

Interactive Posters: An Alternative to Collect Practitioners' Experience

Philipp Diebold
Fraunhofer IESE
Kaiserslautern, Germany
philipp.diebold@iese.fraunhofer.de

Matthias Galster
University of Canterbury
Christchurch, New Zealand
matthias.galster@canterbury.ac.nz

Austen Rainer
University of Canterbury
Christchurch, New Zealand
austen.rainer@canterbury.ac.nz

Sherlock A. Licorish
University of Otago
Dunedin, New Zealand
sherlock.licorish@otago.ac.nz

ABSTRACT

Context: The validity of survey-based research depends on, amongst other considerations, the number and validity of obtained data points. As with any empirical study that involves practitioners, collecting data via surveys is difficult. **Objectives:** We report our experiences derived while conducting an industry survey on the impact of agile practices on software process quality. **Method:** After unsuccessfully trying to collect data with an online questionnaire, we used an interactive approach with posters at practitioners-focussed software engineering community events to aid data collection. **Results:** We present a list of lessons learnt. In particular, the poster-based data collection approach provided utility, for both gathering a large amount of responses and facilitating follow-up interactions with study participants. **Conclusion:** Our experiences in this work may help those facing challenges associated with obtaining responses from practitioners through the use of potentially complex questionnaires.

CCS CONCEPTS

• **Software Engineering Management** → Software process management

KEYWORDS

Agile Development, Agile Practices, Process Characteristics, Impact, Survey, Data Collection, Poster.

ACM Reference format:

P. Diebold et al. 2017. Data Collection Challenges: From Online Questionnaire to Interactive Poster. In *Proceedings of International Conference on Evaluation and Assessment in Software Engineering, Karlskrona, Sweden, June 2017 (EASE'17)*, 6 pages.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

EASE'17, June 15-16, 2017, Karlskrona, Sweden

© 2017 Copyright held by the owner/author(s). 978-1-4503-4804-1/17/06...\$15.00
DOI: <http://dx.doi.org/10.1145/3084226.3084272>

1 INTRODUCTION

In empirical software engineering research, surveys help obtain insights about a phenomenon from a large sample [1]. Survey research is particularly useful to understand how practitioners perceive various aspects related to their tasks and activities [2]. A typical criticism that many surveys face is the insufficient low response rate [3]. Reasons for few practitioners participating in surveys include busy schedules, poorly phrased questions, and questionnaires being too long [2]. In this paper, we describe our experience while collecting data from practitioners, moving from a traditional questionnaire approach to a somewhat unconventional approach – interactive posters. This experience is based on a survey that we designed to gather practitioners' perception of how agile practices influence software process quality characteristics.

In planning our survey, we considered the common challenges related to survey research: (1) obtaining a sufficiently large number of responses, and (2) obtaining valid and complete responses. The original study design used an online questionnaire as the data collection instrument. However, after failing to collect any data with this instrument, we changed the research design, including the data collection instrument. In this paper we discuss what motivated this change as well as the implications of, and lessons learnt from this change. The paper follows guidelines for experience papers as proposed by Budgen and Zhang [5], with a description of the original and the revised study designs in Section 2, illustrative results obtained from the poster (Section 3), lessons learnt (Section 4), and concluding remarks and future work (Section 5).

The goal of our (original) study was to obtain a better (and empirically-grounded) understanding of how agile practices impact software process quality characteristics in practice. Findings from this study were also meant to refine the Agile Practice Impact Model (APIM) [6] defined in our earlier work. Therefore, we investigated the perception of agile practitioners. To obtain data from a large sample of practitioners, we applied survey research. The survey followed the survey processes of [7][8]. In detail, the study was initially aimed at answering three research questions: RQ1: What is the perceived impact of agile practices on different characteristics of software process quality?, RQ2: How does the context influence the perceived impact of agile practices on software process quality?, RQ3: On which kind of evidence are

perceived impacts of agile practices on software process quality based?

