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Using the Focus Group Method in Software Engineering: Obtaining Practitioner and User Experiences

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Abstract

This paper reflects on three cases where the focus group method was used to obtain feedback and experiences from software engineering practitioners and application users. The focus group method and its background are presented, the method's weaknesses and strengths are discussed, and guidelines are provided for how to use the method in the software engineering context. Furthermore, the results of the three studies conducted are highlighted and the paper concludes in a discussion on the applicability of the method for this type of research. In summary, the focus group method is a cost-effective and quick empirical research approach for obtaining qualitative insights and feedback from practitioners. It can be used in several phases and types of research. However, a major limitation of the method is that it is useful only in studying concepts that can be understood by participants in a limited time. We also recommend that in the software engineering context, the method should be used with sufficient empirical rigor.

Keywords: *focus group method, qualitative research methods, empirical research, risk management, requirements prioritization, usability, group support systems*

1 Introduction

In recent years, the software engineering community has started to emphasize empirical research methods to improve the validity and generalizability of research results [1,2,3] and there is a need to increase the share of empirical papers in the community [4]. Experimentation has received much attention in the literature [5,6] and the software engineering community has clearly matured in its use of experimental methods.

The increased interest in empirical methods has also made the community aware of the need to have a broader range of empirical methods available, so that appropriate methods can be selected and used for each research problem. Similar conclusions have been drawn in related fields [7,8,9].

There are several factors, however, that make empirical software engineering particularly challenging [1,2,10,11]: there are limited number of data points available, technology changes rapidly, organizations may be reluctant to accept the overhead of empirical work, it may be difficult to publish data that might expose business secrets, and data may not be comparable between different organizations. Appropriate research methods can mitigate some of the problems so that realistic empirical research can take place.

Thus, in addition to experimentation, the software engineering researchers and practitioners should use a broad range of research methods and approaches, including surveys, case studies, action research and other qualitative methods.

This paper presents a specific qualitative research method, the focus group method and reports experiences from its use in three studies. It supplements current research by providing guidelines for its use in software engineering research and discussing the method also from the point of view of the participants. One of the studies was conducted electronically utilizing Group Support Systems (GSS) technology – this paper thus reports also on the benefits and drawbacks on computer-supported focus groups.

In summary, the focus group method is a fast and cost effective method to obtain experiences from practitioners and users. It can provide content rich, qualitative information and reveal insights that are difficult or expensive to capture with other methods. However, if used for a wrong type of problem or used inappropriately, it can also produce biased or superficial results.

2 The Focus Group Method

2.1 Background and definition

Focus groups emerged as a research method in the 1950's in the social research as researchers expanded the open ended interview format to a group discussion [12]. Focus groups are carefully planned discussions, designed to obtain the perceptions of the group members on a defined area of interest. There are typically between 3 to 12 participants and the discussion is guided and facilitated by a moderator, who follows a predefined structure so that the discussion stays focused. The members are selected based on their individual characteristics as related to the session topic (so-called purposive sampling). The group setting enables the participants to build on the responses and ideas of the others, which increases the richness of the information gained [13].

Focus group sessions produce mainly qualitative information about the objects of study. The benefits of focus group are that they produce candid, sometimes insightful information, and the method is fairly inexpensive and fast to perform [14]. However, the method shares the weaknesses of many other qualitative methods – biases may be caused by group dynamics and sample sizes are often small – and, therefore, it may be difficult to generalize the results [15].

Currently, the method is widely used, e.g., in market research, product planning, political campaigning, defining business services, and in system usability studies [14,16,17,18,19,19,20,21]. Interestingly, the eWorkshops created by the Fraunhofer, U.S.A. Institute for Experimental Software Engineering can also be considered focus groups, albeit implemented over the Internet and using a very specific format [22].

There are several textbooks and detailed guidelines available on how to plan and run focus groups [12,13,23,24,25,26], making it a method that is relatively easy to adopt and use consistently. McQuarrie [27,28] offers extremely useful focus group book reviews which help in selecting a proper book whether the reader is an academic researcher, an industry practitioner or a moderator.

2.2 Steps in Focus Group Research

Based on several sources on focus groups [17,23,25], we have summarized the main steps of the focus group research in the following.

