A REQUIREMENT MODEL OF A WEB-BASED DIARY STUDY FOR QUALITATIVE STUDIES

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ABSTRACT

The Web-Based Diary Studies for Qualitative Studies aims to improve qualitative research by providing a comprehensive and user-friendly platform for conducting diary studies. This system uses web technology to record participants' thoughts, experiences, and activities over an extended period. The goal is to provide researchers with a valuable tool for efficiently and effectively collecting qualitative data in a longitudinal and context-rich manner. The system captures real-time user behaviour and experiences and gives researchers deep insights into user interactions and preferences. Several commercial diary study applications are available, and several studies apply the dairy study method in their data collection. However, they should have covered the design aspect of this app. Therefore, this paper aims to create a requirement model for qualitative studies' web-based diary study. This study was conducted using the Rapid Application Development methodology, where its prototype is evaluated in terms of usability using a survey method. Participants responded positively to the web-based diary study system, expressing satisfaction with its utility, user-friendliness, and overall performance. Most participants regarded the system as straightforward for conducting qualitative research. Furthermore, they commended the system's user-friendly interface and effective data management capabilities. This web-based platform empowers researchers to understand users' perspectives comprehensively and enables them to make informed decisions based on rich qualitative data. Overall, this system contributes to

advancing the field of qualitative research by providing a robust and flexible tool for studying user experiences and behaviours over time.

Keywords: Web-Based Diary Study, Qualitative Studies, Usability evaluation.

INTRODUCTION

Among the many choices of methods available to qualitative researchers, a diary study is a research approach that collects qualitative data about user behaviours, activities, and experiences over time. The diary method does not refer to a specific procedure. Instead, it includes different techniques to record their thoughts and feelings and provide information on their daily life experiences and events (Alaszewski, 2006; Bartlett & Milligan, 2015). Diary refers to a class of methods, such as experience sampling, event sampling, and daily diary studies, which differ in their data collection methods. Previous reviews have introduced this method (Bolger et al., 2003). In a diary study, participants self-report data to promote honest feedback reflecting those experiences longitudinally, which means over a prolonged period ranging from a few days to a month or longer. Participants are often reminded to fill in their diaries regularly through a daily notification or at selected times. Diary studies involve participants recording their thoughts, feelings, and experiences over time (Lakshmy & Lee, 2002). This can be done using various methods, such as paper diaries, electronic diaries, or mobile apps. Diary studies are often used in user experience research to understand how people interact with products and services daily.

In today's mobile world, diary methods have risen in the workplace (van Eerde et al., 2005). A diary system appears to be a beneficial strategy compared to retrospective instruments because workplace learning is frequently merely a by-product of working activities. The fundamental benefit of diary studies is their unique ability to provide contextual insights into real-time user behaviour and demands. Diary studies differ from other research methodologies, such as user interviews or usability tests, which tell something about the usability of specific applications; diary studies provide insight into how users interact with products. Daily studies are generally performed with other research methodologies such as in-depth interviews, observations or shadowing, and surveys.

The diary study method has been employed in a variety of research endeavours. For instance, it has been utilised in investigations about mobile information behaviour (Tang & Oh, 2020), problematic encounters associated with social media (Altuwairiqi et al., 2019), social networking platforms (Alutaybi et al., 2019), experiences with health-related mobile applications (Vaghefi & Tulu, 2019), and the assessment of user experience (UX) (Sutcliffe & Hart, 2013). UX is related to user feelings when interacting with the system, such as web applications (Hashim et al., 2022).

However, diary studies can be challenging to conduct. Participants may need to remember to fill out their diaries or be unable to provide detailed and accurate information. Additionally, the data from diary studies can be challenging to analyse. There are many types of diary study tools used by researchers which are for distributing the questionnaires to targeted respondents. This method requires cost, time, and effort. There are many commercial web-based diary study tools, but users must pay to use them besides registering, such as Indeem, and Dscout. Most researchers prefer not to use this commercial web-based diary study because they need the trust to use this system. Also, it is expensive. This shows that researchers want to use tools that help them conduct a diary study, but the system needs to be less costly. Based on the described problem, a web-based diary study will be developed. This system will cater to traditional methods' needs,

including functions to disseminate questionnaires, gather feedback, specify the period, and analyse the collected data (Sekaran, 1992).

To address these challenges, a requirement model of a web-based diary study system will be created in this study. A prototype of this system will be developed, and its user interface will be evaluated in terms of its usability with potential users. Moreover, this system is designed to be user-friendly and efficient and can collect data from many participants. This system will make it easier for researchers to conduct diary studies and gain valuable insights into user behaviour.

