

Impact of Expert Interviews in Software Engineering: Challenges and Benefits

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Abstract—Expert interviews play a significant role in software engineering research and can improve the reliability and validity of developed software systems. This paper explores the challenges and benefits of conducting expert interviews in software engineering research by examining interviews with the experts from search and rescue organizations, conducted by the author. It is found from literature that expert interviews can enhance the reliability and validity of software development and the usability of the final product. However, challenges such as accessing experts, language and terminology differences, and ethical considerations must be considered. According to the author's personal experience, virtual interviews are more efficient and discrete, whereas physical interviews provide more information about the software systems in use.

Index Terms—access, biased information, experts interviews, software engineering, terminologies.

I. INTRODUCTION

SOFTWARE engineering is a complex and challenging field that involves technical challenges, the integration of machine and human capabilities, and the role of human behavior in software development. The impact of human capabilities and behavior on software development often results in qualitative phenomena, which are typically measured using qualitative methods such as interviews, observations, and questionnaires [1]. Qualitative research methods were originally used in sociology and anthropology, and are commonly used by academic researchers and social scientists to study human behavior [2].

Interviews are commonly used as a data collection method in qualitative software engineering research. An interview is a conversation between people, in which one person seeks to gather information from the others [3]. There are various types of interviews, including structured, semi-structured, and unstructured interviews, and the target population can be either random or composed of experts. When conducting research involving human subjects, researchers must follow ethical guidelines to prevent harm and unethical behavior [4]. There are numerous guidelines available for empirical software engineering research. However, there are both challenges and benefits to adopt any type of qualitative method research.

The primary goal of this paper is to investigate the benefits and challenges of conducting expert interviews in the context of software engineering. An expert, in this context, is someone who is in charge of designing, implementing, or monitoring a software solution. The study investigates the impact of expert interviews on software engineering research and investigates the potential challenges and benefits of conducting expert interviews in various settings. To accomplish

this, I conducted in-person and virtual expert interviews with organizations providing search and rescue services as well as enterprise resource planning (ERP) solutions in a Nordic country. The paper gives us insight into the techniques used to conduct these interviews, the challenges encountered, and the research findings.

The paper is organized as follows. In section II, the expert interviews used as a data source in this study are described, along with an explanation of the methods used to conduct the interviews. This section also briefly discusses the challenges that can arise during the process of conducting expert interviews. Section III reflects on the interviews conducted in both physical and virtual settings, and assesses the challenges and benefits encountered in the use of expert interviews as a research method. Finally, the findings are summarized in section IV.

II. EXPERTS INTERVIEWS IN SOFTWARE ENGINEERING

Many issues in software engineering are subjective and require collecting data through qualitative methods [5]. Among these methods, interviews are a popular choice to gather expert knowledge in the field. Expert interviews are unstructured or semi-structured conversations with individuals who possess significant knowledge and experience in a particular area [6]. Researchers in software engineering frequently use expert interviews to gain insights into problems and evaluate potential solutions for their effectiveness.

The use of expert input during the software development process has been found to enhance the success of a system, as demonstrated by a study conducted by Abelein et al. [7]. The authors noted that involving experts in the early stages of the development process resulted in the identification of potential problems and the discovery of innovative solutions that might not have been considered otherwise. Furthermore, incorporating expert feedback throughout the development cycle was found to result in higher quality software products and higher customer satisfaction. This emphasizes the importance of incorporating expert input into software engineering projects in order to maximize their success [7].

This paper aims to deepen the understanding of the role of expert interviews in software engineering by analyzing their impact on software development outcomes. By examining both relevant literature and personal experiences, this paper seeks to explore how expert interviews can influence software quality, efficiency, and user satisfaction.

For instance, a case study by Jasser [8] exemplified the value of expert interviews in software engineering. She found that software architects and developers are often not well-informed about developing and implementing secure software systems. Through the interviews, Jasser [8] concluded that a catalog could be helpful for architects and developers

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TABLE I
 CHALLENGES OF CONDUCTING EXPERT INTERVIEWS.