Defining the research problem. The focus group method is best suited to obtaining initial feedback on new concepts, developing questionnaires, generating ideas, collecting or prioritizing potential problems, obtaining feedback on how models are presented or documented, and discovering underlying motivations [17]. The method is not suitable for testing hypotheses, making final decisions, obtaining quantitative assessments or opinions ("how much", "how many"), exploring issues with potential political or sensitive issues, studying complex issues that are difficult to grasp in a session, of defining prices or cost preferences [17].

Planning the focus group event. The focus group event usually lasts two to three hours and has a predefined schedule and structure. The number of issues to be covered needs to be limited so that sufficient time can be allocated for the participants to comprehend the issue and have a meaningful discussion and interaction about them. The limited time also creates a constraint on how complex issues can be addressed.

Selecting the participants. The value of the method is very sensitive to the experience and insight of the participants. Thus, the recruiting of representative, insightful and motivated participants is critical to the success of the focus group study. Depending on the type of research question, participants may be people that do not have much experience in the topic of the focus group – or may be seasoned experts that can rely on their years of experience when interacting in the group. It is generally recommended that some over-recruiting takes place as last minute cancellations usually happen. It may also be useful to use pre-group questionnaires so that the session time is used most effectively for discussions.

Conducting the focus group session. The focus group session needs to be carefully managed for time while still making sure that all main contributions can be made during the allocated time. The session needs to be initiated by an introduction where the goals and ground rules of the session are explained to the participants. Each of the topics is usually presented one after another.

The discussion and interaction in a focus group session can take many forms. It can be a structured discussion, where the moderator acts as a chair; it can involve brainstorming techniques, such as affinity grouping or teamwork methods; polling and voting using preference votes or the Delphi method [29]; comparison games; or even role plays [17]. Langford and McDonagh [13] present 38 different tools and techniques that can be used to supplement a traditional focus group discussion.

There are several alternatives for data capture during session. There can be additional observers taking notes during the session, audio, video or keyboard recording can be used, and artifacts used during the session can be captured if the session involved techniques producing

such artifacts. It may also be useful to arrange a debriefing session immediately after the session so that fresh observations and interpretations from the session are captured as fully as possible. It is obvious that relying on moderator notes will not be sufficient, being a moderator is a full-time job in a focus group session. It can even interrupt the discussion it the moderator starts making notes [13].

The role of the moderator is critical in a focus group session. The moderator should facilitate discussion but not allow his or her own opinions influence the discussion. The main task is to listen and probe deeper when necessary, requiring that the moderator must be able to grasp substance discussions quickly. It is often necessary to paraphrase participant points to ensure that the contribution was correctly understood.

The *data analysis and reporting* of focus group studies can use the methods used in qualitative data analysis [30,31,32,33,34]. Quantitative data, if gathered, can be analyzed using descriptive statistics and other standard quantitative methods.

3 Focus Group Cases

In this section we will present the three focus group studies we conducted. Separate, more detailed reports are available about the actual results of the studies [35,36,37] and in this report we will provide more information about the design and arrangements of the studies.

3.1   Risk Management Study

Defining the research problem. The objective of the first study [35] was to provide insights into why and how corporations seek to improve their risk management practices, what they intent to achieve with better risk management, and what are the impediments preventing more effective risk management approaches from being used. Furthermore, we also wanted to obtain feedback on specific characteristics of a risk management method called the Riskit [38] and the corresponding software tool ("eRiskit").

Selecting the participants. We used three main criteria in selecting the focus group organizations. First, we included companies that were involved in either software development or project-based business and we wanted to find organizations from two categories of companies: (i) large, established organizations whose business volumes and size pose challenges to risk management, and (ii) smaller organizations that operate in fast-growing or turbulent business areas.

We used subjective, non-probability sampling [9,15] to select 19 companies that corresponded to the above criteria and contacted them personally to ask them to

participate in the study. We attempted to find either a risk management process owner or specialist or a business decision maker to participate in the sessions. We were not able to reach the four of the companies but all the rest agreed to participate in the sessions. However, due to last minute cancellations, total number of participants was 12.

Planning and conducting the focus group session. We held three focus group sessions, first one was a pilot session with one industrial participant, and the session was primarily intended to practice the focus group process and evaluate the questions. The data from the pilot session was included in the study as only minor changes in question phrasing were made.