This paper is organised into five sections. The first section, Related Studies, discusses previous research on diary studies, including the benefits and limitations of different methods. The second section, Methodology, describes the methodology used to develop and evaluate the web-based system. The third section, Design and Development, describes the design and development of the web-based system. The fourth section, Outcome and Discussions, presents the evaluation findings and discusses the implications of these on diary studies and web-based systems. The fifth section concludes the paper and discusses the impact of the findings and the potential for future work on the web-based system.

RELATED STUDIES

This section covers an analysis of existing tools offering researchers diary study features. This section also covers existing work that uses diary studies in the qualitative analysis. Several commercial web-based diary study systems have been developed to support qualitative research. Three notable systems in this domain are Dscout (Lardner, n.d), Lookback (James, 2022), and Indeemo (Indeemo, 2023).

Dscout is another web-based diary study system that allows researchers to create diary missions that include a variety of prompts. For example, researchers can ask participants to take photos or videos of their experiences or to answer questions about their thoughts and feelings. It also offers a variety of data analysis tools that can help researchers make sense of the data collected from diary studies. Lookback is a web-based diary study system that allows participants to record their screen activity and audio recordings. This can help understand how people interact with products and services and identify areas where the design of the product or service can be improved. Indeemo is a web-based diary study system that is designed for mobile devices. This makes it easy for participants to record their data using smartphones or tablets. It also offers a variety of features, such as push notifications, in-the-moment probes, and media capture. These features can help researchers collect more comprehensive data about participants' experiences.

Moreover, Indeemo is also better than the Dscout tool in terms of usability. Dscout has minimal tools for Indeemo in analysing and processing the data. Besides that, Indeemo provides scheduled tasking for the engaged participants, while Dscout only reminds the researcher to launch its weekly. Based on the collected data, it clearly shows there are no stable tools, and each has its advantages and disadvantages.

The following are several qualitative research that apply dairy studies. Tang and Oh (2020) employed an online survey to recruit 51 participants, who were selected based on specific criteria such as their status as undergraduate or graduate students using smartphones. Subsequently, these participants downloaded the FlexMR diary study app on their mobile devices to log diary entries every time they engaged with their

smartphones over three weeks. Additionally, 15 follow-up interviews were conducted with diary participants.

In contrast, Alutaybi et al. (2019) structured their diary study in three phases: introductory interviews, the diary study itself, and three focus groups, all involving the same 16 participants. Participants received daily email templates for two weeks to complete diary entries concerning their experiences with social network design, filling out the diary as soon as they had relevant experiences. The study on problematic experiences related to social media began with two focus group sessions to gather initial insights, which involved 18 participants over two weeks and two tasks. Participants underwent face-to-face interviews after the diary study phase to review their daily entries (Altuwairiqi et al., 2019).

In Sutcliffe and Hart's (2013) study evaluating user experience with iPads and tablet technology, the process commenced with a pre-test demographic questionnaire. Participants were then assigned two tasks and asked to complete questionnaires at three different points in time. They recorded their experiences with the system in weekly diaries and participated in semi-structured post-test interviews. The questionnaires complemented the qualitative data to assess user experience,

These prior studies illustrate the procedural flow of diary studies undertaken by other researchers, which can serve as a model for the current study. In line with this, the present study recruited participants utilising e-procurement systems, following a sequence that included a pilot test (Tang & Oh, 2020), pre-experience user engagement, a weekly diary study (twice per week), and finally, a post-experience questionnaire (Sutcliffe & Hart, 2013)

METHODOLOGY

This web-based diary study system for qualitative studies was developed using the Rapid Application Development (RAD) methodology, which encompasses four stages: requirement planning, user design, rapid construction, and cutover. This RAD methodology is built around flexibility and the capacity to adjust alongside new knowledge, while standard plan-based methods need a fixed framework with defined requirements (Sommerville, 2004).

The requirement planning phase involves comprehensively analysing the system's requirements. This involved brainstorming sessions to identify potential issues and define the project's scope, including user and functional scopes. The goal was to ensure that all necessary features were included in the application, which aligns to develop an effective web-based diary study system for qualitative studies.

The user design phase of the web-based diary study system involved creating wireframes and interactive prototypes of the system's interface. The focus was on ease of use, intuitive navigation, and clear information presentation. Researchers and potential users were involved in usability testing sessions, and their feedback was incorporated to refine the designs. This iterative process ensured that the final interface design aligned with the specific needs and preferences of the target users.

