além!	8	12	685	172	87	17	28
17	Olimpiadas Rio 2016	8	11	508	148	37	15	33
18	0 jogo do impeachment	7	9	508	115	34	12	12
19	Redução da idade penal	3	13	240	97	35	4	4
27	Greve nas universidades federals	6	9	260	97	35	2	26
20	Desemprego no Brasil—O pior resultado em 11 anos	6	9	260	84	20	8	13
25	A politics e a espionagem: NSA espionou…	4	9	179	79	27	1	18
24	Reforma Politica	6	8	167	73	36	1	3
31	Crise na seguranca públiça	5	6	211	68	19	0	3
21	Swiss Leaks: Crimes do colarinho branco	4	3	240	67	32	8	7
22	Crise na base aliada do governo	5	7	146	66	18	6	1
32	A tecnologia atualizando o crime	6	7	192	64	32	5	18
37	Impostômetro	4	5	148	63	26	0	3
33	A Saúde no Brasil	6	7	172	62	17	1	2
26	Mesmo com crise. montadoras anunciaram R$ 9 bi…	6	6	123	58	23	0	13
23	A polêmica do aplicativo Uber	7	10	163	57	29	3	19
34	O Sistema politico brasileiro	5	7	144	51	27	2	17
30	Porque o Brasil não inova	5	6	159	46	12	2	3
40	Economia de Baixa Carbono	3	4	70	33	7	0	0
35	Mídia: Informação ou Manipulação?	3	5	131	29	8	1	5
33	CPI da CBF	5	6	82	25	3	0	0
39	BRICs e a Economia Mundial	2	3	56	23	7	0	2
36	Avaliação do Governo Brasileiro	4	6	58	15	9	0	1
41	Crise econômica no mundo	1	3	15	3	0	0	0
	Total			6272	2071	679	107	295
	Pearson's correlation coefficient (p)				0.95	0.64	0.65	0.80

6.2.3 Motivation to curate content

We asked participants what motivated them to curate content for a given story. The main reasons reported by the participants and filled in the questionnaire (with predefined options, allowing the respondent to mark more than one answer) included keeping informed about the stories (reported by 67% of participants) and building an audience of readers (reported by 50% of participants).

During interviews many other motivations were reported, including social interaction and sharing provided by the actions of curators, the gamification of the platform (through

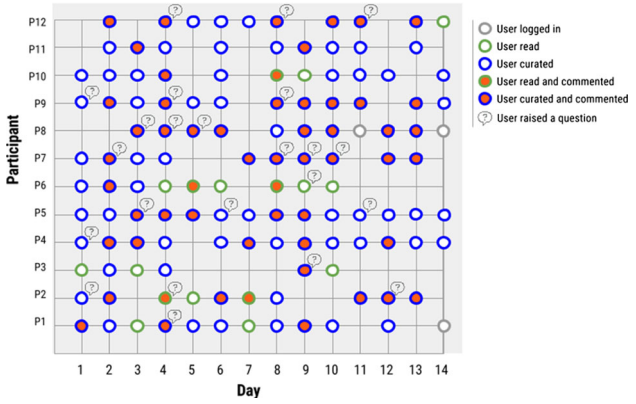

Fig. 3 Overview of participation in the 2nd design cycle experiment

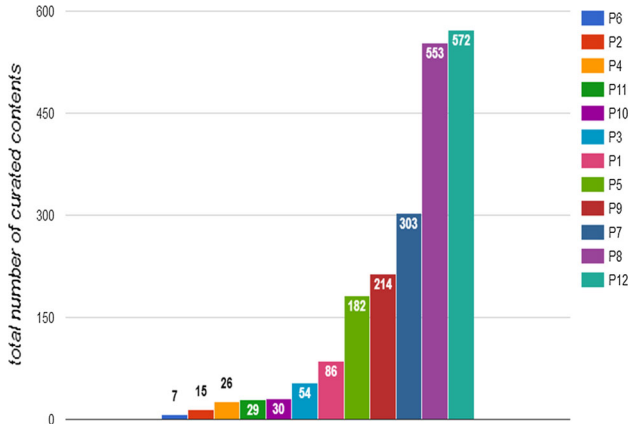

Fig. 4 Total number of curated contents by the participants of the 2nd design cycle experiment