Each session started with an overview of the objectives of the study and with a discussion on how participants should discuss and act during the session. Special emphasis was given to participants ensuring that the participants' opinions should represent the real situation and opinions from their organizational perspective and that the study organizers guaranteed the confidentiality and anonymity of the discussions. Participants were also unfamiliar to each other, i.e., they did not know from which organizations the others came from. The sessions were audio and video recorded so that transcripts of the sessions could be made to document all points that were raised.

We chose the affinity grouping technique [39] to elicit the focus group participants' view on risk management needs as follows. The participants were asked to spend a few minutes writing their answers on notes on question: "*what are the most relevant problems in implementing risk management in your company*"?

The responses were read aloud, briefly clarified if needed, and posted on a wall in a conference room. While the posting was being done, participants grouped the notes into categories so that similar issues were in the same group. Each participant had a unique, numbered set of notes so that the originator could be traced.

These answers were written on number-coded, differently colored notes and participants were asked to give a priority to the actions they recognized. The participants were asked to use the results of the previous session if needed, but were also encouraged to think of other actions that may not have been mentioned in the first affinity grouping session. Results were posted on the same board where the initial risk management needs were posted. All responses were documented for the analysis of the results.

The remaining two main topics were evaluated using the following format. First, a predisposition presentation, lasting usually a few minutes, was given to present each method or product characteristic, including

practical examples. Then, a semi-structured discussion took place and participants were asked to voice their opinions on the concept.

The author of the Riskit method acted as the moderator of the session. However, he also had years of experience in neutral interviewing methods and we took special care in constraining the moderator influence only to conducting the discussion according to predefined outline, clarifying unclear issues, and making sure that all participants were able to contribute.

Analysis. The focus group session results were documented in the notes used during the first part of the session and in the video and audio recordings used during the sessions. Both were transcribed into a document for analysis. The discussion transcript was issue-based, i.e., each issue or point raised was documented verbatim, but the transcript did not include clarification discussions, jokes, or other non-related communications in the meeting. In total, the focus group session transcript included 455 individual points that were raised and recorded, in addition to priority tables and rankings pooled from the participants. Each unique point was numbered for traceability.

The analysis method used was based on pattern-matching the findings against the theoretical propositions we had made [40]. Except for the affinity grouping session, we used the product characteristics as the propositions we compared the comments against.

We used three techniques to ensure that the research construct in this study was valid and in line with our research goals. First, we kept the content and format of the sessions and the presentations in them the same between the sessions. Second, instrumentation errors were reduced by using the audio and video recordings we described earlier. Third, we reduced the potential bias in interpreting the results by having another person review all interpretations made during the analysis.

The study resulted in a recognition and categorization of risk management needs, in identification of a set of theoretical presuppositions that were used in our other research, and in prioritization of Riskit and tool features that we were analyzing.

3.2 Requirements Prioritization Study

Defining the research problem. The objective of the second study [36] was to clarify practical challenges in requirements prioritization. We wanted to find out how and in which phases of the development work companies prioritize requirements and who are the ones that perform the prioritization. We also clarified which factors have an effect to priorities and from which sources practitioners gather the information on which they base their priority decisions.

Selecting the participants. We used two main criteria in selecting the focus group organizations. First, we selected such companies that were not competitors with each other. Second, we wanted to include both product-based business and project-based business companies, while we wanted to gain a wider insight to requirements prioritization.

The focus group consisted of four representatives from the two case companies. The two participants from both of the companies did not know the other company participants beforehand. However, unlike the risk study participants, participants in this study were not anonymous. All the participants got to know the name and company of the other participants.

Planning and conducting the focus group session. We designed the focus group session to consist of five parts (1/2 hour each). Each part was designed to have a dedicated topic. The topics were such as "Problems that companies have with their current practices" or "Factors that have, or should have, an effect on priority decisions".

The focus group session took three hours in total. We started the session by giving an overview of the objectives of the study and with a discussion on how participants should discuss and act during the session. We wanted to ensure that the participants' opinions represent the real situation.

The researcher worked as a facilitator of the session by motivating the participants to discuss and by leading the discussion. The discussions were semi-structured, which means that we had carefully defined the question areas, but not all the single questions in detail.

Each part during the focus group started so that participants were asked to brainstorm their thoughts and key words about the current topic to number-coded post-it notes. After that, the post-it notes were gathered and organized on a white board using the affinity grouping technique [39]. The post-it notes worked as a basis for discussions and they helped participants to keep others opinions in mind.

