
Supporting Teaching Design Thinking Techniques for Requirements Elicitation Through Recommendation Tool

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Abstract

This technical report presents the analysis performed for the selection 27 DT techniques according to established criteria, complete structure of DTA4RE Recommendation Questionnaire and the questionnaire with students' feedback about the experimental study presented in the paper.

1. Analysis and selection of 27 DT techniques for requirements elicitation

Table 1 presents similarities between Brown process steps and the main requirements sources defined in SWEBoK. For a new selection of DT techniques and considering similarities between DT steps and requirements sources, we defined the criteria would take names of DT steps and they would understand the requirements sources. Thus, the criteria were: inspiration, ideation and implementation criteria.

Table 1. Equivalence between Brown's process steps and requirements sources

Brown's process steps (criteria)	Requirements sources
Inspiration	Goals, stakeholders and domain knowledge
Ideation	Business rules, operational environment and organizational environment
Implementation	Business rules, operational environment and organizational environment

The inspiration criterion comprises the requirements sources: goals, stakeholders, and domain knowledge. We subdivided into two sub-criteria: data collection and data synthesis. Data collection is a sub-criterion that contains DT techniques for exploring problem contexts, observation, stakeholder's identification, information gathering, etc. Already the sub-criteria data synthesis, contains DT techniques that organize collected data giving meaning and knowledge of the problem and stakeholders. The ideation criterion comprises the requirements sources business rules, operating environment and organizational environment. This criterion selects ideas generation techniques, besides the possibility of inferring solutions considering business rules and environment types. Finally, the implementation criterion also includes as requirements sources business rules, operating environment and organizational environment. However, this sub-criterion considers techniques the elaboration of prototypes and simulation of solutions possible in certain contexts and environments. With these criteria, a new set 27 DT techniques of aimed at requirements elicitation was defined, considering the defined criteria (Table 2).

Table 2. New DT techniques set for requirements elicitation

DT techniques			
1	Behavioral Archeology	15	Empathy Map
2	Service Blueprint	16	Customer Journey Map
3	Bodystorming	17	Stakeholders Map
4	Brainstorming	18	Mind Map
5	Business Model Canvas	19	Motivation Matrix
6	Insight Cards	20	Touchpoint Matrix
7	Affinity Diagram	21	Personas
8	Interviews	22	Exploratory Research
9	Rapid Ethnography	23	Prototyping
10	Fly on the Wall	24	Questionnaires
11	Group Sketching	25	Storyboard
12	Cognitive Map	26	Storytelling
13	Behavioral Map	27	Try it Yourself

DT techniques	
14	Conceptual Map

2. Structure of the Recommendation Questionnaire

We present the structure of the recommendation questionnaire, which is divided by means of questions and answers. Figs 1 and 2 present questions and answers respective of each step of the recommendation questionnaire.

