Requirements Elicitation for Mobile Apps:
An exploratory study of challenges in Practice
Supplementary Materials

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This document provides supplementary materials which have not been included in the submitted conference paper due to size restrictions.

1   Survey instrument

The following survey instrument has total 22 questions. The first part contains general purpose question to understand participants and their company's background. Following two sections explore the current practices and factors that might affect mobile app requirements respectively.

	General purpose questions	
1	*Are you part of a team in a company or do you work on your own?*	
2	*What roles do you play if you work for a company/team? You can specify more than one role.*	
3	*How many years of experience do you have in collecting requirements?*	
4	*You/Your company build mobile apps for*	
5	*Could you list to which categories your apps belong?*	
6	*Your mobile apps are essentially (novel ideas, transforming an existing software/web app into mobile app etc.)*	
	Current practices in the mobile app development	
1	*Do you outsource the elicitation work?*	
2	*Are you familiar with the domain/concepts required in your app?*	

3	*(Which sources do you consider while collecting requirements?)*
	  − *App store reviews*
	  − *User feedback from social media websites such as Twitter, or Facebook*
	  − *Contextual data such as user interaction with the app, user location etc.*	

4	*How do you benefit from app store reviews, or user feedback on social media sites?*	
5	*Do you check similar apps before starting development?*	
6	*Do you build a prototype or Minimum Viable Product (MVP) before the first app release?*	
7	*How often do you communicate with users/stakeholders?*	
8	*How do you communicate with your users/stakeholders?*	
	Factors that potentially affect mobile app requirements	
1	*Are your app users anonymous?*	
2	*Do you consider people with special needs e.g. elderly, blind users or children?*	
3	*Does locality of the users e.g. global vs local play an important role for any of your apps?*	
4	*Does ethnicity of users play an important role for any of your apps?*	
5	*Do you believe that co-location of developers and requirements engineers matters to requirements elicitation?*	
6	*What difficulties do you face during elicitation?*	
7	*Which methods or tools do you mostly use for elicitation?*	
8	*How do you keep up with changing requirements?*	

2   Interview Instrument

The following interview instrument has total 50 questions, arranged similar to survey survey instrument. The first two parts contains general purpose question to understand interviewees and their company's background. Following two sections explore the current practices and factors that might affect mobile app requirements respectively.

Interview Instrument

	Interviewee profile
1	*What is your current role in the company and since when?*
2	*How many years of experience do you have in the field of software and mobile development?*
3	*How many years of experience do you have in the field of requirements engineering/elicitation?*
4	*What is academic background? Are you a computer scientist, business person or something else?*
5	*Do you read latest academic research publications related to your job to explore the state-of-art elicitation techniques?*
6	*Where and how did you learn the requirements elicitation techniques you currently use?*

	Company profile
	Company stats
1	*How many employees does your company have?*
2	*What is/are the major (geographical) markets your company focuses on?*
3	*Does the company have other offices?* *– If yes, what is their purpose?*
4	*How many users do your apps on average have?*
5	*How many apps have you built so far?* *– are they free or paid?*
	Company policies
6	*Does the company enforce one official language for communication such as English?*
7	*Do you build only mobile apps, or software in general?*
8	*Which platforms / app stores do you support? Who decides the platforms — the company or the customer?*
9	*Do you believe your company is rather product-oriented, service-oriented, or both?* *– If the company is product-oriented: What is the major product, and what is its price?*

	– If the company is service-oriented: How long do projects usually last?
Company structure	
10	*How do the teams in your company look like?* *– Are there dedicated teams for different tasks such as management, dev, testing etc.* *– Are they distributed?*
11	*How big are the development teams?*
Teamwork	
12	*Which roles exist within a single team?*
13	*In which phases of a project are customers involved?*
14	*Do you believe that a client's expertise could influence the requirements engineering/elicitation process?* *– If yes, to what extent?* *– If yes, how?*
Security and legal affairs	
15	*Has your company encountered a security breach so far?* *– If yes, what kind of breach?* *– If yes, what were the consequences?*
16	*Has your company ever experienced legal challenges?* *– If yes, what were they about?*
17	*Does your company maintain a team of legal experts?* *– If yes, what is their purpose?*
18	*Has your company ever enforced copyrights or (software) patents?* *– If yes, what were they about?*