Challenge	Description
Access	It can be challenging to access experts, as they are often busy individuals with full schedules. It can be difficult to find time in their calendar for an interview. Additionally, experts may be hesitant to participate in research, either due to a lack of time or a lack of interest.
Biased information	The information provided by experts during interviews may be biased due to the expert's memory, perspective, or personal experiences. To ensure the validity and reliability of the data gathered from expert interviews, researchers can use multiple sources of information and techniques, such as official documents.
Terminologies & language in use	Different software systems may support different terminologies, and experts may use different terms or languages depending on their roles and areas of expertise.

who have limited knowledge about software security. Additionally, she emphasized the importance of being aware of the expertise of the person being interviewed and making conscious decisions when conducting interviews. In her case study, she was interested in identifying architectural security rules for a secure software system, and so she conducted expert interviews with industrial software engineers.

On the other hand, Abelein and Paech [7] conducted expert interviews with experts from the business and IT industry to explore the importance of user participation and involvement in large-scale IT projects.

It has been noted in the literature on political and social studies that accessing experts is one of the main challenges [6], [7]. In software engineering, this challenge can manifest as inviting the right person for an interview because choosing the wrong person for the job can result in unreliable and misleading information. Similar to expert interviews in political science, there are several potential challenges in software engineering, such as difficulty in obtaining the contact details of experts, security measures regarding sharing information, and experts being busy or unwilling to share sensitive information. Even if an interviewer overcomes the challenges mentioned above, they may still face the issue of biased information [6]. There is a possibility that the information shared by experts may be biased. As experts are human, their memories may be faulty, or they may be accustomed to doing their job in a certain way. The information may also be influenced by the expert's perspective on the questions asked [9].

Deakin and Wakefield [10] stated that social desirability can also impact the information shared by experts and elites in political science studies. The role or position of an expert within an organization can also be a factor that influences the shared information. For example, if a researcher conducts an interview with a business expert who is a manager in the software industry, the knowledge gained from that interview will be influenced by their knowledge and experience. Therefore, it is common practice to review documents with expert interviews.

Additionally, the use of different terminology among various domain experts can be another challenge in qualitative software engineering studies. It is common for software developers to focus on the needs of end users rather than

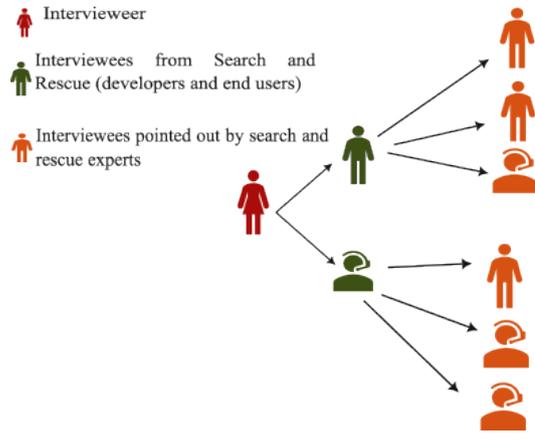


Fig. 1. Snowball sampling process (different icons shows both physical and virtual settings).

creating a generic software that can be understood by everyone. For example, if a developer is creating software for a search and rescue organization, they must use language that makes sense to rescue coordinators. This limitation on language reuse can be a significant challenge if one wants to generalize a problem. To address these kinds of challenges, it is effective to use reference documents to cross-check the data gathered and analyzed from interviews before making any conclusions.

To summarize, experts play a crucial role in the success or failure of a project in software engineering studies. However, there are various challenges when conducting interviews with experts, such as difficulties in accessing experts, concerns about biased information, and the use of different terminology among different domains, as described in Table I. There are still many ways and strategies to address these challenges.