The rapid construction phase of the web-based diary study system involved implementing the functionalities outlined in the requirement planning phase using rapid development techniques. RAD development methodologies were adopted, which allowed for incremental and iterative development cycles. This enabled the system to be quickly developed and deployed while continuously gathering user feedback to incorporate enhancements and address any issues.

The web-based diary study system for qualitative studies was developed using tools and technologies to ensure efficiency and functionality. The user interface and design of the system were created using HTML, CSS, and JavaScript, with Visual Studio Code as the integrated development environment (IDE) for coding and project management. Visual Studio Code provided a versatile, user-friendly environment facilitating seamless development and debugging processes.

The cutover phase of the web-based diary study system involved deploying the developed system to a production environment. This included setting up hosting infrastructure, configuring server settings, and conducting thorough testing to ensure system stability and performance. Comprehensive documentation and training materials were also provided to researchers and system administrators, enabling a seamless transition from the development environment to the operational phase.

A usability evaluation was conducted using a standardised questionnaire, the Web-based Application Measurement Inventory (WAMMI), to assess the developed prototype. This questionnaire is a validated instrument that measures user satisfaction with information systems regarding ease of use, usefulness, and overall satisfaction. Participants were shown recorded demonstrations of the system and allowed to interact with it while their interactions and workflows were observed. A post-task questionnaire collected feedback on specific aspects of the system, and the collected data were analysed to gain insights into usability, user satisfaction, and effectiveness. Moreover, this comprehensive evaluation method utilised participant feedback, observations, and data analysis to assess the system's performance and user experience (Claridge & Kirakowski, 2011).

DESIGN OF A DIARY STUDY REQUIREMENT MODEL

This section describes the design and development of a web-based diary study system for qualitative studies. The development approach follows the four phases of RAD methodology to ensure a flexible and efficient product. The process began with a thorough requirements analysis, ensuring that the system's functionalities align with the needs of researchers and respondents, followed by the tools and technologies used. The requirement of the web-based diary study system for qualitative studies is shown in Table 1.

Table 1

A List of Requirements

Num.	Requirement ID	Requirements Description	Priority
1	DDSS1	Manage users	
	DDSS1_1	Admin can update the researcher's account	M
	DDSS1_2	Admin can remove the researcher's account	M
	DDSS1_3	Admin could retrieve the password if the users forgot the password	D
	DDSS1_4	Admin can view a list of diary studies	D
2	DDSS2	Manage Diary Study	
	DDSS2_1	Researchers should be able to create new diary studies and questions, specify questions, and add them to the database.	M

	DDSS2_2	Researchers can modify the questions and answers.	M
	DDSS2_3	Researchers can edit the existing diary study questions.	M
	DDSS2_4	Researchers can delete their design diary study only.	M
	DDSS2_5	Admin can view a list of all registered visitors within a given period.	M
	DDSS2_6	Admin can generate summary statistics.	M
	DDSS2_7	Admin can add additional options to diary study questions.	M
3	DDSS3	Manage Analysed Data	
	DDSS3_1	Researchers can respond to the data.	M
	DDSS3_2	Researchers can view data on a total number of questions that have been completed and pending based on diary study questions.	D
	DDSS3_3	Researchers can view the simple data analysis based on collected data.	M
	DDSS3_4	The Researcher can choose different types of analysis results.	M
4	DDSS4	Filling in user diary	
	DDSS4_1	Respondents can be notified via email when they must answer the diary.	M
	DDSS4_2	Reminder emails will be sent to those who still need to complete the diary study as the due date approaches.	O
	DDSS4_3	Respondents can view the list of diaries that she or he has filled in.	M
5	DDSS5	Manage User Profile	
	DDSS5_1	Researchers and respondents can create a new account	M
	DDSS5_2	Researchers and respondents can view their profile information.	O
	DDSS5_3	Researchers and respondents can choose to update their profiles.	M
	DDSS5_4	Researchers and respondents to cancel any changes.	D
6	DDSS6	User Authentication	
	DDSS6_1	Researchers and respondents to type username and password to log in.	M
	DDSS6_2	Researchers and respondents can choose to log out.	D
	DDSS6_3	Researchers and respondents can request to retrieve the password from the admin.	O

To visually represent the system's structure and behaviour, we utilised StarUML to create diagrams. Figure 1 illustrates the use case diagram, showcasing the interactions between actors and the primary use cases. This system includes six critical use cases: Manage Users enables administrators to handle user accounts; Manage Diary Study allows researchers to design and set up new diary studies; Manage Analysed Data grants researchers access to collected data for analysis; Manage User Profile enables both researchers and respondents to update personal information, User Authentication ensures secure login for registered users, and Filling in User Diary allows respondents to participate in diary studies by accessing assigned diaries and responding to surveys. Through this comprehensive design, we have developed an efficient and user-friendly platform that facilitates qualitative studies and enhances user engagement.