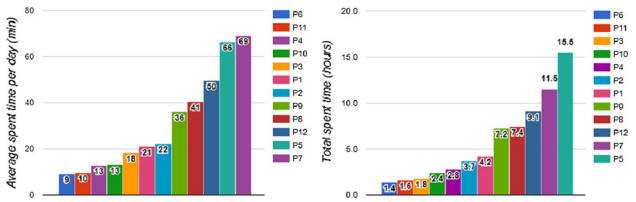

Fig. 5 Time spent by the participants during the days of the experiment. On the left, the average time spent per day; on the right, the total time spent in hours

rankings, medals, trophies and curators charts), interest in exposing positions and particular points of view on the issues related to stories, the interest in their own stories, and to keep on Acropolis the most relevant news stories, as in a repository of "favorites".

Some participants were more specific and provided examples of stories that prompted them to be curators, as in the case of P2: "I created two stories on the platform, the 'CPI of CBF', and the 'Swiss Leaks'. And I also got involved in the 'Car Wash'. I think Brazil has its 'bad guys', and one of them is money laundering. So these stories, by trying to solve the problems of society, are the ones that interested me the most,

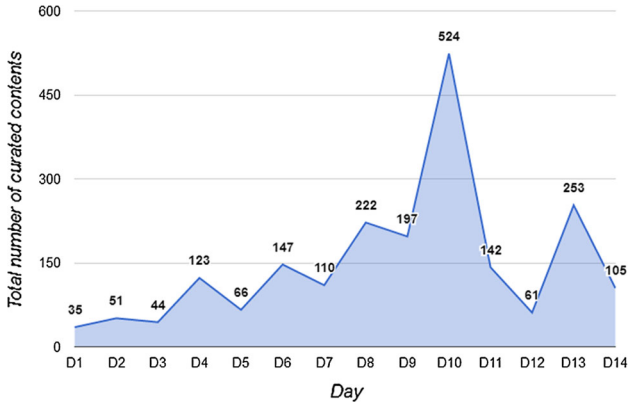

Fig. 6 Total number of curated contents per day

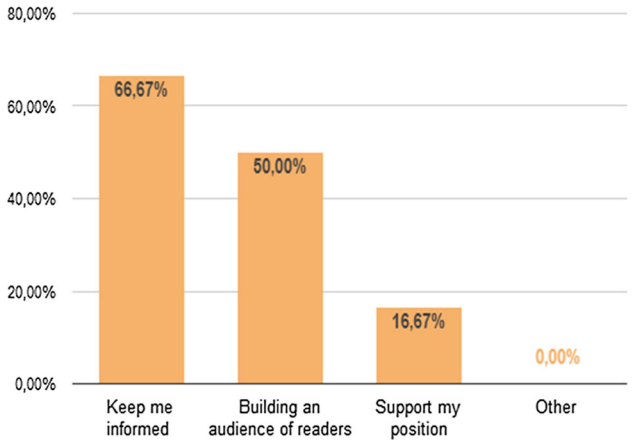

Fig. 7 Evaluation results on the motivation to curate contents in a story

so I chose these stories to be reader and curator of". Figure 7 graphically illustrates these results.

6.2.4 *Gap reduction between individual/social curation*

We asked participants how they evaluated the Acropolis functionality of allowing the user to curate their own narratives of stories, but allowing the user to visualize the other users' narratives of the same story, and also the public narrative.

All 12 participants positively evaluated the user-curated narratives approach, with 3 of them (participants P2, P4 and P12) raising some caveats. Among the main positive points highlighted by the participants are the ability to see different points of view raised by the curators of a particular story, the ability of users to build their identity by curating their own narratives, and the "filter" and content aggregator role played by personal narratives and by the public narrative (which only includes the contents curated the people "followed" by the user in the Acropolis social network).