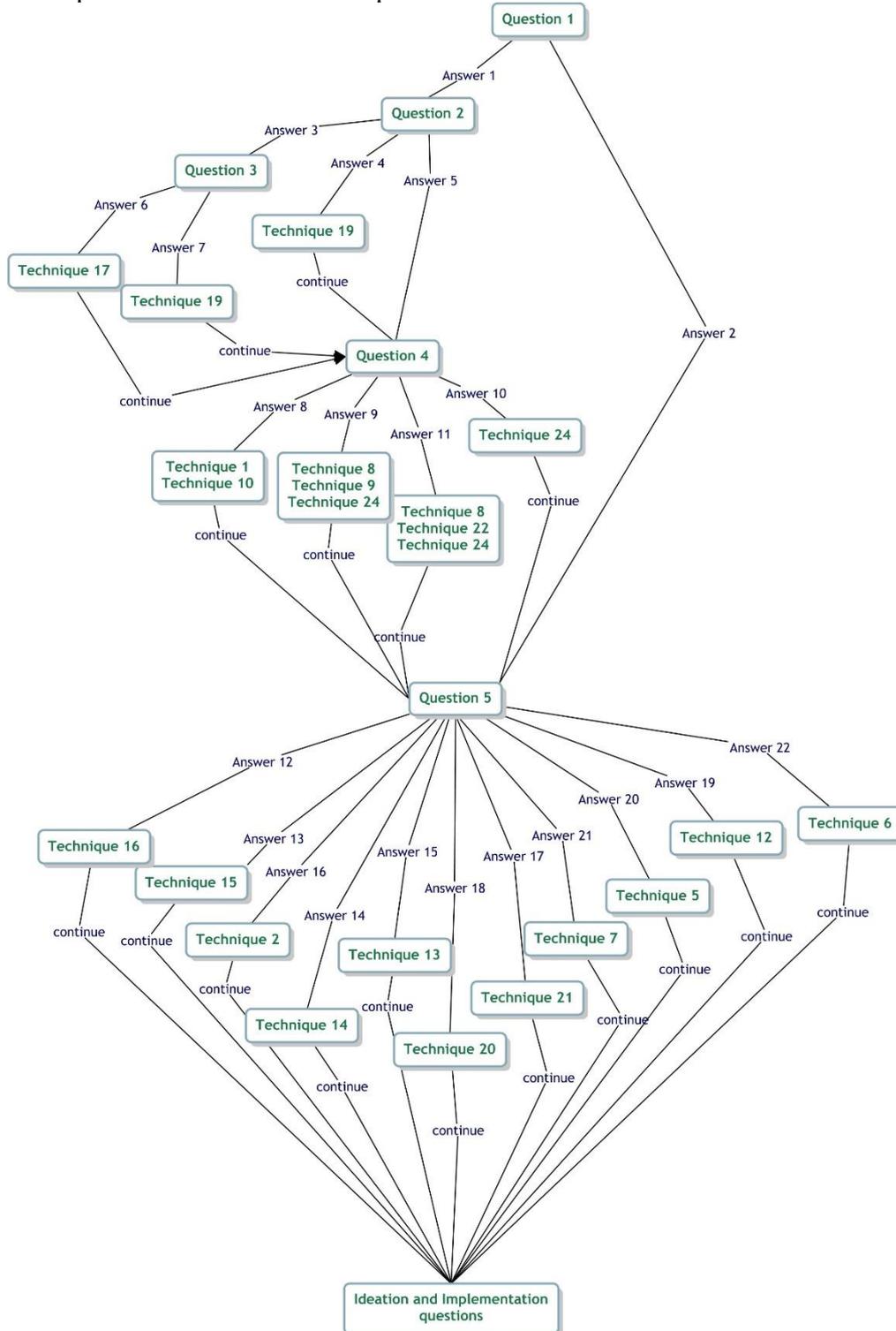


Fig. 1. Structure of Inspiration step of Recommendation Questionnaire

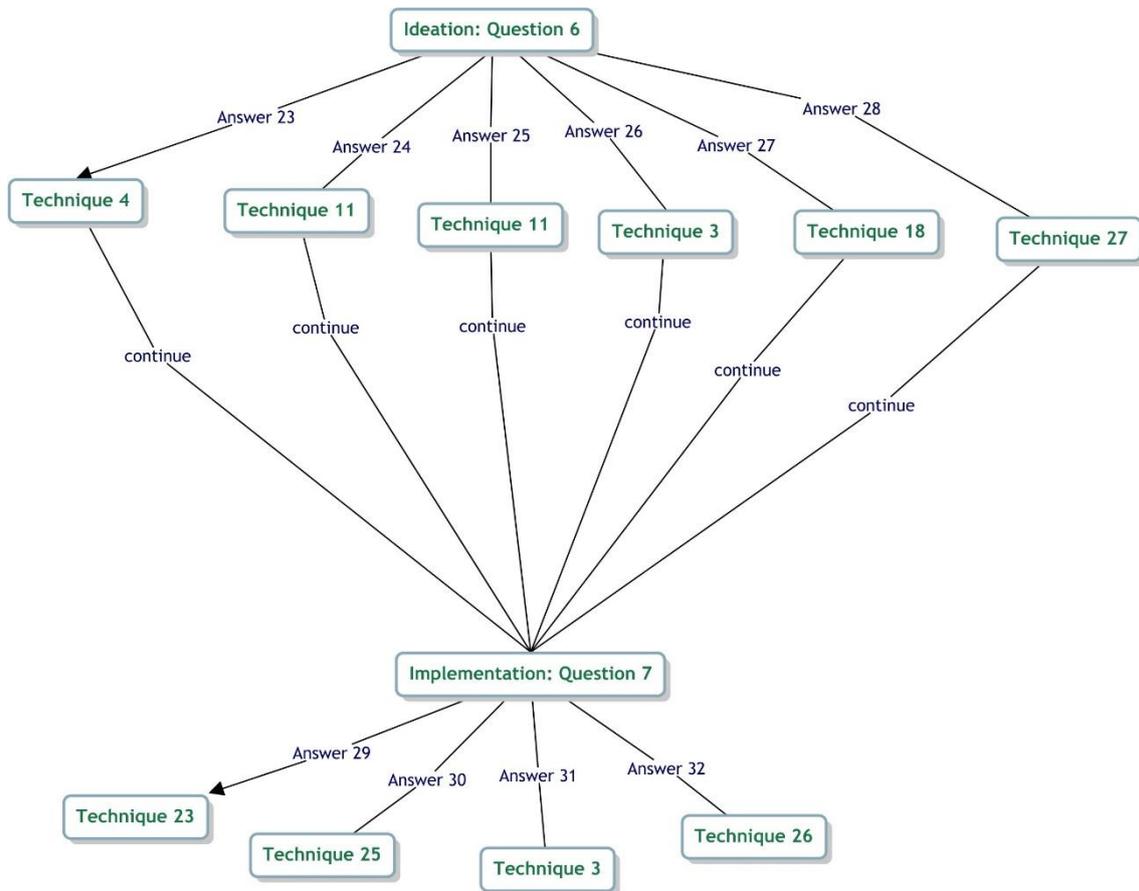


Fig. 2. Structure of Inspiration and Implementation step of Recommendation Questionnaire

We present the questions and answers in Table 3 and Table 4. The techniques respective follow the numbering according to Table 2.

Table 3. Questions of the Inspiration, Ideation and Implementation Recommendation Questionnaire

Question number	Question
Question 1	Welcome to DT4ARE, from now on I will ask you some questions in order to help you choose Design Thinking techniques according to your answers. Come on? What do you want to do now?
Question 2	How do you want to know who the stakeholders are?
Question 3	After meeting with stakeholders, how do you want to organize the identified information?
Question 4	What do you want to do to get to know the users and their context?
Question 5	You must have collected lots of data, right? Now what do you want to do to analyze and synthesize this data?
Question 6	After collecting all possible data and performing a synthesis and analysis on top of these data, choose an option below.
Question 7	After brainstorming, what do you want to do now?

Table 4. Answer to questions of the Recommendation Questionnaire

Answer number	Answers
Answer 1	I want to know who the stakeholders of the software I'm going to develop.
Answer 2	I already know who are the stakeholders of the software that I will develop. Now I want to synthesize and analyze data I collected.
Answer 3	I want to gather all interested people and they will be affected software.
Answer 4	I know who the stakeholders are and what their motivations are. I just want to organize this information so that I can facilitate my viewing later.
Answer 5	I want to know more about users and their context. Other stakeholders do not apply to my project.
Answer 6	I just want to know who the stakeholders are.
Answer 7	I want to organize this information so that I can easily view it.
Answer 8	I want to observe them in your workplace without interacting with them.
Answer 9	I want to look at them in their workplace and interact with them.
