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CAUX Tool for Supporting Diary Studies

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Diary method can help user experience (UX) researchers to understand the behaviour and intention of a user in a real environment for a period of time without being present. To capture accurate and effective diary data and improve the overall quality of the diary study, the author presents a new tool for supporting diary studies. Context-awareness User Experience (CAUX) tool is able to perceive the user's situation by using context-awareness technique in appropriate way so as to remind users of recording diary entries timely. And some techniques such as sensors can be used to collect user data which can serve as clues to help users recall, thus some comparative experiments can be designed to evaluate CAUX tool for supporting diary studies, comparing diary entries collected by this method with those collected in traditional method. The result shows that diary entries collected by CAUX tool have advantages in the numbers of words, effectiveness, accuracy, and the abundance of diary. CAUX tool can collect a higher quality of diary entries, and also provide the powerful support to help the UX researchers find more valuable insights and findings.

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1.Introduction

Nowadays, user experience (UX) has drawn a great deal of attention in all walks of life. UX research is an important activity in human-computer interaction (HCI) research [1], and gradually become the key factor to determine product's success [2].

Under the background of mobile Internet, it is quite difficult to understand the behavior of users in a period of time and create suitable scenes in a laboratory environment [3]. Diary method, as a UX research method, which is widely used in the field of HCI and collects qualitative data, can help UX researcher to understand the behavior and intention of users in real situation, which allows diary method to have a higher ecological validity [4]. Diary usually collects data with situation and period; therefore, diary method can provide a more real contextual situation.

Based on the diary method, the author proposes a new method for diary studies by using the Context-awareness User Experience (CAUX) tool. This method uses context-awareness technology to remind users to record diary and automatically collect data in the background as clues to help users to recall. The second part is the overview of study; the third part introduces the process of improving the capabilities of CAUX to support diary studies; the fourth introduces the experiment that evaluates the ability of CAUX from four dimensions; the fifth summarizes the article, and describes existing problems and future research directions.

2.Overview of study

Brandt proposed a "snippet-based" diary collection technique [5], and Karen also used this technique to study mobile needs which can not ensure the effectiveness of user diaries [6]. Benjamin proposed an application called "Storytelling" that allows users to recall according to the early entries [7], Chang used a tool called "Catch Note" to collect diary [8], Ludwig summarizes the advantages of the traditional diary method [9]. However, these diary tools are still in developing stage, and they still have some shortcomings: the first is that users often forget to record the diary. As a result, the traditional and existing diary tools can not guarantee the instantaneity and effectiveness of diaries; and the other is that users' memory is overloaded, as a result, traditional and the existing diary tools can not guarantee the accuracy and completeness of diaries.

The current CAUX tool is still in groping phase, and its capability to help UX researchers conduct the high quality of diary studies needs to be improved. The author firstly sums up the shortcomings of traditional diary methods and tools, and then conducts many iterations on the basis of extensions to make the advanced CAUX to support diary studies well. Based on real user behaviour research cases, the author conducts comparative experiments, and describes the experimental design and methods in details, and lastly analyses and discusses the experimental data collected by CAUX tool and traditional diary method. This article attempts to demonstrate that the CAUX tool can effectively collect more diaries which are more accurate to help UX researchers better understand user behaviour.

3.Improving the Capabilities of CAUX Tool

According to literature research and small-scale case studies, CAUX tool should be improved in the following two parts to support diary studies.

3.1 Reminding based on Context-awareness Technology

One of the shortcomings of user research in diary method is that the user will forget to record the diary in time. CAUX shows the process of simulating the UX researchers' context. First of all, the context is acquired, and all the context information related to user behaviour is obtained by the phone's sensor as saved, then matched with the expected context. If there is a match, the user data is collected. If not match, continue to monitor until the end of study. CAUX tool can support diary study to remind the user to record the diary in spare time, which not only ensures the high ecological validity of the diary, but also uses the phone notification to remind users, thereby reducing the disturbance to users.

3.2 Prompting Users with Clues

A common problem for users in the diary phase is the omission of events when doing the recording. As a result, it may influence the reliability and validity of the research. Therefore, the author uses the contextual data collected by CAUX as a clue to help users recall and reduce the memory burden of users, and store the user data in the cache pool, and present the user with clues to help them recall the usage of mobile phones and behavior. The interface of diary with clues is shown in Figure 1.