On this last point, P1 compared the Acropolis approach with the approach of some online social networks, stating that "a positive point is not having repeated news (on Acrop-

olis), which is very common to see (happening) on Twitter or on Facebook. You see several people posting different things, but it's the same thing (the news story is the same). In the Acropolis not, everything is grouped, and I see it in a positive way". Already P3 saw the approach of user-curated narratives as an opportunity for social interaction, for debate and the social construction of knowledge about stories: "In addition to allowing the visualization of different viewpoints, by reading about the opinion of people who are in your circle, you can interact with people who have the same opinion, or if the person desires, you can also build knowledge collaborating with people with different opinions".

Despite the small number of users participating in the experiment, the number of contributions was relatively large, considering the period of 14 days. Some stories engaged all the 12 participants and included dozens of curated contents, which made it sometimes difficult to find certain contents. This point was emphasized by P10, who suggested a search and retrieval strategy for contributions that were "associated" to certain users, by resorting to their narratives to find the desired contents: "Sometimes it was hard to find something. So the possibility to view the personal narratives helped me find some things".

Some participants (P4, P7 and P11) stressed the ease of switching between the public narrative and the personal narratives of the curators of each story, as can be seen on P7's account: "I found it quite adequate (the Acropolis approach) since you could easily change from the personal narrative to the public one, it could be done with a simple click, and you could also switch for the narrative of anyone".

The participants who made reservations pointed out various issues, such as the convenience of curating news and other content in private mode, a feature not implemented in the version of the platform used in the experiment (participant P2), the limited usefulness of the "recurating" feature, because the public narrative already included all the curated contents (participant P4), and the delay to analyze one by one the personal narratives of the curators of a story (participant P12). We pointed out to these three participants the importance of the recurating feature, as the public narrative tends to grow and lose cohesion and coherence. We also stressed that the curator could examine only the perspective of the closest curators, with which the user has greater affinity (relative to that story).

6.2.5 Curation processes on Acropolis

We asked participants in interviews which process they used to curate contents on the platform: "Did you use more the suggestions of news and posts from Acropolis, or chose the option to enter the URL of the news you wanted to curate but had sought out of Acropolis? Explain".

Of the 12 participants, five participants reported primarily using the option to enter a URL (of a news retrieved outside the Acropolis environment), 6 participants stated to balance the two options, and one participant claimed to have only explored the option of the contents suggested by the platform. Two reasons were reported by two different participants in the first group to their predominant option by typing a URL: interest in adding contents that were not offered by the platform and the similarity of the contents suggested by the system with the contents that had already been curated in a given story.

Among the participants who balanced the two options, participant P9 pointed Acropolis suggestions as a way to speed up the search and retrieval of news: "At first I was looking for (news) out there and just used the (option to enter a) URL. After the gamification features were released, it encouraged me to use the platform suggestions to accelerate curating". Already P7, who also alternated between the two available options, recognized the value of curating the contents posted by public figures registered in the platform: "I really liked Acropolis suggestions of posts that came from public figures. I would not go on Twitter or Facebook of each of these personalities. And I spend very little time on social networks. I just wanted to know what the guy was talking about this issue".

6.2.6 Asymmetric collaboration

In order to assess how the functionality of curating content for other users' narratives (through the asymmetric collaboration feature) was received by the participants, we asked in interviews:

(A) How do you evaluate the support to the contributions of other users in their own narratives of stories, subject to approval? And what is your perception about the contributions of other users on your personal narratives during the experiment?
(B) Do you think that your engagement was higher in the stories on which you received contributions from other users (answering questions or content you posted) than in other stories?

Regarding the first question, all 12 participants considered positive the asymmetric collaborative approach (implemented on the platform), and the main positive aspect that they reported involved the possibility of peers to enrich their personal narratives by adding different views, opinions or more consolidated data. Beyond that, some participants saw on the proposed approach an invitation for social interaction, as can be seen on P10's account: "I think [the approach] is useful even to foster discussion. When the person answers a

content that you curated [with a curated news], it is thought that you will answer back".

