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# A WIKI THAT KNOWS WHERE IT IS BEING USED: SOCIAL HAZARD OR SOCIAL SERVICE?

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## Abstract

*This study assesses reactions to a wiki enhanced with context-aware features that enable users to learn about people, places, and events in their proximity. In a physically compact enclave such as the urban university in which this wiki is being implemented, context-aware applications can support a hybrid community in which individuals develop and sustain physical and virtual social ties. Participants in this study were first-time users. They were given a guided tour of the wiki and then their impressions, concerns and intention to use were elicited through a semi-structured interview. Participants were enthusiastic about the prospects of the wiki in assisting them in learning about events and interesting places on campus, and in exchanging information. However, they were concerned about issues such as privacy, accuracy, and the potential for intentional misuse of the system. Privacy concerns were based primarily on a misconception of the location-aware feature of the wiki. These findings can guide designers and implementers on the desirable and possibly undesirable features of such a system.*

## Keywords

Wiki, context-aware, people-to-people-to-places or P3 systems, pervasive computing, collaborative authoring, privacy, accuracy

## Introduction

Since the mid 1970s, insights from researchers and developers in diverse fields have contributed to the advancement of information and communication technologies (ICTs) in facilitating group collaboration (Grudin, 1984). One of most recent collaborative technologies, which is gaining widespread acceptance in the workplace and in online virtual communities is the “wiki” (Goodnoe, 2006). A wiki, invented by Ward Cunningham in 1995 (Raman, 2006), is defined as comprising “a set of linked web pages, created through the incremental development by a group of collaborating users” (Leuf and Cunningham, 2001) “and the software used to manage these pages” (Wagner, 2004).

Context-aware pervasive computing has also grown exponentially in recent years. As described by Schilit et al. (1995), context aware systems adapt according to changes in the environment in which they are being used. With these systems, the three key aspects of the users' context usually considered are: "where you are, who you are with, and what resources are nearby" (Schilit et. al., 1995). Under the umbrella of context-aware pervasive systems is a class of ubiquitous social computing applications that provides "people-to-people-to-place" or "P3" services such as geographically contextual social matching, collaboration, coordination and recommendations based on user preferences (Jones, et. al. 2004; Jones et. al., 2006; Kim, et al. 2007).

CampusWiki, the innovative application described in this paper, integrates context-aware functionality into a wiki structure. This application is part of a broad initiative, called SmartCampus, which is a testbed for developing a set of location aware pervasive computing applications for P3 services to build and maintain a stronger sense of community in urban enclaves, such as business or educational campuses or a museum complex (Jones et al, 2006). The premise of CampusWiki is that awareness of users' location at the time of use can help to support collaboration by identifying entries in the wiki that are likely to be of most immediate interest.

The campus in which SmartCampus is being implemented is an urban enclave that is physically compact, and hence there are unique benefits to be leveraged from the use of an application such as CampusWiki (Jones et. al. 2006). Users of CampusWiki can share their knowledge of people, places, events and organizations in the campus and can learn about interesting places and events in their proximity. However, with the location-aware attribute of P3 systems and the principle of openness of wikis, there are potential concerns such as privacy, trust, and misuse. As discussed in previous studies (e.g., Patil and Lai, 2005; Kim et. al. 2007), location awareness raises concerns about what is going to be disclosed, and who gets to see what, about whom, and when.

A series of studies is being conducted in an effort to understand the perceptions of the benefits and concerns that are specific to the potential users of the SmartCampus applications. The first study in the series was conducted during the early, pre-implementation stages of the development of these applications and its results were used to inform their design (Kim et. al., 2007). In the first study, participants were asked about their impressions of each of the SmartCampus applications after they were described using scenarios. This second study of the series was conducted after the deployment of the first application in the SmartCampus suite - CampusWiki. It gathered prospective users' perceptions during and after their hands-on experience with a prototype of the system. The results are expected to be useful in guiding future enhancements to CampusWiki and in developing a general framework for defining specifications of context-aware wikis.

The remainder of this paper includes an overview of the uses of wikis and their appeal; an outline of the issues and challenges relevant to their use and implementation; and a brief description of CampusWiki. The methodology of the study is described, followed by a report on the results, and a discussion of the limitations and conclusions.