III. PHYSICAL VS VIRTUAL INTERVIEWS

This study analyzed the challenges and benefits of expert interviews in software engineering, it was initially prompted by a three-year project as a computer scientist in the field of search and rescue operations. The research project aimed to assess the effectiveness of the systems that search and rescue experts used to save endangered lives. To gain a deeper understanding, I had conducted a study based on interviews with experts responsible for search and rescue operations, starting in the late 2020. In the beginning, the interviews were planned to be in person, but were later converted to virtual settings due to COVID-19 restrictions.

The increase in virtual research methods in 2020 was not a priority, but a necessity. There is a limited literature on virtual interviews in the software engineering domain, though in other fields of study, online interviews or fieldwork are not always favored. However, Deakin and Wakefield [10] shared a different experience of virtual elite interviews, stating that online settings increased access to elites and the interviews were very personal and open.

I had reflected on my personal experience of conducting multiple interviews in both physical and virtual settings. For the first set of interviews, I invited experts from the main organization involved in search and rescue operations, and then followed snowball sampling to invite other experts as shown in Figure 1. The first set of interviews with all

the experts were exploratory and were conducted in both settings. The questions asked in these interviews were about the role of the experts and their organizations in search and rescue missions, and how the software used by these organizations contributes to the search and rescue operations. The interviews were semi-structured, following a guideline defined by Paul D. Leedy [11]. Whereas, the second set of interview was conducted with the experts from the central organization of search and rescue and was in person.

An overview of the interview process adopted to conduct the interviews is provided in Figure 2. The first step was to plan the interview and send email invitations to the experts. The interviews were conducted both in person and virtually via Zoom, with most of them being off-camera due to the sensitivity of the topic. However, with the consent of the interviewee, one of the interviews was conducted on-camera. During the off-camera interviews, notes were taken, whereas audio/video files were generated during the on-camera interview. The next step involved transcribing these interviews and analyzing the shared information by corresponding with the experts.

Deakin and Wakefield [10] reported that conducting online interviews with elites was comfortable and personal. However, my experience was different in both settings. As my research work focused on the software systems used by the experts from rescue centers, it was not feasible to achieve this in a virtual environment. In both settings, the experts were very welcoming and encouraging and talked comfortably. However, in the physical setting, it was easier for me to relate the answers to observations.

During the virtual interviews, I had to make assumptions about what the experts were saying. Although two of the experts shared their screens to show how their software looked and how it was contributing, one of the experts from virtual interviews shared a link to their software sites. However, I still found it difficult to understand a working system in a virtual interview. There were factors that could not be ignored when making conclusions about online interviews, such as the software systems not being interfaced with the online platforms, causing delays and lost connections during interviews, and the experts requesting to stop recording for sensitive information displayed on the software.

One positive aspect of online interviews that I observed was the inconspicuous recording feature in Zoom. In contrast, I had observed an awkward pause when placing the recorder on the table during physical interviews. This experience has also been shared by Deakin and Wakefield [10].

In summary, I found online interviews to be more enjoyable than physical interviews because they required less time and effort. Rather than planning a trip, I was able to meet with experts virtually and gather valuable information for my research. However, in terms of practicality, virtual interviews in software engineering may not be the best option for those interested in learning about how software systems were used in an organization. Physical interviews could provide additional information about software systems and how experts handled them during rescue operations. During physical interviews, for example, I was able to observe the software systems in use and how the experts interacted with them, which gave me a better understanding of the challenges encountered in real-world scenarios. Therefore,

before choosing the type of interview to conduct, it is important to consider the research objectives and the context in which the interviews will be conducted.

A. Access

One of the main challenges in conducting expert interviews is accessing experts, as described in Table I. It is important for researchers to consider these challenges when planning and conducting expert interviews, and to take steps to address them. This may involve carefully selecting and approaching potential interviewees, and explaining the value and importance of their participation in the research [7]. It may also involve offering incentives or compensation for their time and effort, or adjusting the timing or duration of the interview to accommodate their schedules. By considering these challenges and taking proactive steps to address them, researchers can increase their chances of successfully accessing and interviewing experts.