Answer 10	I do not know who the potential users of the software might be, but I want to find out.
Answer 11	I want to take to the streets to observe and interact with potential users.
Answer 12	I want to understand the user relationship cycle with an organization.
Answer 13	I want to better understand the target audience.
Answer 14	I want to structure field data and facilitate the communication of this data to my team.
Answer 15	I want to graphically represent user behaviors by documenting characteristics, movements, and activities that were easily observed.
Answer 16	I want to represent the functioning of an existing service of an organization.
Answer 17	I want to summarize the behaviors observed and represent motivations, desires, expectations and needs.
Answer 18	I want to understand in more depth the interactions of several people in different contexts with an existing product / service.
Answer 19	I want to represent possible patterns and cognitive structures.
Answer 20	I want to plan and create sources of value creation and links to business strategy.
Answer 21	I want to group insights by checking for affinity, similarity, dependency, or closeness.
Answer 22	I want to represent reflections based on the actual data collected for later viewing.
Answer 23	I want to generate and discuss many ideas in a short time on top of relevant information gathering issues.
Answer 24	I want to discuss these ideas with my team, but with a tangible area so that all participants can represent their ideas through simple and basic drawings.
Answer 25	I want to discuss the initial ideas and requirements raised with sketches involving all stakeholders.
Answer 26	I want to simulate contexts and user situations to stimulate alternative ideas.
Answer 27	I want to create an association between the generated ideas.
Answer 28	I want to try out an application developed by my team to get ideas and useful information.
Answer 29	I want to validate the ideas generated.
Answer 30	I want to represent the chaining of a solution and communicate an idea to third parties.
Answer 31	I want to empathize with possible solutions.
Answer 32	I want to communicate a solution to a diverse set of stakeholders in narrative form.