Other participants compared the Acropolis approach to the approach of some online social networks, such as LinkedIn and StackOverflow. As in P1's account: "I use StackOverflow a lot, a site of questions and answers. And in this website they have something of curating content as well. You put a question or an answer, and other users edit content to improve […] In StackOverflow, you are the owner of the content you create […] I think it's a mechanism that works very well, and Acropolis approach is similar. You end up relying on other users that their narratives will end up getting better".

P2 and P5 stressed the importance of including the contributions of other peers in their narratives, even if this entailed accepting opposing views raised by peers, as in P5's account: "I considered the approach great, even by the fact that you can approve contributions or not, and that makes a difference. In my case, I approved all contributions. But it is important to have the option to revert [approval or disapproval]. The reason I did not disapprove any contributions is that I wanted to record there that someone was against my position". Finally, P7 emphasized the importance of asymmetric contributions being subject to approval and suggested a new feature for future versions of the platform: "There must be approval [of content] to eliminate spam. I also think that the curated contents should bring an option to report abuse".

Reports of answers regarding the second question (greater engagement of the participant as a result of asymmetric collaborations) were collected only from participants who received asymmetric contributions from others. Of the 12 participants, five (P2, P4, P5, P8 and P9) received contributions and admitted greater engagement with the stories as a result of the contributions received; three participants received contributions but were in doubt (P7, P11 and P12), and four participants received no contribution (in the form of curated news) in their narratives (participants P1, P3, P6, P10).

P4, for example, justified his greater engagement with the argument that "there was greater interactivity" in those stories, while P8 provided a more detailed explanation: "When someone answered (with a suggestion of content for my narrative) I went there to see what was answered and also tried to bring some news to respond to the contribution. This forces you to engage more with the story. The participation of people is what gives grace to the platform".

6.2.7 Impact of the introduction of gamification

Over the 14 days of the experiment, participants were introduced gradually to a set of gamification features, including medals, trophies, rankings, visualization of curators and curated content. In order to assess the impact of the introduction of such facilities in the system with respect to participation and particularly regarding the motivation to curate and discuss the contents, we asked the participants during interviews how they assessed the introduction of these incentives during the experiment, that is, if they improved somehow their experience of participating on Acropolis.

Of the 12 participants, 75% of them (9 participants) said that the introduction of medals and trophies improved participation experience on the platform, two said no, and one participant claimed not to be sure. Considering the nine participants of the first group, two of them made reservations. P1 pondered: "I saw that some stories had several posts with the problem of broken sentences, for example. You end up decreasing the quality of content. I think limiting the total of posts in something around 20–30 postings per day will continue prompting the user to log in every day, and will increase the quality of content. One idea would be to use the upvotes and dowvotes as a criterion to take into account the curated content in the rankings. But that suggests another problem (the 'socket puppets'), when you create fake accounts to escape from this scheme". Already the participant P8 emphasized another risk of users not using the incentives of gamification properly: "I like to compete. So gamification for people like me fits like a glove. But there is another more dangerous side, because the person can simply curate to get badges and does not even know what is happening in the story".

The participant P5 was enthusiastic while commenting on the effect that gamification brought to her participation experience on the platform: "It is unquestionable that when medals were released, it gave me a desire like 'oops, I want this medal too!'. This does not justify my contributions because [the interaction as a whole] is already very cool, but the badge does make a difference […] From time to time I looked at the ranking, and wanted the medal…It was very nice to have the suggestion (inhibited) of the medals that each one can achieve. In addition, the main features had an associate badge. This encouraged me to use each feature".

6.3 Quantitative evaluation

To evaluate the performance of the IT artifact, we proposed in this study a framework consisting of the ten elements listed in Table 3, also discussed in a previous work [38].