## Wikis and Their Appeal

The two primary uses of wikis identified in IS literature are:

- (1) as a shared knowledge repository for a virtual dispersed community - e.g. wikipedia
- (2) as a depository for shared artifacts within an organization e.g. project documentation (Raman, 2006, Fuchs-Kittowsk and Kohler, 2002)

Recently, research has been exploring the use of wikis in a novel role of supporting virtual/physical hybrid communities by sharing online information specific to a particular locality (Gaved and Mulholland, 2005).

Why are wikis gaining such widespread adoption? Researchers and practitioners have attributed wiki's success to a number of key factors including the following:

- Cost effectiveness: A variety of wiki engines or wiki clones available on the Internet that can be downloaded free for installation on a personal web server, or the services of wiki farms or wiki hosts are available for a nominal fee (Raman, 2006).
- Low barriers to making contributions: There is no need for registration or knowledge of web publishing technology (Gaved and Mulholland, 2005).
- Easy to use: Although anecdotal evidence suggests that wikis are not very intuitive to non-technical users (Raman, 2006), generally it is believed that wikis are easy to use (Wagner, 2004; and Désillets, et. al. 2005)
- Fulfilling users' knowledge management needs: such as ad-hoc knowledge creation, ease of finding required knowledge, dynamic update of knowledge, quality assurance through quick error recovery (Wagner, 2004).

## Issues and Challenges

The key issues that are to be taken into account in the successful implementation of a context-aware wiki include:

- **Trust:** There are two aspects of trust: (i) the technology’s principle of openness permits anyone to author and edit the information published in a wiki, hence there is always the question of whether its content can be trusted (Wagner, 2004); and (ii) as noted by the implementers of one of the earliest location aware systems, Active Badge, users must trust that information about their location will not be misused by administration and others in authority (Want et. al. 1992; Harper, 1995).
- **Privacy:** Maintaining control over dissemination of information about oneself. For instance, any individual can create a page about another person and enter inaccurate details or disclose personal information on that page.

## An Overview of CampusWiki

CampusWiki allows users to create and edit web pages about any topic or entity in the following categories: People, Places, Organizations, Events and Other. Pages can be easily accessed through a typical search engine algorithm. Links to “nearby”, “popular”, “recently edited”, or “random” pages for each category are displayed on almost every page in order to facilitate access to the following types of pages respectively: those associated with locations in the users’ proximity, the most frequently accessed, the most recently edited, and randomly selected pages.

When a page for an entity (person, place, organization or event) is created, a static location associated with that entity is specified by the page’s author. For example, one student might specify where she or he works, while another might provide a dorm. For events and places, of course, the convention is to specify the locale of the event or place. The “nearby” filter uses the context-aware capability of the wiki to display pages of entities for which the associated location is in physical proximity to the user’s current location. Therefore, the nearby filter is usable only within the campus wireless network. Otherwise, a message indicating that the feature is not available is displayed. Note that although CampusWiki “knows” the user’s current location, it uses that knowledge only when activating the “nearby” filter and does not disclose a user’s real-time location to other users. However, as will be discussed, this distinction was not clear to many subjects in the study.

Figure 1 shows the home page of CampusWiki. More details about the design of CampusWiki, including its innovative “light weight” ratings feature designed to encourage active participation from users, is found in Schuler et al. (2007).