Initially, I contacted the search and rescue experts (software developers and users) and scheduled an interview for August 2020. The interview was conducted in-person in a single session. Further interviews were planned through the snowball sampling, as shown in Figure 1. Following the initial interview, the interviewees gave me a list of contacts for other experts from other actors involved in search and rescue software systems. During the same meeting, it was also decided that I should go to the main office of the search and rescue service.

I sent email invitations to the other experts in August and September 2020 and set a time to meet in October 2020. However, due to COVID-19 restrictions and travel bans, it was impossible for me to visit them. As a result, the plans were changed to a virtual meeting, which was willingly agreed upon by all parties. During the virtual interview, I felt that the experts were unsure about how to share information related to software systems and asked me to visit the organizations to observe the systems in person.

In August 2021, I visited the software provider company that offers software solutions to the search and rescue service. During the visit, I found the expert to be relaxed and gave me a tour of the area where an avalanche occurred in winter 2020. The expert shared firsthand knowledge of how they and other rescue coordinators devised a search and rescue strategy to rescue people trapped in the snow. In December 2021, I visited the central office of search and rescue organization and conducted a second set of interviews with them, which helped me relate the information to the software itself.

To conclude, going online was not an issue and provided easy access to experts working remotely around the globe. The differences observed between different settings varied from the experience shared by [10]. I felt that physical interviews were more personal and informative, but under COVID-19 restrictions, online interviews were the best solution as they provided a clearer understanding of how things are done in rescue centers and how all experts coordinate together to make a rescue mission successful.

B. Biased information

The other challenge mentioned in Table I is biased information. It is important to be aware that the information pro-

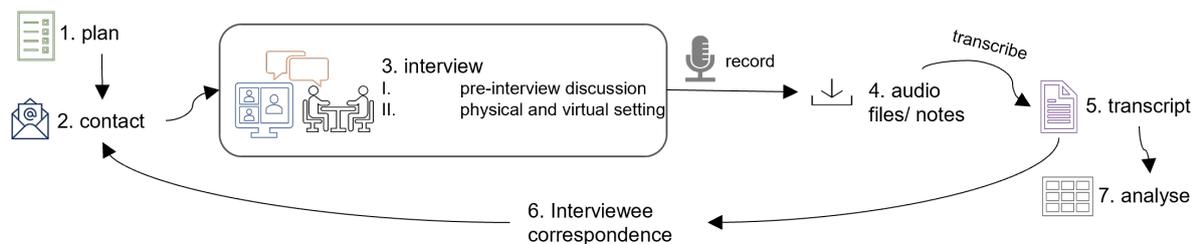


Fig. 2. Overview of the interview process.

vided by experts during interviews may be biased in various ways. Experts are human, and like all people, their memories may not be perfect. They may also be accustomed to certain ways of doing things and may be biased towards their own perspective or experiences. Additionally, the information they provide may be influenced by the questions being asked and their own interpretation of those questions [9].

To mitigate these biases, it is important for researchers to take steps to ensure the validity and reliability of the information gathered during expert interviews. This may involve using multiple sources of information, such as triangulating the data with other sources, or using multiple experts to provide different perspectives on the same topic. By taking these steps, researchers can increase the validity and reliability of the information gathered from expert interviews. In this case, I verified the shared information against official documents provided by search and rescue services.

C. Terminologies or language in use

The use of different terminologies or languages can pose a challenge in expert interview, as described in Table I, particularly in software engineering. Where different software systems may use different terminology [10]. For example, I conducted interviews with experts from organizations responsible for search and rescue operations in a Nordic country. These experts used different terminologies due to their varying roles, such as knowledge of log systems for rescue coordination or expertise in rescue operations using mapping systems. One expert had knowledge of weather conditions. It was challenging for me as an interviewer to understand each system and the terminologies used in them.