2.1 Initial Study Design

Initial Data Collection. We first defined a self-administered online questionnaire as the original data collection instrument [9]. The questionnaire was implemented using the LimeSurvey tool¹. The questionnaire was separated into two sections:

1. Questions related to the background of the participant's organization (size, location, business domain), the background of the participants themselves (role, experience in role and agile development), and the background of the teams and projects that participants were involved with (size, agile method used).
2. Questions assessing agile practices, which presented a list of agile practices (we preselected 12 practices and gave participants the opportunity to provide further open answers) and asked participants to select the top five practices that they have used, so that they only assessed the impact of those specific practices. We asked participants to assess the impact of selected practices on software development process quality characteristics (see Y-axis in Fig. 2 and Fig. 3) based on a scale that resulted in a matrix: strong positive impact (+2), positive impact (+1), neutral (0), negative impact (-1), strong negative impact (-2). For each assessment of the impact of a practice, we asked for their sources of evidence (e.g., personal experience, anecdotes from colleagues, professional literature, and research literature). The questionnaire was distributed through our personal networks and through mailing lists (from the "Agile in Automotive" conference organizers) to more than 2,000 potential respondents from the automotive industry, mainly in Germany.

Results from initial data collection: Having made the LimeSurvey accessible online for respondent to complete, we observed that around 200 respondents (~10% of email recipients) accessed the introduction page (providing information on the topic, number of questions, estimated time for completion, and anonymity) of the questionnaire, but did not proceed beyond the first page. To this end, and despite the different quality assurance activities (e.g. several external reviews, piloting) we performed, we were not able to collect any valid response with this original data collection instrument. We then investigated two potential reasons for why no participant proceeded:

1. **Inappropriate questionnaire design:** Before sending the questionnaire invitation to the possible participants, we tested the online survey several times through reviews by empirical as well as agile experts. Also, we piloted the questionnaire with about 20 representatives from the target population. Although pilot respondents provided suggestions for minor improvements, such as linguistic changes for clarification, none had trouble with the survey and matrix. Furthermore, the first question (which

was not answered by any participant) simply asked whether participants use agile practices or not (a *yes/no* question). Our original hypothesis that participants were discouraged by being confronted with a complex matrix comprising a large number of agile practices and process characteristics to assess could not be confirmed due to the fact that they aborted the questionnaire before accessing the matrix.

2. **Technical issues with the survey tool:** As part of the reviews and pilots, we collected pilot data to check that everything worked fine from a technical perspective. Also, after noticing that there were no responses, we checked the survey subsequent to closing the questionnaire (the survey was hosted on a dedicated LimeSurvey installation at Fraunhofer IESE). Therefore, we are certain that the online tool² used was not the issue. In fact, during the pilots, the tool properly recorded respondents' details when they cancelled the survey (by clicking the "leave" button in the questionnaire itself, by simply closing the browser, or by leaving the survey web page) at different stages of the survey completion process.

After deactivating the survey, we discussed the problem of having no responses on the original questionnaire with some Fraunhofer IESE colleagues (experts in empirical software engineering), leading to no new insights or ideas around the reasons for respondents cancelling the survey after browsing the introduction page. We thus changed our data collection instrument to an interactive poster-based approach³ as an alternative to aid with data collection.

2.2 Revised Study Design

Revised Data Collection. We made a number of changes to the original study design. First, we provided a predefined matrix of specific process characteristics as columns, and all (not just a filtered selection) 12 agile practices as rows. Agile practices were preselected based on different sources, e.g., VersionOne⁴ and a previous mapping study [10]. Two examples of practices can be found in Fig. 2 and Fig. 3. Process quality characteristics were taken from a previous study [6]. Further, we provided the option to add new practices (and characteristics) as additional rows or columns on the poster (Fig. 1). Second (and as a consequence of the first change), we focused on one of the original research questions, rather than collecting data to answer all three questions. Since our main concern was assessing impacts, we focused on RQ1 (the perceived impact of selected agile practices). Third, the scale mentioned above was reduced by removing neutral, and presented as colored sticky dots (+2 = green; +1 = blue; -1 = yellow; -2 = red). This legend was also mentioned on the poster together with a short description. Fourth, we applied a different method for sampling. Instead of sending the poster as a questionnaire to specific mailing lists (see Section 2.1), we placed the poster at the Agile in Automotive Conference 2016 (AiA'16)⁵ and the International Conference on Product-Focused Software Process Improvement

