

Designing a Tool to conduct Real-Time Delphi Studies in Research Projects

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Delphi study such as the time needed to conduct it by allowing the experts' answers to

In this paper, we present a free and open source tool to quickly configure and anonymously run RTD studies in time-critical meetings at research projects, workshops or other similar events.

2 Design of the artifact

This section provides details about the design process, features and configuration of our tool. The software tool was originally developed as part of the Revi-Framework and a public funded research project [6]. It was used to conduct an RTD study to analyze future trends in competency management in companies. The tool was developed in multiple iterations and applied in a research project and a university course. In iterations 2 and 3 an RTD study was conducted in which probands were questioned about a specific topic. After the study was conducted, requirements for the tool were determined. Table 1 shows the subjects, topics and resulting requirements for each iteration. Features are highlighted in bold.

Table 1. Iterations and emerging requirements with key features

Iteration	Emerging Requirements
0	Initial Requirements

Iteration 3 After we implemented the requirements, we presented the tool at another event in a following semester (with new students) and, as before, we conducted a survey with the students and asked them for their feedback. In addition to the students from our course, a master thesis investigated the integration of embedded user assistance (EUA) [8], with 25 students from different universities in Germany, found it beneficial and identified further requirements. For example, in addition to the EUAs, the integration of a glossary as well as a contact form for questions to a teacher.

Configuration. To create an RTD study, creators must follow these steps. First, they define the title of the survey and a welcome and end message under the Configuration menu item and from which threshold value the statistically summarized answers visualized in a boxplot are displayed for the survey participants. Then, they create a topic area under the menu item Thesis overview. A topic has only one description and one answer option. This is used for the participants to assess their expertise in this topic area. Therefore, this data is not included in the statistical aggregation. If a topic area is defined, the creator can create theses that belong to this topic area. A thesis is a statement such as "Online formats will replace traditional meetings." For this thesis, the creator can then create different answer options with different types such as Likert scale, year statement, text. If a Likert scale is selected, the creator chooses between different sizes, eg. 5 or 7. The creator can also select existing "answer sets" if they already exist or create new ones. For example, the answer set is labeled "The number of online formats will increase at universities." For this, the creator creates a five-point Likert scale with the values "Do not agree at all" to "Agree completely". These values are saved as an answer set and can be used for further thesis statements or answer options.

When all topics and theses are created, the creator generates "Survey Tokens". Each of these survey tokens represents one participant. This allows us to guarantee complete anonymity within the system, as no personal data is stored in the RTD tool. Once the survey tokens have been created, they can be merged into a form letter using Word, Excel and Outlook, for example. This can be used to compose an invitation that can be sent to the participants. If the tool is to be used in a workshop where the participants are not distributed but sit centrally in a room, QR codes can also be generated from the survey tokens and these can be physically distributed to the participants.

Process model. An RTD study in our tool consists of the steps self-assessment (1), thesis response (2), statistical aggregation of answers (3), reassessment (4) and analysis (5). The QR code generated in the configuration step automatically takes participants to the starting page. Participants scan the QR code or enter the URL sent to them in their browser and are directed to the start of the survey. After reading the welcome message, they have to give a self-assessment about the first topic area (1). The next step is answering the theses that are assigned to this topic area (2). If the participant was not the first and is above the threshold defined by the creator, then after answering all theses of a topic area they

and motivate participants to look at the results of the study and adjust their opinions if necessary. Steps 2 to 4 can be repeated several times, depending on how many areas have been configured. After survey completion, the creators can view the data or export it in CSV format and process it in another statistical analysis program such as SPSS(5). Since we have made sure that our tool complies with the Responsive Design guidelines, participants can complete the study with mobile devices adequately.

Fig. 1. Topic area/thesis configuration and aggregation of answers

Fig. 1(a) shows the configuration menu for topic areas (yellow) and theses at a top level. Fig. 1(b) shows a boxplot that is displayed after answering a topic area each thesis, provided that the answers are given on a Likert scale.

3 Significance to research and practice

The implementation and application of our tool within workshops and research projects [7] enable us on the one hand to gain knowledge about the design of our tool and its application in research communities and on the other, the tool itself can be used by the scientific community to conduct RTD studies at time

Our implemented prototype can be used by everyone who wants to conduct a Delphi study with relatively small costs. The tool is open source and can be found with the source code and an instruction page here

Moreover, our tool enables researchers or practitioners to learn about the research methodology Delphi and especially Real-time Delphi by experiencing how a study is designed and conducted. Due to the time factor, this can be done directly for example, in a workshop to conduct unbiased opinions about one or more topics and is therefore easy to integrate for workshop moderators. The results, being immediately available, can then be used afterwards for further discussions or other workshop formats and are not outdated, because slides were provided to the participants in a short time frame (in contrast to a Delphi study that can last several months).

Another advantage of the tool is the focus on purely conducting Delphi studies. Other survey tools that allow Delphi studies to be conducted often provide a plethora of other features and methods to be executed. Our tool allows a more efficient focus on conducting the study itself.

4 Evaluation of the artifact

As a first step, to evaluate whether our prototype meets the requirements of a practical real-time Delphi tool, we asked futurologists and students before each design iteration, as shown in section 2, whether they thought there were any missing features