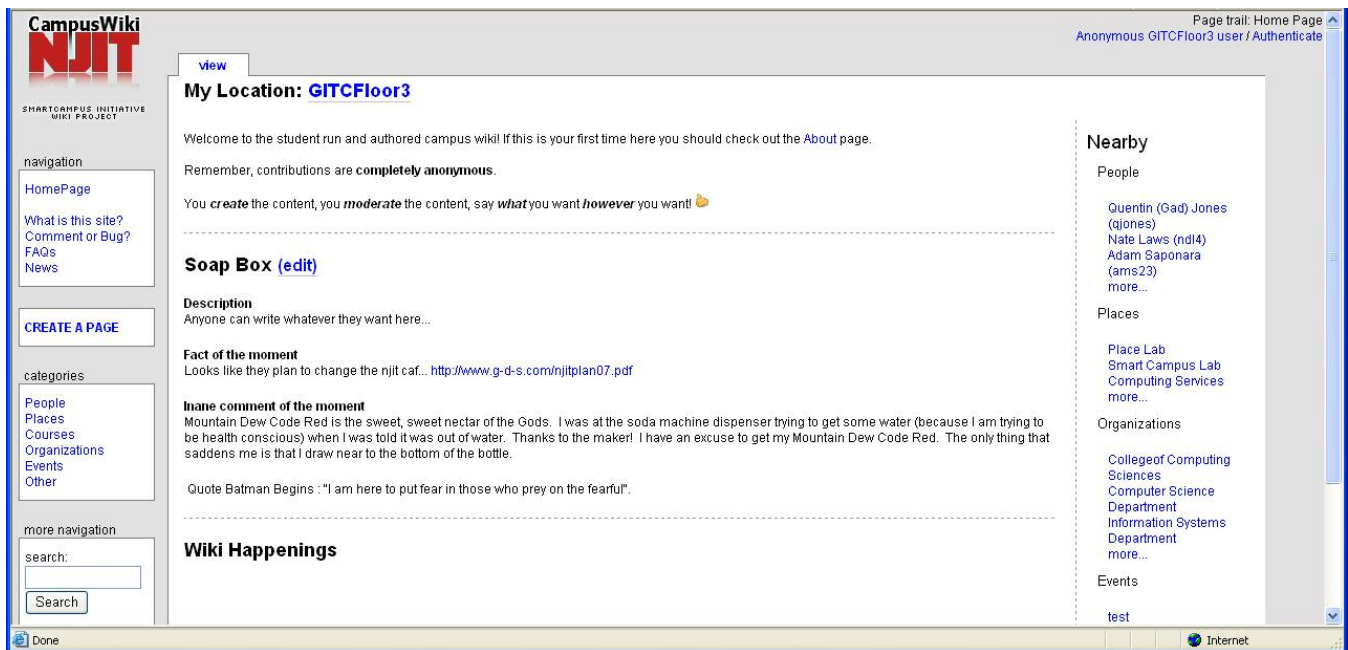


Figure 1: Home Page of CampusWiki

## **Methodology**

Participants' views on CampusWiki were elicited through a two step process: a hands-on exploration/tour of the application, followed by a semi-structured interview. Students in a graduate Qualitative Research Methods course planned and conducted the guided tour and interviews under the supervision of the study director. The responsive interviewing technique, described by Rubin and Rubin (2005) as a flexible and iterative process of data elicitation, was used. In applying this technique, the interviewers allowed the interviews to be guided by the interviewees' responses. This meant that the interviewers modified their questions to explore further what the interviewees said. Described below are: (a) the guides for exploring the application and for conducting the interviews; (b) the recruitment of subjects; (c) the actual system exploration and interview session; and (d) the data analysis. .

### ***Application Exploration and Interview Guides***

Scripts to guide the exploration of the application and the interview session with each participant were developed collaboratively and iteratively by the six students in the course, divided into two teams. The same script was used by both teams for the guided tour. This script included a general overview of the study, the SmartCampus project, and the CampusWiki application and directed participants in performing the following tasks: (a) navigating the site; (b) editing, rating, and participating in a discussion; and (c) creating a web page. The participants were also encouraged to explore the site after the tour.

The main topics in the interview guides used by the two teams were the same except that a few questions were worded slightly differently. Since the responsive interviewing technique was used, slight differences in the wording of questions should not have impacted the validity of the study because the interviewers were not required to adhere strictly to the guides. The guides were designed to capture from participants their overall impressions of CampusWiki; their specific views on its usability; its usefulness to them personally and to the campus community as a whole; their concerns relating to privacy, location awareness and anonymity; and their intention to use it. The guides also included questions relating to the participant's experience with wikis and wireless devices, their places of residence (i.e. on campus or off-campus), and demographic attributes such as age, degree program and department.

### ***Subjects/Interviewees***

A quota sampling approach was used in recruiting subjects for this exploratory study. Given the small size of the sample (12 subjects), only the characteristic that was expected to be most important (age-related undergraduate versus graduate) was selected. One of the two research teams was required to interview six undergraduates and the other team six graduate students. However, within each level, the interviewers were free to approach any student without prior CampusWiki experience who was not a close friend. The twelve students who agreed to participate were registered with various departments including Computer Science; Information Systems; Mathematical Sciences; Civil and Environmental Engineering; and Industrial and Manufacturing Engineering. The eight male and four female participants, ranging in age from 18 to 50 years old, reflected the composition of the student body. However, the 11 commuters and one resident under-represented resident students.