¹ The complete questionnaire can be found here:

<http://impact.iese.fhg.de/EASE17/Survey.pdf>

² Lime survey: <http://limesurvey.org/>

³ The poster can be found here:

http://impact.iese.fraunhofer.de/EASE17/PROFES_v1.pdf

⁴ <http://stateofagile.versionone.com/>

⁵ <http://www.euroforum.de/agile-automotive/>

2016 (PROFES'16)⁶. Since AiA is an event primarily attended by industry professionals from the automotive domain and contains a sub-sample of the sample we sent the survey to, our sampling strategy did not change. PROFES attracts practitioners primarily from academia but also from industry.



Figure 1. Poster at Agile in Automotive Conference with two participants engaged in discussions

Data Analysis. In the original design we planned to apply descriptive statistics (including frequency and correlation analysis) and qualitative content analysis to analyze the data. After changing the data collection procedure, we also adjusted the data analysis procedure; as the poster did not collect any free text, we excluded content analysis.

Results of revised data collection: At AiA'16 with about 170 participants (from 17 countries; with the majority of the participants being from Germany), we collected 118 data points in two days. Since approximately 45 people of the 170 conference participants (~ 26%) interacted with the poster (contributing the 118 data points) the response rate increased tremendously compared to the 200 survey accesses without any meaningful response. At PROFES'16, a three-days event and attended by an equal number of academics and practitioners, we collected 141 responses.

3 ILLUSTRATIVE RESULTS

To support the later discussions around our lessons learnt, we present in this section illustrative results for two agile practices ("Evolving and Prioritized Backlog" and "Continuous Integration"). This data was extracted from the poster introduced above.

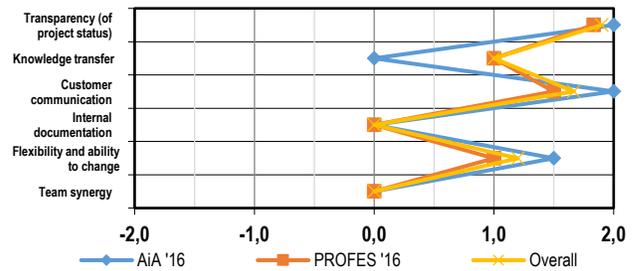


Figure 2. Profile for "Evolving and Prioritized Backlog"

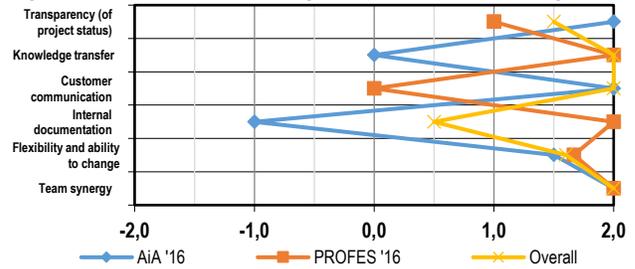


Figure 3. Profile for "Continuous Integration"

Fig. 2 and Fig. 3 show a profile for two practices (one in each figure), covering the respondents' perceptions for the six predefined process characteristics. Each profile contains the data from AiA'16 and PROFES'16. Since we separated the data based on events, it is possible to provide some context. For instance, in Fig. 2, respondents from the automotive domain (AiA'16) indicate a positive to strong positive impact of "Evolving and Prioritized Backlog" on three process characteristics (transparency, customer communication, and flexibility), while they did not report any impact on three characteristics ("0" in this case means having no answers or no impact). This is slightly different to impacts reported by respondents from more general software engineering domains (PROFES'16). Participants at PROFES'16 indicate a positive impact of "Continuous Integration" on the characteristic "Internal Documentation", while responses with a heavy background in developing automotive systems (AiA'16) indicate negative impacts. Note that these figures do not show the absolute number of responses but averages. For example, 1.9 for the practice "Transparency in the Backlog" in Fig. 2 is the average score from four responses from AiA'16, and six responses from PROFES'16. For practice "Knowledge Transfer", we only obtained one response at PROFES'16.