The first part of the questionnaire completed by the participants sought to evaluate, in addition to the "performance" of the artifact used during the experiment in relation to each element, the "importance" of that element in a general environment of content curation, as perceived by each participant. Thus, the questionnaire presented two propositions for each of the framework elements. The first proposition was to evaluate the performance of the element in the user experience of Acropolis, while the second proposition evaluated the perceived importance of the element in question in creating a

Table 3 Evaluation framework

Element	Description
Self-agency	To what extent did the user feel as if the "self" was in control of the interactions (with content and other users)?
Social curatorial experience	To what extent did the user perceive the curatorial activity as a social experience?
Engagement with content	To what extent did the platform help the user to engage more in stories in which he was reader or curator (in terms of time, effort and dedicated attention) than would have engaged if he had not used the platform?
Social interaction	To what extent did the platform encourage the user to interact with other users who were interested in the same stories?
Support for complex and long-term stories	To what extent did the user consider useful the approach that allowed him to monitor complex stories or long-term through the narratives curated by the citizens themselves?
Curation through asymmetric collaboration	To what extent did the user consider useful the way the platform allowed other users to contribute content (subject to approval) in their personal narratives?
Variation in plot	To what extent did the user evaluate as positive the potential of the "plots" feature, which allowed users to portray different perspectives (or angles) of a story?
Strategic curation	To what extent did the user consider useful the way the platform allowed him to curate news content distributed by public figures (registered in the platform)?
Aggregation of content	To what extent did the user consider useful the ability to view the perspective of other users who curated the same news in a single object?
Gamification	To what extent did the introduction of game elements (rankings, medals and badges) throughout the experiment bring an additional motivation for the user to contribute in the stories?

valuable experience of content curation (regardless of Acropolis).

For example, for the "self-agency" element, the first proposition was formulated thus: "In Acropolis, when curating my own narratives of the stories that interested me, I felt like I was in control of the interactions (with the content I posted and with others who interacted with me)". The second proposition was defined as follows: "In a social content curation environment, it is important that the system make you feel like you are in control of interactions with content and other users". Each proposal was evaluated by participants using a Likert 5-point scale (1—strongly disagree; 2—partially disagree; 3—indifferent; 4— partially agree; and 5—totally agree).

The rationale of this type of evaluation is that if you know how the artifact performs for a certain element and you know how important the element is perceived, then elements on which the artifact performed poorly but were highly valued would have to be improved in the following design cycles. In other words, this assessment approach helps us to define where to focus in future design and build iterations of the artifact.

6.3.1 Evaluation results and discussion

Table 4 shows the central tendency values of the result of the evaluation of the ten elements of the proposed framework, which considered the response of all 12 participants of the experiment. Methods employing ordinal data should work with the modal value (median) as a measure of central tendency, because the necessary arithmetic manipulations to calculate the average (and standard deviation) are inadequate for ordinal values.

Table 4 Evaluation results

Element	Performance	Importance
Self-agency	4	4
Social curatorial experience	5	5
Engagement with content	5	5
Social interaction	5	5
Support for complex and long-term stories	5	5
Curation through asymmetric collaboration	5	5
Variation in plot	3	5
Strategic curation	5	4
Aggregation of content	5	5
Gamification	4	5

We argue that the central tendency for the "importance" of the elements that we prioritized in the second prototype was evaluated with a high score: only three items received a modal answer of 4, and the remaining received score of 5. This means that the participants considered that the ten elements of our framework are in general relevant in any content

curation environment. Similarly, we were pleased to note that the central tendency for the "performance" of these elements evaluated also obtained a high score in most of them. It is worth here considering the following elements: self-agency, variation in plot, strategic curation, and gamification.