### ***System Exploration and Interview Process***

The duration of the system exploration and interview session was approximately one hour. During the system exploration, the participants were required to perform the specific tasks described in the script. However, they were also free to make comments, ask questions, and explore other aspects of the system that were not covered in the script. The entire process was recorded and transcripts were prepared from the recordings.

The twelve system exploration and interviews were done in two phases: six in the first phase (three for each of the two teams), and similarly, six in the second phase. On completion of the interviews in the first phase, a review of the study design was performed. As suggested by the responsive interviewing model, the study design should be "flexible and adaptive... the interviewer must be able to change course based on what he or she learns" (Rubin and Rubin, 2005, pg. 36). The only

notable modification based on the review was the clarification of the description of the location aware feature in the system tour and interview guides. The participants appeared to have misunderstood this feature and thought that it showed the location of other individuals using the system in real time.

### ***Data Analysis***

Two coders examined jointly the transcripts of recorded interviews in order to extract prominent and interesting themes that emerged from the subjects' comments and reactions during the guided tour of the system and their responses during the interview. Coding categories followed the logic of the questions in the guide. For example, some of the themes in the category relating to "concerns" were based on users' responses to the following question: "Do you think there are any special issues regarding this site?" The identified themes were used as the basis for coding the transcripts using QSR Nvivo, a software application for qualitative data analysis. As this was a pilot study, each coder coded six transcripts individually. Therefore, inter-coder reliability could not be calculated.

## **Results and Discussion**

The following discussion focuses on the key themes that emerged under the three predominant topics of the discourse that took place during the guided tours and interviews: perceived benefits, concerns and anticipated use. Pseudonyms are used in this discussion for purposes of readability and anonymity. It is important to note that the subjects were first time users with, on average, less than an hour experience with the CampusWiki before the interview. The benefits, concerns and response to anticipated use described below are, therefore, based on their first impressions of the wiki.

### ***Perceived Benefits***

The participants in the study were asked what benefits, if any, they thought CampusWiki might have. Table 1 lists the perceived benefits, ranked in order of the frequency with which they were mentioned. The specific benefits are discussed below.

**Table 1: Perceived Benefits, Ranked by Number of References**

| <b>Perceived Benefits (Number of times referenced)</b>            |
|-------------------------------------------------------------------|
| 1. Locating people (8)                                            |
| 2. Being informed about events (7)                                |
| 3. Promoting collaborative learning (5)                           |
| 4. Finding interesting places (5)                                 |
| 5. Decision making: course selection, organization membership (4) |
| 6. Expanding social networks (4)                                  |
| 7. Other benefits (referenced 3 times or fewer)                   |

### **Locating People**

The benefits mentioned most frequently related to locate people on campus. Most of the expressions of interest in locating people were similar to Sarah's statement that, "If you're all online and you log on the wiki and you're like, 'Oh look, that person's online too'." That is, the subjects mistakenly thought that the wiki's location-aware feature would allow them to ascertain the current location of other online users. While the wiki uses location-aware capabilities to determine where users on the wireless campus network are when they edit a page on campus, this location information is not updated in terms of "real-time" location of users. When a page is created about an entity (a person, organization, place, or event), a static location is designated as associated with that entity by the author. This static location is used by the wiki to determine the information that will be displayed as "nearby" to the campus wireless network user. Interestingly, even after the location-aware feature was clarified in the redesigned guide used in the second phase of interviewing, subjects still misunderstood this functionality.

This misunderstanding, as well as the implications of it, will be addressed in more detail in the Limitations section of this paper.

### **Being Informed About Events**

CampusWiki can be used by event organizers and other users to describe events and associate locations on campus with these events. The location-aware functionality displays events on campus that are in close proximity to the user. The ability to be informed about events was also cited frequently by participants as they described their perception of the benefits of CampusWiki. Leonard, when asked what benefits he saw to the wiki, succinctly replied, “Events. You can see what is going on, on the campus.”