4 LESSONS LEARNT

We now compare the two data collection methods (survey versus interactive posters, cf. Tab. 1), discuss resulting lessons learnt, together with recommendations for those lessons. This discussion and the lessons learnt also include different threats to validity which we considered during our data collection change.

Lesson 1 (Capturing context): The online questionnaire worked better for collecting context information, as observed during its piloting phase. Furthermore, questionnaires are normally not

⁶ <https://profes2016.wordpress.com/>

limited in size compared to the limited space on a poster. Every data point may relate to its specific context (e.g., background of participants). This is very hard to implement using the poster since context information would mostly be based on the nature of an event where the posters are placed and its target audience. However, even at one event there could be participants with different backgrounds. For example, after the first poster we had the idea of using two posters for the different groups of academics and practitioners (at PROFES'16). With that approach, it would be possible to compare at least these two groups and to remove academic responses if necessary. Nevertheless, it is not practical to have more than two posters, which would be necessary to obtain additional information about context and participants' background as gathered via an online questionnaire.

Another idea regarding a more detailed context specification was the collection of business cards from the participants (independent of their responses on the poster), such that it would be possible to provide some information about the overall set of participants and their roles. A further alternative would be talking with every participant and collecting their context, which is effort-intensive and requires one person in front of the poster all the time. In a scenario where the colors are not necessary for representing a scale (as it was in our case), it would also provide an option to encode context information such as domain, respondent type (practitioner or academic), role, etc., in the colors of the stickers that are placed on posters. Nonetheless, by having very specific events with a clearly defined participant group, such as the AiA-conference, the results can be generalized at least for this specific target group, e.g. practitioners in automotive.

To consider context in data, we recommend making clear what contextual data is needed upfront. This can be assessed early in the research and instrument design phase. Researchers would also need to be creative at finding ways for collecting contextual information that is appropriate for the collection method. For example, in our situation using a poster to collect data matched with the interest of agile practitioners' ways of working, and different color stickers could have been used to group respondents.

Lesson 2 (Reducing bias versus engaging participants): The poster allows respondents to see the responses of other participants. Therefore, they might be biased by answers of the other participants. Furthermore, participants may start discussions with other participants based on the data shown on the poster. On the other hand, we experienced that a poster with some data motivates potential participants to interact with the poster. Further, we noticed that some participants tried hard to think of different answers relative to the existing ones, which helps us to identify the whole range of answers. Additionally, and unintentionally, the poster approach worked quite well for starting discussion with or even between the different participants (without the need for us to moderate). Overall, we were quite happy with this side effect, and look forward to improving the poster approach for coming events.

We believe it is up to the researcher to balance potential bias and a possibly larger number of responses. However, respondents are encouraged to participate in interactive data collection exercises, as observed in our study. Thus, the recommendation is for researchers to select the appropriate trade-off for their circumstance(s).

Lesson 3 (Managing and analyzing the data): In considering data storage, interactive approaches to collecting data requires more effort than an online questionnaire, because of the need to transfer

and digitalize the collected data into a medium for performing later analysis. Photos of posters might be taken if it is not feasible to move posters including stickers. An online survey already stores data digitally and allows exports to different file formats for further processing. Besides digitalization, the main disadvantage of the poster approach, from our point of view, is that the poster is limited to a very small number of questions (one to three). The poster is also limited to a defined number of sticky notes per matrix, even if there is the possibility of replacing the poster (when it is filled) or reducing the number of columns/rows, and thus, increasing the size of the cells. Nonetheless, we experienced that it is easier to motivate respondents to participate in using a poster than an online survey. In fact, even when considering the added data processing burden when using a poster, we still found the poster easier to execute, as there was less contextual information to process and analyze.