Figure 1

A Use Case Diagram of Web-Based Diary Study for Qualitative Studies
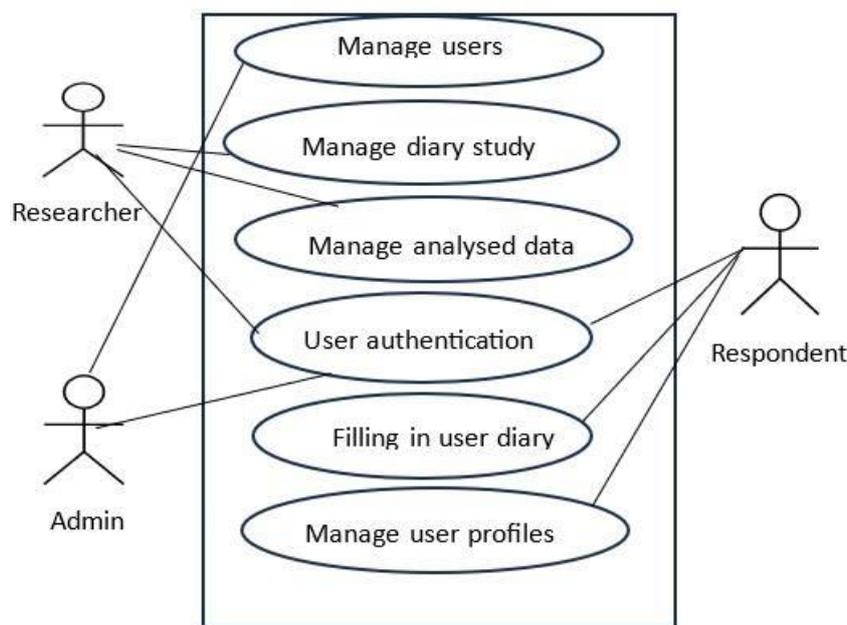
The use case diagram for our web-based diary study system for qualitative studies, shown in Figure 1, provides a comprehensive representation of the system's dynamic behaviour, encompassing the interactions between administrators, researchers, and respondents.

FINDINGS OF THE PROTOTYPE EVALUATION AND DISCUSSIONS

The usability evaluation of the web-based diary study prototype included participants from a variety of academic backgrounds and levels of experience with diary study systems. A total of 30 participants took part in the evaluation, consisting of 17 females and 13 males. 43.33% of the respondents are 25 and above. 23.33% of the respondents were aged 21-22. 23.33% of them are between 23-24. Only 10% of the respondents were aged 18-20. 56.67% of respondents are employed, and 43.33% are students. The diverse demographics of the participants ensured that the system was assessed from various perspectives.

Table 2

The Respondents' Responses on the Usefulness of the System

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I recommend this software to my colleagues.	0 (0.0%)	0 (0.0%)	5 16.67%)	12 (40.00%)	13 (43.33%)
I enjoy my sessions with this software.	0 (0.0%)	0 (0.0%)	2 (6.67%)	14 (46.67%)	14 (46.67%)
Working with this software is satisfying.	0 (0.0%)	1 (3.33%)	4 (13.33%)	16 (53.33%)	9 (30.00%)
Working with this software is mentally stimulating.	0 (0.0%)	5 (16.67%)	8 (26.67%)	12 (40.00%)	5 (16.67%)

Table 3

The Respondents' Responses on the Ease of Use of the System

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The instructions and prompts are helpful.	0 (0.0%)	0 (0.0%)	0 (0.0%)	16 (53.33%)	14 (46.67%)
I sometimes need to figure out what to do next with this software.	4 (13.33%)	14 (46.67%)	8 (26.67%)	4 (13.33%)	0 (0.0%)
I sometimes wonder if I am using the correct command.	1 (3.37%)	9 (30.00%)	6 (20.00%)	10 (33.33%)	4 (13.33%)
The way that system information is presented is clear and understandable.	0 (0.0%)	0 (0.0%)	4 (13.33%)	13 (43.33%)	13 (43.33%)
The software documentation is very informative.	0 (0.0%)	0 (0.0%)	3 (10.00%)	17 (56.7%)	10 (33.33%)
I feel in command of this software when I am using it.	0 (0.0%)	2 (6.67%)	8 (26.67%)	15 (50.0%)	5 (16.67%)