In addition to the facilitator leading the discussion, there were also two other researchers in the focus group session. One was responsible in collecting the post-it notes and arranging them into the white board so that similar issues were in the same group. The other researcher was making some notes during the session and participating the discussion on the basis of her earlier prioritization experiences in one company. Her comments were not later analyzed, while her insights worked just as an inspirer to the participants. In addition to the notes she made, all the discussions were audio recorded.

Analysis. The focus group session results were documented in the post-it notes used during the first parts of the sessions, in the audio recordings, and in the notes the other researcher made.

The discussions and post-it notes written were later analyzed by reorganizing them into the topic tables. The topics of the tables were mostly formed according to the mini-session topics in the focus group session. The comments given were reorganized to the tables according to similarity between them. Each participant were given an unique ID, which marked their comments in the topic tables.

The study resulted in deeper understanding of the requirements prioritization practices in the companies and categorization of the practical challenges involved.

3.3 Usability Evaluation Study

Defining the research problem. The aim of this focus group study [37] was to collect user opinions about the usability of a university's (HSE) website. This information was to be used mainly in planning the actual usability testing to follow, but the focus group results offered additional insights as such also. The usability study as a whole consisted of several phases (focus group discussion, web survey questionnaire, usability tests and heuristic evaluations), and thus it was also possible to compare the results gained by different methods used.

The HSE-website was redesigned one and a half year before the study began and the wanted to find out what could be done to improve the usability of it. An Information Systems Science Master's student trained in usability evaluation was commissioned to conduct the research. The third author of this paper acted as the supervisor of this study and she moderated also the focus group session. The researcher helped her during the session, e.g., by frequently summing up the main points of the discussion to the participants.

Selecting the participants. Initially ten representatives from the personnel of HSE – five from faculty and five from staff - were invited by e-mail to take part in the focus group discussions. The personnel regarded the topic very relevant and they were in general enthusiastic to take part in the session. The invitees were selected so that they represented various departments, administrative units and employment positions. They were asked to name a colleague in case they were not able to participate. Altogether nine representatives from the personnel eventually participated in the focus group session. A comparable pre-study for the usability tests was done with students employing a web questionnaire. Both students and personnel participated in the actual usability tests.

Planning and conducting the focus group session. This usability focus group session differed from the risk management and the requirements prioritization cases as it was computer-mediated. See research by [41,42,43] on electronic focus groups. We employed a GSS software called GroupSystems^{TM} (from www.groupsystems.com, see also [44]) in a decision room setting so that every participant was able to contribute to the discussions anonymously and simultaneously via personal computers. They were able to see each other's comments as they were typed in and submitted. Also oral discussion was allowed. The moderator had been trained as a facilitator for GroupSystems and she had facilitated previously several brainstorming and strategy formulation sessions using it.

The focus group session lasted two hours and the agenda for it was carefully planned and prepared in advance. The importance of a well-prepared agenda cannot be emphasized too much, and especially in situations where the meetings are conducted electronically. The session began by the usability researcher's presentation about her study and the purpose of the focus group meeting. Then, the moderator gave a brief presentation about GroupSystems, after which the participants were able to acquaint themselves with the tool by marking their opinions on a 1-to-5 Likert type scale to a few warm-up statements. The use of the software for the participants is no more difficult than using simple applications like e-mail.

The actual focus group questions were divided into several subgroups: background, technical, graphical design, contents, structure, navigation and best/worst characteristics. In contrast to the traditional way of presenting questions one at a time, the participants were allowed to type their answers to each subgroup's questions (ranging from 2 to 7) one group at a time. This was done as different participants have more to say on some issues and less to some others. Hence, they did not have to wait for the others to finish on some issue. In the last subgroup of questions the participants were first asked to mention which are the best and then the worst characteristics of the HSE website. The best/worst characteristics generated were also voted - again using GroupSystems - on a scale from 1 to 5 to get an overall rating from the group. The voting results were immediately discussed with the group. The session ended with a feedback questionnaire (using GroupSystems) about the session and the electronic aid used. The participants found the software useful in this type of study. However, as only little verbal discussion took place some of them thought that the session could have been conducted online as well (i.e., not necessarily being at the same place nor at the same time).