### **Promoting Collaborative Learning**

Lee was very enthusiastic about the academic possibilities for CampusWiki. He perceived it would be effective as a tool for collaborative learning. Rather than depending on the teacher for clarification or information, students could use the wiki to collaborate and help each other. Lee described this possible collaborative use as:

“...even other students could answer questions from one another, you know it doesn't necessarily mean that you have to bother the teacher.”  
“Everyone's a resource, you know?”

### **Finding Interesting Places**

Users of the wiki can create, edit and read pages about various places on campus and can rate various aspects of these places. Leonard felt that “you can find a lot of places” that serve as locales for events or gatherings, is a benefit of CampusWiki. The user-supplied information about a place might be used by students to determine whether or not to frequent that place.

### **Decision-making**

A number of references were made about the potential usefulness of the wiki for making decisions about where to live, where to go, what courses to take, and what professors to select as advisors. Sarah believed that because comments would be provided by the user community, not the entity being discussed and rated, they would be less biased than opinions expressed by the entity itself. She said,

“If I wanted to join RHA and I went to the RHA website they're going to say all nice things about themselves because they made their own website. But, if I was to look here and people were saying ‘Don't go, it's a waste of time’ or ‘it's actually great,’ it would help me decide.”

### **Expanding Social Networks**

The interviewees' responses also suggest that the wiki application has the potential to contribute to the expansion of social networks. Users can add their own pages and describe themselves, their likes and dislikes, etc. Perhaps a user who is interested in meeting people who play basketball can create a wiki page and a dialogue can start on that page with contributions from others who share the same interest. Perhaps with that type of scenario in mind, Sunil mentioned that he liked to play cricket and would like to use the wiki to help him create a team. Similarly, Keisha suggested that the wiki would be useful to enhance communication and could lead to developing new friendships

### **Other Benefits**

Four other benefits were noted by the respondents. These benefits along with representative quotes are as follows: (a) improving a sense of campus community – “I was not on campus when I did my undergraduate... My wife though was a campus resident... She had much more of a sense of community with the school. I didn't have any sense of belonging to it... If you are living on campus, I can see some of that [referring to the information on CampusWiki] being useful;” (b) enhancing campus orientation for new students and commuters – “CampusWiki can be a very good resource to get useful

information, such as best places for study, lunch, or meeting people” or “for example, I can know which organization is most suitable for me;” (c) creating and participating in discussion forums - “if there is something you want to discuss, you can post a message and ask people to comment on it... a forum kind of thing;” and (d) planning events – “based on the comments of the place, I can make a better plan for my events.”

### ***Perceived Concerns***

Concerns expressed about the wiki’s functionality and potential use, ranked by the frequency of references in the coded transcripts, are shown in Table 2. The two main concerns, privacy and misuse, are discussed in more detail below.

**Table 2: Perceived Concerns, Ranked by Number of References**

| <b>Perceived Concerns (Number of times referenced)</b> |
|--------------------------------------------------------|
| 1. Privacy (10)                                        |
| 2. Misuse (9)                                          |
| 3. Other concerns (referenced 3 times or fewer)        |

#### **Privacy**

Many of the privacy concerns were related to the location-aware capability of the wiki. One subject expressed concern that the system would be able to track him wherever he went on campus. He nervously asked,

“This has limitations, right? It’s not going to be like ‘Oh, where’s Lee? He’s in the restroom but he has his PDA on?’”

Lee was concerned that other users would be able to know his location whenever he was on the network. The other subjects with privacy concerns were also worried that other users would be able to track them. Rachael indicated that if she could be tracked, she might be interrupted while working. Some of the subjects suggested that a solution to other users being able to locate them could be “to make this an option like most of the messaging services where you can remain invisible to others.” Interestingly, these concerns represented a misunderstanding of CampusWiki’s functionality, a misunderstanding that was addressed in the benefits section and will be addressed again in the limitations section of this paper. The wiki does not “track” anybody; it simply customizes the display of wiki pages to reflect the user’s location. However, the fact that the location-aware functionality aroused such concerns is suggestive that the use of the feature needs to be clearly explained to users and that the designs of SmartCampus applications must be made with careful consideration of these concerns.