Analyzing the "self-agency" element, we observed that it was evaluated with score slightly below the others in terms of importance, and also in terms of performance. This may indicate a caution by the participants in leaving in the hands of every citizen the control over the gathering and dissemination of the curated content (when evaluating the importance of this element in the overall context of social curation), but can also indicate that the support for self-agency could still be improved in Acropolis. Already the element "variation in plot" got the worst result (modal note of 3) among all the elements in the "performance" evaluation, and obtained maximum score in "importance". The result of the item "performance" was expected and is in line with the results collected from the interviews where participants admitted to having little explored the functionality of "plots" and the exploitation of the different perspectives of a story. This suggests that a third design cycle could have a special focus on the improvement of this issue, leading to a complete review of the aforementioned functionality.

The "strategic curation" element had a curious result in the quantitative evaluation. It was evaluated with maximum modal answer in the item performance—meaning that the platform approach was effective in suggesting content distributed by public figures worthy of being included in the curated narratives—but received a slightly lower score in "importance". This may indicate some caution on the part of participants since it is a new approach not yet explored in other curation environments. Finally, the "gamification" element achieved a maximum score of "importance" and a slightly lower evaluation (note of 4) in the item "performance", suggesting that the design of the platform's incentives through the game elements could be enhanced, which is in line with the suggestions of improvements collected during the interviews of the second cycle.

Finally, it is worth here a brief evaluation of the results obtained by the other elements that received grade of 5 in the item performance. They demonstrate a central tendency of approval by the participants of the Acropolis approach to provide a social curatorial experience, encouraging engagement in complex or long lasting stories, social interaction, collaboration in the construction of personal narratives, as well as the designed facilities to aggregate curated content.

7 Formalization of learning: design recommendations and generalization

Design-oriented research should indicate what kind of design problems its findings and conclusions can be generalized to, in order to make a contribution to research. The class of problems is defined here as "social curation platforms to tell news stories". In this section, we list a set of design recommendations that we consider generalizable to this class of systems. A preliminary list of these recommendations was consolidated at the end of the first design cycle—and presented in [4]—and extended with the end of the second cycle. As a result, we will limit ourselves here to only discuss the latest recommendations.

> Recommendation 1: Use shared stories as the medium of assemblage
> Recommendation 2: Encourage users to build narratives with the help of their peers to allow variation in perspective
> Recommendation 3: Encourage users to recurate relevant contributions
> Recommendation 4: Follow stories, not people
> Recommendation 5: Taking into account strategic communicators is key
> Recommendation 6: User-curated personal narratives

The building of user-curated narratives as a strategy of elaboration and triggering of the "self-as-source" scheme was considered to be successful in Acropolis design, allowing users to engage with stories, and this has been confirmed through several positive evidences in the evaluation of the second design cycle experiment. In this context, the recommendation is to design news content curation environments by supporting "user-curated narratives", giving participants the freedom to choose the stories they want to contribute to, and encouraging them to reframe content and build their narratives by remixing content from other participants' narratives.

> Recommendation 7: A high-level architecture for social news curation platforms

Based on the reflection and learning stage of the second design cycle, we propose a high-level architecture for sociotechnical platforms of social curation of news content, shown in Fig. 8. Acropolis is an instance of this architecture.

Besides Acropolis platform, other applications built making use of these recommendations could potentially engage more citizens in collaborative processing of complex stories that affect their day-to-day, supporting both learning and preservation of them.

Thinking about the next platform design cycles, one possibility would be to allow users to annotate the narratives of their peers (reordering is already possible in Acropolis "plots"). Rounds of voting (using crowdvoting) could also be organized to choose the best narrative of a given story.