Analysis. With electronic focus groups there is no need to transcribe the discussions, as complete records can be produced right after the meeting using a reporting wizard. The focus group questions in this usability case were defined beforehand and thus the conduct of the session corresponded to a structured interview. Consequently, the answers were also conveniently organized according to the subgroups of questions.

According to the usability researcher [37] the anonymous comments obtained from the focus group participants were much more frank than the comments from their colleagues who attended later the usability tests conducted one-by-one. However, the tests were able to produce more detailed analysis of usability although the most severe problems were found already in the focus group discussions. As compared to the web survey questionnaire, the focus group provided information on more detailed issues since there was time to ask more questions. The web questionnaire was prepared so that it took maximally ten minutes to fill. Moreover, the ability to communicate with others and to build on each other's comments and ideas, most often produces richer feedback than simple filling of forms.

Based on the results we can recommend the combination of two or more methods in usability and also in other kinds of empirical software engineering studies. The focus group method seems as a promising method and it surely is worth considering conducting it electronically. We will discuss some of the electronic focus group's benefits and drawbacks in Section 4 where we synthesize the lessons learned from the three different focus group studies.

Table 1: Estimated effort in the studies(person hrs)

Task	Risk study	RE study	Usability study
Research problem formulation	15	5	3
Planning and preparation (including rehearsing)	25	10	10
Selecting and recruiting the participants	8	3	2
Conducting the sessions	9*	3	2
Transcribing the data	11	6	0
Analysis	15	6	10
Total	**83**	**33**	**27**

* Includes three sessions

4 Experiences

We collected the experiences from the three focus group studies by having each main author reviewing their own focus group study documentation and constructing a mind map of the experiences and lessons learned. These mind maps were compared and discussed, and the synthesized lessons learned recommendations are reported in the following sections. In addition, we collected participants' feedback in informal discussions or in feedback surveys.

We did not track the effort spent during the studies but estimated it afterwards using the Delphi method [29]. These estimates are presented in Table 1 by the main tasks.

4.1 Strengths

Discovery of new insights. The interactive nature of the group setting and participants' different backgrounds seem to encourage and prompt participants to react to the points during the discussion, reflecting and building on each other's experiences. This may lead to discovery of issues that researchers might not have been able to plan in advance, as happened in both of the studies.

Aided recall. On several occasions the points made by participants resulted in other participants confirming similar, almost similar and opposite incidents or events. These insights could have been hidden in personal interviews.

Cost-efficiency. For the researchers the focus group method is a cost-efficient way of obtaining practitioner and user experience as several subjects can be "interviewed" at the same time. In addition, most of our research projects are conducted with industrial companies and access to practitioners is limited due to their business responsibilities. Practitioners find the method cost-effective as well. (See next section).

Depth of interview. Focus group discussions allow in-depth exploration of the reasons why the participants think the way they do. For instance questionnaire results reveal usually only what people think, not why.

Business benefits to participants. The practitioners in our studies were quite pleased with the interactions during the session and found them valuable even before receiving any reports or summaries. In informal feedback sessions they indicated two main reasons that provided immediate benefits to them:

- *Benchmarking***.** The participants in our studies indicated that the sessions provided valuable information to them already during the sessions. This seems to have resulted from two factors. First, the discussions resulted in benchmarking experiences and practices between companies. Second, they seemed to value other participants' experiences and insights. This seemed to be a substantial advantage to participants.

- *Networking.* The focus group event seems to increase networking contacts and incentives to increase cooperation between participants.

4.2   Weaknesses

Group dynamics. As the focus group discussion within a topic often takes place without predefined format, it is possible that the group dynamics or communication styles influence the level of activity. In addition, compared to a personal interview, it is not as easy to the moderator to have control over the flow and style of the discussion. This weakness can be compensated by using structured discussion techniques or by the moderator balancing the discussion and activating the less active participants.

Social acceptability. In group situations, the social acceptability can influence the points made during the discussion. For example, it is possible that a participant volunteers incorrect information at times and disagreement may take place. Such situations may be perceived as embarrassing by some participants, resulting in selective contributions and volunteering of information. This weakness can be mitigated by laying out appropriate ground rules in the beginning and by the moderator taking an active role in conducting the discussion in those situations.