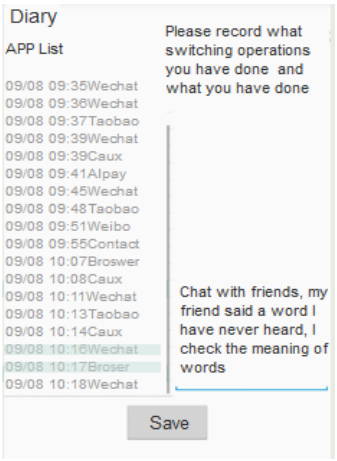

Figure 1 : The Interface of diary with Clues

4. Experimental Design and Evaluation

To evaluate the ability of CAUX tool for supporting diary studies, the comparative experiment was designed. The study case chose the college students' behaviour of cross-Apps. The experiment recruited 8 college students online [10], including 4 females and 4 males with an average age of 23.2 (SD = 0.8). Users were required to meet the average daily use of mobile phones for more than 6 hours with more than 5 kinds of Apps installed in their phones.

4.1 Experimental Method

The experiment was two weeks long, and six users were randomly divided into Group A and Group B. First, Group A used the traditional diary method and Group B used the CAUX tool; after one week, the two groups exchanged methods.

(1) Traditional diary method

To reduce the burden of recording, the design is as simple as possible. The number of Apps in users' mobile phone is fixed, when two or more Apps are involved in completing one

task, the users should record the numbers of Apps, length and usage, all of which are required to submit before 22:00 and responses to the three Likert Scale prompts.

(2) CAUX method

The method needs to sense the user's context so as to remind them to record the diaries in their spare time which are relatively fixed during the working day. Therefore, the experiment set the contextual triggering rule, if users in spare time (12:00/18:00/22:00) and indoor (laboratory/classroom/dormitory), then there is a notification. Users should response to Likert Scale as well.

4.2 Analysis and Results

The data collected in this experiment include objective data by the background of CAUX and diary which offer objective data 26230 rows and 227 diary entries.

4.2.1 Data Analysis

The experimental data analysis steps are as follows:

1. Selecting two similar days to compare with one day using traditional diary method and the other using CAUX tool method by the same use. The similarity is based on the tool collected by the background objective data, including: working days/non-working days, the time couples with location and the network status, the number of applications and frequency, background application running list.
2. According to the specific dimensions, the author compared the diary entries collected in two methods, the four dimensions are as follows: the length of diary entries, effectiveness of diary entries, accuracy of diary entries and richness of diary entries.

4.2.2 Discussion of the results

The data collected in this study include objective data(26230 rows) and subjective data (275 diary entries) by CAUX. According to the statistical results of the dimensions, the author will analyse the advantages of the CAUX tool method over traditional diary method.

(1) The length of diary entries

From statistical results, the CAUX tool helps UX researchers collect longer user diary entries than traditional diary method (CAUX/Traditional difference *P*-value: 0.049). One reason is that context-awareness reminding from the CAUX tool reminds users to record the diary entries instantly. In the exit interview, user 1028 spoke: "It's a lot easier to see what Apps I use today when I recall something more than just going to them". Both the statistical data and exit interviews show that the CAUX method can collect an average longer diary entries than the traditional method. The reason for the difference between Group A and Group B is that group B used the CAUX method first and then used the traditional method. Three of them used to apply CAUX, but they do not know what to record in traditional method. A summary of this data is shown in Figure 2.

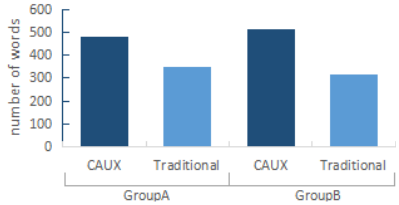

Figure 2: Average word count for CAUX and traditional daily diary entries, broken down by group

(2) The effectiveness of diary entries

The effectiveness of the diary entries is the difference between the diary entries actually recorded by the user and expected goals. Experimental data from the CAUX tool show that, the cross-App behaviour automatically collected by the background shows that users should record 141 cross-App behavioural stories, and the tool actually collected 127 dairy entries with an effectiveness of 90.7%. Using the data from the traditional diary method, the baseline data (the usage of App automatically collected by the CAUX background without disturbing users) shows that the user should record 159 cross-App behaviour stories and the user actually submits to the UX researchers a total of 101 dairy entries, the effectiveness rate is 63.5%. The users record each cross-App story according to their time and App clues list in diary interface, which reduces the missing rate in the cross-App research, while in the traditional method experiment, each user has the problem of inaccurate recording of the number of App sequences. In the cross-sequence of App, two Apps have been switched several times before and after. However, the user only records the switching behaviour once, and the user reflects that because they cannot remember how many times the two Apps are toggled, they can only record what has been done by these Apps. However, during the experiment with the CAUX tools, the user has clues about the App stream and can see which App, and to some extent to help users recall the events that switch multiple Apps in details.