Additionally, I investigated experts involved in search and rescue operations, and the software used by these actors was in their local language. However, much of the available literature is in English. To overcome this challenge, I relied on expert knowledge and official documents to understand the terminologies and language used in the software system.

IV. CONCLUSION

In this paper, I have reviewed the literature on expert interviews to understand the impact of expert interviews on research in software engineering. It is evident from the literature that expert knowledge plays a significant role in the success or failure of any software development and validation. Using interviews as a data source can improve the reliability and validity of the developed software system. Software developers often do not have the expertise of the organization for which they are developing the system, so

involving experts from the organization can increase the usability of the software.

I have also reflected on the challenges and benefits of conducting expert interviews in different settings, based on my own experience with physical and virtual interviews in the winter of 2020 and the fall of 2021. The purpose of these interviews was to gain a deeper understanding of the software systems used in search and rescue organizations and how they contribute to search and rescue operations. Two sets of interviews were conducted with experts from different backgrounds involved in search and rescue operations. The first set of interviews was conducted with all experts via snowball sampling and the focus was exploratory in nature, while the second set of interviews was conducted with main experts to discuss new developments in the investigated domain, as the research matured over time.

Overall, my experience with different settings suggests that online interviews provide easier access and are more time efficient, but physical interviews offer more insights about the software systems used in an organization. In physical meetings, it is possible to observe the software systems while also gaining information about them.

To conclude, it is critical to carefully consider the research objectives and the context of the study when deciding on the appropriate interview setting. As demonstrated in this paper, both physical and online interviews have their advantages and disadvantages, and the chosen method should be based on the specific research goals and the context in which the interviews will take place. Researchers should evaluate the benefits and limitations of each method and choose the one that best meets their research objective. Ultimately, the success of any research study is heavily dependent on the quality of the collected data, and the interview method used plays a significant role in the reliability and validity of the data.

ACKNOWLEDGMENT

The author wishes to express gratitude to all the experts who participated in the data collection process. Additionally, the author would like to extend appreciation to her supervisors for providing guidance and support throughout the research.

REFERENCES

- [1] S. Hove and B. Anda, "Experiences from conducting semi-structured interviews in empirical software engineering research," in *11th IEEE International Software Metrics Symposium (METRICS'05)*, 2005, pp. 10–23.
- [2] N. K. Denzin and Y. S. Lincoln, *The Sage handbook of qualitative research*. sage, 2011, pp. 37–84.

- [3] B. J. Oates, *Researching information systems and computing*. Sage, 2005, ch. 13, pp. 193–206.
- [4] P. E. Strandberg, “Ethical interviews in software engineering,” in *2019 ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM)*, 2019, pp. 1–11.
- [5] C. Seaman, “Qualitative methods in empirical studies of software engineering,” *IEEE Transactions on Software Engineering*, vol. 25, no. 4, pp. 557–572, 1999.
- [6] K. Van Audenhove, Leoand Donders, *Talking to People III: Expert Interviews and Elite Interviews*. Springer International Publishing, 2019, pp. 179–197.
- [7] U. Abelein and B. Paech, “A descriptive classification for end user-relevant decisions of large-scale it projects,” in *2013 6th International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE)*, 2013, pp. 137–140.
- [8] S. Jasser, “Constraining the implementation through architectural security rules: An expert study,” in *Product-Focused Software Process Improvement*, X. Franch, T. Männistö, and S. Martínez-Fernández, Eds. Cham: Springer International Publishing, 2019, pp. 203–219.
- [9] C. Wohlin and A. Aurum, “Towards a decision-making structure for selecting a research design in empirical software engineering,” *Empir Software Eng*, vol. 20, pp. 1427–1455, 2015.
- [10] H. Deakin and K. Wakefield, “Skype interviewing: Reflections of two phd researchers,” *Qualitative research*, vol. 14, no. 5, pp. 603–616, 2014.
- [11] P. Leedy and J. Ormrod, *Practical Research: planning and design*, 10th ed., 2013, vol. 6, ch. 6, pp. 141–172.