#### **Misuse**

Users can edit pages on the wiki without first registering or being authenticated. That all pages can be anonymously edited by users brought the possibility of misuse to the minds of many of the subjects. The primary concern was that offensive and/or obscene material might be placed on the wiki. A number of the subjects felt there should be ways to either control the content or to determine who posted specific material. Andy said,

“If you are saying something which is obscene or really nasty, you shouldn’t have the ability to put it in there anyway.”

Leonard wanted more control of a personal page he might create and the ability to identify posters who might post “nasty” things about him. He said

“I’d like to know exactly what is and what is not coming out now in the page and who’s editing it.”

#### **Other Concerns**

Other concerns were expressed about security, upsetting the status quo, confusion about use, and accuracy. On the issue of security, a respondent asked about the content of the web site being viewed and edited by individuals who are not part of the university community. The following questions suggests that another participant was interested in the wiki’s impact on the status quo: “Will this eliminate our personal websites? Are they going to make everything into a wiki?” A subject’s



confusion about use was reflected in the following comment and questions: “It’s like a conflict now. Where do you go? The teacher says he has something up online, do you go look at his website, his homepage, or do you go look at his wiki?” Finally, with regard to accuracy, a participant expressed the following, “anybody can write whatever they want.”

### ***Intention to Use***

The subjects were asked, “Do you think you will use CampusWiki during this semester?” or “Do you think you are likely to use this site?” Over 80% (10 out of 12) gave a positive response. Some subjects volunteered specific reasons for which they would use the wiki. For instance, one said, “yeah, I think it would be really good to advertise events on here... I can imagine it would be fun in class too” and another stated, “probably yeah, because the information that’s in njit.edu, a lot is not updated.... So, yeah I’ll probably use it.” These encouraging reactions suggest that with very little exposure to the wiki, participants were able to appreciate its benefits and were probably able to make a determination that these benefits outweighed their concerns.

### **Limitations**

This was a preliminary study on an early prototype. As the system evolves, some of the findings may no longer apply. Only a small number of participants were selected for this study, and moreover, they were all students in the sciences. These students are probably able to perceive its potential uses more easily, and may have a greater inclination to use a new technology than humanities majors. This can be verified in future research. In addition, the sample underrepresented undergraduate students residing on campus and this needs to be rectified in future studies.

Another limitation is that only wireless notebook computers and desktop computers were used. CampusWiki, however, is intended for use on any wireless device including PDAs and cell phones. It would be interesting to elicit the perceptions of users with devices that have much smaller screens.

As noted earlier, there was confusion about the location-aware functionality of the application. This stemmed largely from the sparseness of online documentation of the incomplete system at that stage of development. This limitation is also an interesting finding in that it suggests to the implementers that the information disseminated does not adequately explain a central feature of the wiki.

### **Conclusions**

This paper describes the reactions of prospective users of a context-aware wiki, a new type of collaboration software, during and after their “hands on” exploration of an early version of the software. The most frequently cited benefit and the primary concern were based upon a misconception of the location-aware functionality of the wiki. This in itself is an important finding as increasing system acceptance for this new type of application requires addressing not only the actual benefits and challenges, but the perceived ones as well. The participants also found benefits that were intended by the implementers of the system, such as being informed about events, finding interesting places, helping in making decisions about course selection and organization membership, and expanding social networks.

The concerns expressed by the participants about possible misuse suggest that there needs to be a delicate balance between a flexible, free community of users and the constraints that are appropriate for the environment in which a context aware wiki is being used. Many of the privacy concerns were based on a misunderstanding of what “location aware” meant within the context of the CampusWiki application. This finding indicates that the system should display the information that “location” of another user refers to their usual “hangout” rather than tracking their real time campus location. The overwhelmingly positive response with respect to participants’ intention to use CampusWiki, despite their (often mistaken) impressions about what location information would be displayed to other users, confirms the findings of several prior studies that privacy concerns do not necessarily translate into a decision not to use the software that raises these concerns (e.g., Spiekermann et al., 2001).

In general, the results of this study can help to guide designers and implementers of this type of system in terms of the functionality desired (and not desired) by users, and also in terms of the documentation and guidance to be provided to users to shape their perceptions of and adoption of the system. There is a need to overcome misunderstandings and increase trust in

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the system through better education of the prospective users about how “current location” information will and will not be used in systems like CampusWiki.

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