Hidden agendas. Some participants may have hidden agendas in the session, e.g., due to business relationships between them, due to motivation to appear in favorable light because of the potential publication of the results, or due to their company's internal politics. Such hidden agendas may bias the results of the session. This can be mitigated by selecting the participants into sessions so that such business relationships are not present, by emphasizing the importance of open information, and by guaranteeing or agreeing of the anonymity or confidentiality of the results.

Secrecy. Some relevant information may be withheld because of proprietary or business reasons. This can be avoided by the same procedures as in the previous point.

Limited comprehension. The time available for discussions in a focus group session is limited and communication happens most often only only verbally during the discussion. This means that too complex issues or points are not necessarily understood by all participants – nor by the researchers. However, if the participants are all experts in their area, the discussion may be surprisingly complex and deep for an outsider. Nevertheless, there is an obvious limit to how complex issues can be discussed. This potential weakness can be mitigated by selecting participants of equal expertise in the session, by providing more thorough briefings to participants, by providing advance reading material to

participants, and by partitioning complex issues to more "digestible" pieces.

4.3   Benefits and drawbacks of Electronic Focus Groups

Group Support Systems have been developed to help people work together towards a common goal by alleviating the problems related to groupwork (e.g., waiting one's turn to speak) and by fostering the benefits (e.g. synergy effects) of it. See further discussion, e.g., in [45]. The strengths of computer-mediated GSS-sessions are built on 1) simultaneous and anonymous contribution via computers 2) structured agenda 3) real-time voting and multi-criteria analysis possibilities, and 4) complete records of the electronic discussions. According to our experience, GSS offer many benefits for the conduct of focus groups. It is possible to increase the focus group size without complicating the conduct of the session. Moreover, communication apprehension, unequal participation (dominance of one person) and social conformity (groupthink) can all be alleviated or even avoided through anonymous input. Also, the ideas presented are evaluated on their own merit and not based on the person who presented them. In case several focus group sessions need to be run on the same topic, it seems that the structured agenda prepared in advance helps the groups to be conducted in a similar fashion, even if different moderators are used.

Although technology can alleviate several of the process losses of traditional group work (and focus groups), it has some drawbacks of its own. First of all, not everybody is willing or able to use computers. The communication is poorer as gestures and facial expressions are left out using computer media. People often like to socialize more with each other, and thus they may not be that satisfied with the process although the results might be superior to an equivalent face-to-face discussion. Free-riding and flaming might also produce problems especially in larger groups. Last but not least, the investment in the technology is relatively high and expertise on using GSS must be acquired or rented.

5 Guidelines for Software Engineering

5.1   Suitability

Our studies showed that the focus group method is suitable for gathering experience: all of the studies resulted in relevant and usable findings that were used to guide or complement our research. We believe that the types of research questions that can be addressed by focus groups include among others the following:

- Identifying relevant research questions;

- Obtaining practitioner feedback on research questions;
- Recognizing past experience that can be studied in more detail by other methods;
- Initial evaluation of potential solutions, based on practitioner or user feedback;
- Collecting lessons learned recommendations; and
- Identifying potential root causes of phenomena.

Such issues can be relevant in all main phases of research life cycle [35]. In the *informational phase* the focus group method can be used to collect characterizing information about the current practices, experience, or problems.

In the *propositional phase* the initial constructs, i.e., models, theories or prototypes, can be subjected to practitioner and user opinions to provide early feedback. In the *analytical phase* the user feedback can be used to evaluate the operationalization of constructs or to test initial feasibility of them.

In the *evaluative phase* the focus groups can be used to refine research questions, provide some of the empirical feedback, and support the interpretation of empirical data.

Finally, in the *technology transfer phase* the focus group can help researchers to package their contributions into a form that is more easily deployable by users. In addition, a focus group session can also act as a "sales session" for such research results. We have included examples of potential research questions in

Table 2: Example research questions for the focus group method

Informational phase
• What are most urgent or relevant research questions?
• What kind of problems are common in industry?
• Why are some problems relevant or urgent?
• What practices currently exist in industry?
Propositional phase
• What are possible solutions or hypotheses?
• What similar experiences exist in industry (has someone already tried or tested it?)?
• Are the assumptions made realistic from practitioner and user perspectives?
Analytical phase
• Is the model understandable?
• How can it be deployed into practice?
• What are the potential problems in using or understanding the model?
• Are there any omissions or gaps in the model?
Evaluative phase
• Is there any data available, can data be obtained?
• Is the empirical study design sound and practical?
• What does the data mean?
Technology transfer phase
• Is the model packaged well for operational use?
• What are the potential challenges in selling or using it?
• How it could be packaged better?