Table 4

The Respondents' Responses on the Satisfaction of the System

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This software responds too slowly to inputs.	7 (23.33 %)	11 (36.67%)	7 (23.33%)	3 (10.0%)	2 (6.67%)
The software has, at some time, stopped unexpectedly.	7 (23.33%)	6 (20.00%)	11 (36.67%)	3 (10.0%)	3 (10.0%)
Learning to operate this software initially is full of problems.	8 (26.67%)	10 (33.33%)	6 (20.00%)	5 (16.67%)	1 (3.33%)
The help information given by this software is not very useful.	7 (23.33%)	13 (43.33%)	2 (6.67%)	5 (16.67%)	3 (10.0%)
If this software stops, it is not easy to restart it.	4 (13.33%)	14 (46.67%)	5 (16.67%)	6 (20.0%)	1 (3.37%)
It takes too long to learn the software commands.	4 (13.33%)	14 (46.67%)	5 (16.67%)	5 (16.67%)	2 (6.67%)
I feel safer if I use only a few familiar commands or operations.	0 (0.0%)	3 (10.00%)	12 (40.00%)	12 (40.00%)	3 (10.00%)
This software disrupts how I usually arrange my work.	2 (6.67%)	8 (26.67%)	9 (30.0%)	9 (30.0%)	2 (6.67%)
There always needs to be more information on the screen when it is needed.	5 (16.67%)	11 (36.67%)	8 (26.67%)	5 (16.67%)	1 (3.33%)
I feel in command of this software when I am using it.	0 (0.0%)	2 (6.67%)	8 (26.67%)	15 (50.0%)	5 (16.67%)
I prefer to stick to the facilities that I know best.	0 (0.0%)	4 (13.33%)	10 (33.33%)	11 (36.67%)	5 (16.67%)

The web-based diary study system was well-received by participants in terms of its usefulness, ease of use, and overall satisfaction. Most participants found the system to conduct qualitative studies easy to use. They also praised the system's user-friendly interface and efficient data management features. However, some participants reported that the software had stopped unexpectedly at times. This feedback highlights the importance of addressing and resolving these technical issues to enhance the system's reliability and user experience. The web-based diary study system is a valuable platform for qualitative research. The positive feedback on its usefulness, ease of use, and overall satisfaction affirms its potential as a valuable tool for

researchers and participants. The system can further improve and contribute to advancing qualitative studies by addressing the reported technical issues.

CONCLUSION

In conclusion, the development of the web-based diary study system has resulted in a user-friendly and efficient platform that facilitates comprehensive research in qualitative studies. The system's essential features, such as user authentication, diary study management, and data analysis, have been successfully implemented and meet the needs of researchers and respondents alike. The evaluation findings of the system were positive, with participants rating the system as easy to use and attractive. Participants were also satisfied with the system overall. The system's simple and intuitive design makes it easy for researchers and respondents to use, and its features and functionality support the collection and analysis of qualitative data.

Overall, this web-based diary study system is a valuable tool that has the potential to revolutionise qualitative research. The system is a promising tool for qualitative research and has the potential to be even more effective and user-friendly in the future.

FUTURE WORKS

The development and evaluation of the web-based diary study system have provided valuable insights into its effectiveness, usability, and user satisfaction. The system has shown that it can streamline the process of administering diary studies, allowing researchers to collect and analyse qualitative data more efficiently and organised. Participants' positive feedback and overall satisfaction with the system highlight its potential to improve the research process and reduce the cost, time, and effort associated with traditional diary studies.

However, there are still some aspects that need to be improved and future work to be done. Several potential areas for future enhancements have been identified based on the feedback and suggestions received during the evaluation. The first one will be making the system more accessible. It will involve adding features such as text-to-speech and screen reader support. This will allow people with disabilities to use the system and benefit from its features. Next is enhancing the user interface: Some participants mentioned that the user interface of the web-based diary study system could be improved to make it more intuitive and visually appealing. This could involve redesigning the layout, optimising the navigation, and incorporating user-friendly elements. The goal is to ensure a seamless and engaging user experience. Another suggestion will be to enhance the data visualisation. One participant suggests integrating advanced data visualisation techniques and tools into the system. This will allow researchers to draw meaningful conclusions from the study data. Lastly, Integration of Chatbots. This will involve implementing chatbot functionality within the system. This will offer real-time support to researchers and respondents, providing timely assistance and addressing queries throughout the diary study process.

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