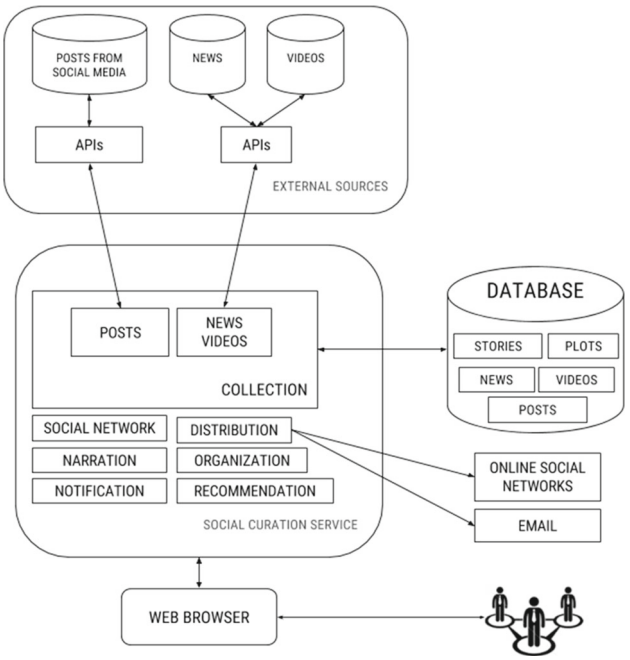

Fig. 8 Generic architecture of a social curation service for collaborative processing of news content

8 Conclusion and future work

8.1 Main contributions

In this paper, we described the second design cycle of Acropolis, a social computing platform that allows citizens to build and share their own narratives about stories of news content, involving them in a process of collaborative processing of news content called social curation.

Evaluations conducted during two design cycles guided by the ADR methodology have demonstrated, by positive evidence, that the approach proposed here was able to support citizen engagement in collaborative curation of news content. However, the evaluation of the platform's ability to address this problem was limited to these two cycles. If on one hand it was possible to make some generalizations and design recommendations as proposed by the ADR methodology, on the other hand it is necessary to continue this research to investigate issues involving, for example, participation and engagement of citizens over periods of longer time.

Results from qualitative and quantitative methods described in this paper also showed that social curation technology can be promoted as a way of addressing the problem of engaging future generations with news content, positively validating the design decisions described in [4]. Following the ADR methodology, we concluded the first two cycles of this research with a set of design recommendations for building similar platforms.

8.2 Limitations

A critical analysis on the studies carried out to evaluate the curatorial approach proposed here allows us to identify some limitations. First, we can mention the size of the samples, considered to be small from a statistical point of view but acceptable for CSCW studies. In addition, studies conducted during the first two design cycles were not controlled: we did not compare the platform with other social news curation environments using metrics to evaluate, for example, engagement with content, the quality of created narratives or the diversity of viewpoints covered therein. Secondly, another limitation associated with the latest prototype regards its performance. Once the platform was tested only in the context of small groups, we cannot infer what would have happened with the platform's performance in a massive collaboration context (this will be discussed in the next section).

8.3 Future work

This research has stepped forward in exploring the vast potential of social news curation technologies, trying to look at the future of citizen involvement in the collaborative processing of news content. At this time of the study, we can outline various ways to extend the work carried out so far.

First, we plan to conduct some controlled experiments on the Acropolis environment, involving a larger number of participants, and exposing them to a number of different scenarios. This would make it possible to assess the scenarios that trigger greater engagement with content as a means of articulating design recommendations. Another possibility would be to compare the platform with other social news curation environments using metrics to measure the engagement with content.

Another possible future work would be to evaluate the platform's performance in an open collaboration scenario, allowing the participation of any person in a platform instance available for public use. This would require some steps and precautions related to performance and platform security. Today, for example, the platform's data model is persisted in a relational database. Migrating the data model for a NoSQL system (like Cassandra) would be a way to address this limitation.

We cannot say anything about the quality of stories and plots built during the first two studies conducted with the prototypes. As future work, some possibilities to measure the quality of stories include the evaluation of these by professionals or researchers from Journalism, or the use of metrics to measure the engagement of readers with the curated narratives.

Finally, recent research has shown that people have a psychological preference for proattitudinal information more than they avoid exposure to different points of view, and

that the so-called "selective exposure" has only a modest influence on the consumption of information by individuals. Whereas the content suggestions provided by Acropolis include news from various sources, future work could examine to what extent the curators are collecting in their curated narratives content that reflect diverse viewpoints, not only those that are in line with their views. Advancing research in this area is critical in face of an increasingly opinative and partisan new media [29].

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