(3) The accuracy of diary entries

At the end of each day in the experiment, participants responded to three Likert Scale prompts. Figure 3 presents a breakdown of the responses to each prompt. For the prompt regarding accuracy, participants selected either “I strongly agree” or “I agree” on over 80% of the entries they completed by using CAUX method, which is much higher than the result of using traditional method. Participants disagreed (strongly, moderately, or mildly) that they had left out large and small details in 89% and 62% of entries by using CAUX. Making accurate entries in CAUX is that it eliminates the time window where participants potentially forget important details, but which means that CAUX tool can help reduce the forgetting rate. Although the APP list is relatively simple, the user still remember what happened. Using data as a clue to increase accuracy is one of main purposes. The users’ feedback suggests that it is not a problem to remember the details of an event as they record diary, and they think that if the interface adds more hints, it will help them recall more details.

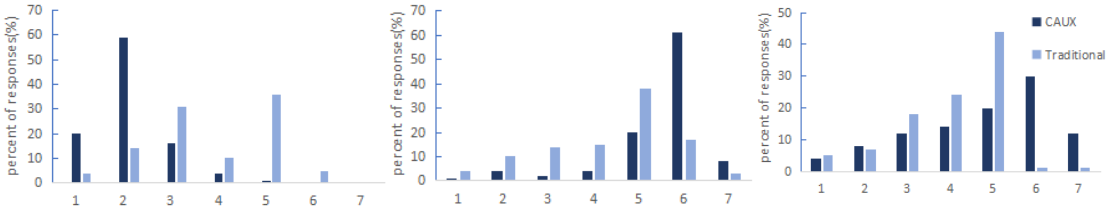

Figure 3: Responses to Likert Scale prompts “All of the data contained in this entry is accurate”, “I left large amounts of information out of this entry because I couldn’t remember it”, and “I left small details out of this entry because I could not remember them” respectively. A response of 1 corresponds to “strongly agree” and 7 to “strongly disagree”.

(4) The richness of diary entries

The number of people and geographical location information included in the entry is obviously more than the traditional method. The number of words with subjective emotions included in the entry can reflect the psychological state of the user at the time, which can reflect the user's dissatisfaction with the mobile phone App experience at that time. CAUX tool reminder function can prompt the user to express the mood at that time, but during the traditional method experiment, the user reflected that they have forgotten the emotion at the time of the event. So CAUX method has a clear advantage; while the user in the diary reflected

that the greater of the number of verbs used in the entries, the more user behaviour is reflected in the diary entries; the more specific and independent things are reflected by users of CAUX. Overall, the CAUX tool has some advantages over the traditional diary method in the richness of diary entries. It is mainly based on the higher freshness of the user for the events and less difficulty in recalling the details of the event. The specific dimensions and statistical data are shown in the Table 2.

Specific dimensions	Group A		Group B
	CAUX	Traditional	CAUX
The number of person contained in diary	121	51	136
The number of geographies or places contained in diary	108	44	99
The number of words with colour of emotional contained in diary	88	12	74
The number of verb words contained in diary	198	101	174
The number of relative independent events contained in diary	101	54	87

Table 1: The data of 5 specific dimensions of the richness of information contained in diary entries, broken down by group

Judging from the quality and quantity of the diary entries, the CAUX tool method has advantages over the traditional diary method in diary entries collecting. The diary data collected by the CAUX tool is more effective, accurate, and richer, but whether CAUX tool can get more valuable insights still needs to verify .

5. Conclusion and Future Work

Based on context-awareness technology, the author proposes a new diary method, which uses CAUX tools to collect diary entries. Experiment shows that CAUX tools can collect real users' data of users in real environment. Compared with traditional dairy method, CAUX tool can collect a lot more effective, accurate, and richer qualitative data. Using context-awareness technology can remind users to record diary entries in time and ensure the length and effectiveness of diary entries; data clues help users recall more behavioural details to ensure the accuracy and richness of diary entries; Through the research on the behaviour of users cross-Apps, we explored the method of diary studies using CAUX tool to make up for the shortcomings of traditional methods and existing diary tools, and elaborate on the advantages of the CAUX tool supporting diary from four dimensions with each having edges to improve the overall quality of diary studies.

CAUX has achieved its goal as a new tool for supporting diary studies. However, CAUX is limited by the accuracy of the sensor and the lack of stability of the system also limits the context-awareness of the CAUX tool to a certain extent. In the future, we will further enhance the CAUX tool with context-awareness; the next step is to apply CAUX to more types of diary study and improve the generalization of tool for more types of diary studies.

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