Table 2 that are relevant in this research framework.

McQuarrie and McIntyre [46] offer guidelines on how to utilize focus groups in the evaluation of new product concepts developed by technologically driven companies. They distinguish six stages through which the discussions could evolve. These stages are comparable to the actual adoption and diffusion processes regarding new products (orientation, exposure, evaluation, pricing, extensions, product modification). Among others [47,48] have discussed recently how software development and IS in general could benefit from the research done in the field of new product development (NPD), and vice versa. Thus, the framework provided by McQuarrie and McIntyre could well adapt to software NPD processes as well, especially of those software products that are targeted to normal consumers (e.g. embedded in mobile phones).

5.2 Instrumentation and Analysis

The focus group method is, by its very nature, prone to problems associated with qualitative data. As the developers of models and theories may also act as the researchers responsible for the focus group session, there is an obvious danger of researcher bias influencing the results, either during the planning, during the sessions themselves, or during the analysis. However, e.g. [13] mention that it is usually better to use a moderator that is expert in the subject matter and not in professional facilitation. Thus, we recommend that disciplined, objective and rigorous instrumentation and data analysis methods are used in focus group studies and that all findings are based on traceable data.

5.3 Focus Group Study Design

We found the affinity grouping method to be a useful and effective tool in obtaining inputs from practitioners and users. While we do recognize the limitations posed by the short time available for discussions, we believe that it is also possible to address more complex issues with focus groups. Compared to consumer studies, the software engineering field contains some well-defined methods and standards that are used fairly consistently across the industry, such as the UML, CMMI, and FPA. Thus, it is possible to select a group of experts that are familiar with a given, complex technology and use the focus group session to elicit these experts' insights.

It is also possible to use brainstorming, scenario-based discussion, cognitive maps and a variety of other methods in a focus group. Langford & McDonagh [13] discuss these and 35 other tools and techniques that can be utilized especially regarding ergonomics and human factors design, but also in regarding information systems. They posit a view of focus groups as a method that encompasses many tools, and not just a simple

group interviewing technique. We also recommend the use of other stimulating techniques that fit the characteristics of the situation.

5.4 Session Execution

As our effort data indicates, the actual sessions only constitute a small share of total effort. Yet, these sessions provide more data and are perceived as value-adding sessions to participants as well. Thus, we recommend that more than one session is held when possible.

The role of the moderator is central in focus group sessions and is particularly challenging task in the software engineering domain, due to the complexity of the technology and issues involved. The moderator should have experience or be trained non-intrusive, neutral facilitation techniques and be cautious about his or her own bias in the session. A practice session should be a mandatory practice for all focus groups studies.

We wanted to include the electronic focus group study in this paper as we believe that the computer-mediated technology is naturally prone to studies in the field of software engineering, as well as in IS studies in general. It is easier to get software users and developers to employ the technology than for example carpenters or other craftsmen. Moreover, the future users of software are more and more used to discuss via electronic media.

6 Conclusions

Our studies indicate that focus groups can provide valuable, complementary empirical experience quickly and at low cost. However, there are potential sources for unwanted bias. The method should be used properly and the sessions should be planned and executed well and with appropriate rigor.

Due to its apparent ease of use and low cost, some researchers may be tempted to use it without proper planning and instrumentation. Such studies are likely to contain biases and ignore much of the experience available in such sessions. Therefore we recommend that the researcher or practitioner take a closer look at the extensive variety of books on focus group research, e.g., by starting with the valuable book reviews by McQuarrie [27,28]. Langford and McDonagh [13] is also a valuable source to start with.

We hope that the empirical researchers in the research community and in the industry learn to use the method with appropriate rigor. As the method is not frequently used in the software engineering domain, we hope that the community develops sound practices for applying the method so that it could establish itself as a reliable research method in the field.

We ourselves plan to continue using the method in our future studies and in addition we aim to develop repeatable focus group processes in spirit of the newly established field of collaboration engineering, see discussion, e.g., in [49].

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