In considering data management and analysis, we would recommend the approach that is most suitable for researchers' and practitioners' given their context. Furthermore, we believe that it is easier for practitioners to complete the poster than an online questionnaire, especially with the assistance of a moderator. If there are moderate numbers of data points, a poster may be of utility given manageable data processing activities. The survey instrument does not require as much processing, but the challenge with getting participants to complete the instrument is greater.

Lesson 4 (Accommodating participants' ways of working): We recognized that using a poster to collect data is particularly useful for our topic of interest, that of agile development. This is because most agile teams like, and are used to working with physical task boards, post-its and stickers. Thus, respondents favored the direct interaction with a poster. This also provides easy access to those participating in such events. On the other hand, for some kind of respondents, an online questionnaire provides more anonymity, so that they are not easily identified.

For this reason, we recommend employing steps aimed at learning about the target population or participant group(s) to get to know their preferences for participating in such studies.

Lesson 5 (Accessibility): Reaching out to participants of an online survey is up to the researchers (usually based on mailing lists, forums, etc.). In evaluating our experience, posters allow easier recruitment of participants since potential participants are already attending the respective event which lowers the entry barrier (e.g., investing extra time). This is especially the case when promoting the poster at the event, e.g., via the event organizers, and/or by having a moderator next to the poster. Nonetheless, the usage of a moderator also influences other aspects mentioned before, because (s)he could potentially influence the responses from the participants. As discussed earlier, posters quite easily draw the attention of event participants and therefore help convince individuals to participate. Practitioners in particular might be more willing to participate in a study that takes place at a professional event and does not require them to commit time during their usual work (as, for example, filling in an online questionnaire would).

Lesson 6 (Interaction and Extendibility): Having an interactive poster for data collection makes it easy to allow respondents the opportunity to extend the item list (or options). In our case respondents could also extend the preselected agile practices and process characteristics as they see fit. This is also possible with a traditional survey; however, there will be a need to have separated

question(s) for each item set. Thus, the poster approach brings more flexibility and is not that time-consuming.

In general, we recommend giving participants the freedom to extend the study items, such that they might bring in new ideas. Nonetheless, having too much open questions in a survey prevents some participants from answering given perceived time burden.

Lesson 7 (Change in study focus): Since the study design changed, the study goal and related research questions also changed. This might be somewhat contradictory to the ideal way of conducting empirical research where the research method and study design should follow the research questions. Nonetheless, focusing the study design may be beneficial for some studies, and especially in terms of reducing the amount of time respondents must commit in order to participate in studies. For instance, we have experienced survey studies that take about 30 minutes to complete.

For this reason, we recommend that researchers consider how their study could be designed as an interactive poster collection approach. Such a thought process could help to clarify the most important research questions. We also encourage researchers to pilot the interactive poster approach, perhaps with one question at one appropriate event, to get some sense of the relative strengths and weaknesses of the approach.

Table 1. Comparison of data collection methods

	Online questionnaire	Poster
Sample size	2,000	~ 350 (at two events)
# responses	0	> 250 (at two events)
context	detailed	less detailed; only information about event participants
bias	not influenced by others, but no clarification of questions possible	high, seeing the answers of other participants
access	medium; up to the creators' distribution lists, mailing lists	Easy; selection of the event
data management	digital, often CSV	poster, photo; transfer to digital (XLS) manually
control by study admin	none	none (poster works on its own) to high (motivating the people to participate)
flexibility and obtaining additional insight	none	could start discussions; up to the participants

6 CONCLUSION AND FUTURE WORK

In this paper we described our experiences when conducting a study aimed at contributing to a better (and empirically-grounded) understanding of how agile practices impact software process quality characteristics in practice. We described our experiences that influenced a shift from an initially planned online questionnaire to an interactive poster approach for data collection. After not recording any response for the online questionnaire, we recorded a large number of responses using the interactive poster. However, the way the data were collected on the poster affected how much analysis we were able to perform. This paper shares our experiences gathered while designing both instruments and collecting data. We believe that our lessons learnt are useful for any person conducting empirical studies, beyond academic researchers.

From our point of view, the poster approach works quite well in many cases and appears to be a viable alternative to ordinary surveys. It especially works in cases where there are very complex questions that may be based on a matrix, or even having three dimensions (the third dimension in our case is the colors). Nonetheless, there are trade-offs between collecting a large amount of data (as with the poster in our case), and neglecting threats to validity (e.g., collecting limited contextual details). For this reason, we would especially recommend the poster for cases where a large amount of data is necessary, such as our purpose.

Apart from addressing the context information (RQ2), we are also currently exploring ideas around how to evaluate different evidences (RQ3), which no doubt affect each dimension of the matrix. We are planning to participate in different events, those dealing with different software processes, and/or events specific to agile development. Our intention is to use our poster-approach at these events to expand our dataset.

ACKNOWLEDGMENTS

Parts of this research are based on research being funded by the German Ministry of Education and Research (BMBF 01IS12053) in a Software Campus project. Together, the University of Canterbury and Auckland University of Technology (AUT) supported the research visit of Philipp Diebold to New Zealand, which formed the basis for our collaborative work, and this publication. Finally, we would like to thank Liliana Guzman for reviewing the paper and providing valuable feedback.

REFERENCES

- [1] Wohlin, C., Hoest, M., and Henningsson, K. 2003 Empirical Research Methods in Software Engineering. In Empirical Methods and Studies in Software Engineering, R. Conradi and A. I. Wang, Eds. Springer Verlag, Berlin / Heidelberg, 7-23.
- [2] Galster, M. Tofan D., 2014 Exploring Web Advertising to Attract Industry Professionals for Software Engineering Surveys, Proceedings of the 2nd International Workshop on Conducting Empirical Studies in Industry, pp. 5-8
- [3] Torchiano, M. and Ricca, F., "Six Reasons for Rejecting an Industrial Survey Paper," in First International Workshop on Conducting Empirical Studies in Industry (CESI) San Francisco: IEEE Computer Society, 2013, pp. 1-6
- [4] Diebold, P., Ostberg, J. P., Wagner, S., & Zendler, U. (2015, May). What do practitioners vary in using scrum?. In XP'15 (pp. 40-51). Springer.

- [5] Budgen, D. and Zhang, C., "Preliminary Reporting Guidelines for Experience Papers," In EASE'09 (Durham, UK: BCS), 2009, pp. 1-10.
- [6] Philipp Diebold and Thomas Zehler. 2015. The agile practices impact model: idea, concept, and application scenario. In Proceedings of ICSSP'15. ACM, New York, NY, USA, 92-96.
- [7] Ciolkowski, M., Laitenberger, O., Vegas, S., Biffel, S.: Practical Experiences in the Design and Conduct of Surveys in Empirical Software Engineering. In: Conradi, R., Wang, A.I. (eds.) Empirical Methods and Studies in Software Engineering, pp. 104-128. Springer Verlag, Berlin / Heidelberg (2003)
- [8] Dillman, D., Smyth, J. & Christian, L., 2009. Internet, mail, and mixed-mode surveys: the tailored design method.. 3rd ed. New Jersey: John Wiley & Sons, Inc
- [9] Kitchenham, B. and S.L. Pfleeger, Principles of Survey Research - Part 2: Designing a Survey. ACM SIGSOFT Software Engineering Notes, 2002. 27(1): p. 18-20
- [10] Diebold, P. and Dahlem, M., "Agile Practice in Practice: A Mapping Study" in EASE'14 (London, UK), 2014, art.no.30 .