	Current RE practices in the mobile app industry
1	*Could you describe requirements elicitation process you employ?*
2	*What percentage of budget (time and cost) is allocated to requirements elicitation activities?* *– What are the major challenges with respect to the time/cost budget?*
3	*How many clients/stakeholders usually participate in the elicitation process?*
4	*Have you asked your clients/stakeholders whether they face any difficulties in the elicitation process?* *– If they do, what difficulties.*
5	*How does the communication with your clients/stakeholder work?* *– Do you face any challenges regarding the communication?* *– Who is allowed to communicate with clients/stakeholders?*
6	*Who is responsible for doing the user or market research? Is it your responsibility or your client's?* *– How does it work?*
7	*Are your app users globally distributed?*
8	*How do you make decisions about the app users' preferences and needs considering the global differences?*
9	*Do you collect non-functional requirements as well?* *– If yes, which are the most important ones?* *– If yes, how do you collect them?*
10	*Do you prototype?* *– If yes, to which extent? Explain.* *– If yes, is it economical to build prototypes?* *– If yes, what were the reactions of your clients/stakeholders?* *– If yes, what was the gained benefit?*
11	*Do you use group session methods such as focus groups or workshops?* *– If yes, what are your impressions regarding those with respect to time, efficiency, and cost?*
12	*Are you aware of the mobile tools/ mobile apps/ mobile device features that can be used for requirements elicitation?* *– If no, have you ever thought of using tools in the requirements elicitation process?* *– If yes, do you use any of them?*
13	*Do your customers have concerns/preferences regarding OS specific user experiences?*

	– Is the decision regarding the commitment to a platform also part of an elicitation activity?
	– Do you use hybrid apps, i.e., web apps than run in a native browser sandbox?
14	*Which tools do you use for requirements collection, management, traceability, etc.?*
15	*Do you collect privacy and security requirements?*
	– If yes, who is responsible for the collection (dedicated experts/predefined template from externals/you)?
	– If yes, do stakeholders/clients provide any input?
	– If yes, how much do stakeholders/clients know/ understand those?
	– If yes, what are examples of security measures that have been deployed?
	– If yes, do you believe that some basic knowledge (e.g., PKI, authorization) in security is important for your work?
16	*Do legal issues affect requirements elicitation?*
	– If no, why not?
	– If yes, what are examples of measures that have been deployed?
	– If yes, do you believe that some basic knowledge (e.g., copyrights, patents) of law is important for your work?

Factors that affect requirements of mobile app	
1	*What are in your opinion the major differences between app development for desktop and mobile platforms?*
	– If you see any differences, what are they?
	– If you see any differences, how do they interact with the requirements elicitation process?
2	*Do non-functional requirements play a different role in case of mobile apps than desktop/ web apps?*
3	*Does the requirements elicitation process differ for mobile apps and traditional desktop applications?*
	– If no, why do you believe there are no differences?
	– If yes, why and how would you adapt traditional requirements elicitation techniques?
	– If yes, what are changes you applied to the requirements elicitation process to specifically improve mobile app development?
4	*What are the biggest challenges in requirements elicitation for mobile apps?*
5	*Did the Google Play or Apple App Store checks (e.g., security checks, design guidelines etc.) alter your requirements elicitation process?*

	– If yes, how?
	– If yes, what was the result of the checks?
6	*Does elicitation process/ decisions you make depend on external factors, such as OS releases, external library versions etc.?*
7	*Do you consider the troubles that might be faced by special users such as old or blind people?*
8	*Did you ever meet platform constraints such as app size or number of classes etc.?* *– If yes, which ones?* *– If yes, what was the workaround (if any)?* *– If yes, did those constraints influence your requirements elicitation process?*
9	*Can you reflect on the following points to tell us whether they are crucial points for mobile requirements elicitation? If yes, how?* *– App's power consumption* *– Mobile phone/ operating OS generation* *– Third party libraries and their versions* *– Mobile ads and revenue generation* *– User feedback on app stores, social media etc.* *– Data privacy* *– Legal constraints*
10	*Is revenue generation through mobile ads a requirement?* *– If yes, who was the requester?* *– If yes, do you believe that you could incorporate such ads on desktop platforms without impacting customer's expectations?*
11	*What is your impression about hybrid apps? Do you build those?*
12	*What is your impression about Progressive Web apps?*

3   Statistical results of the survey

3.1   Results of the general purpose questions
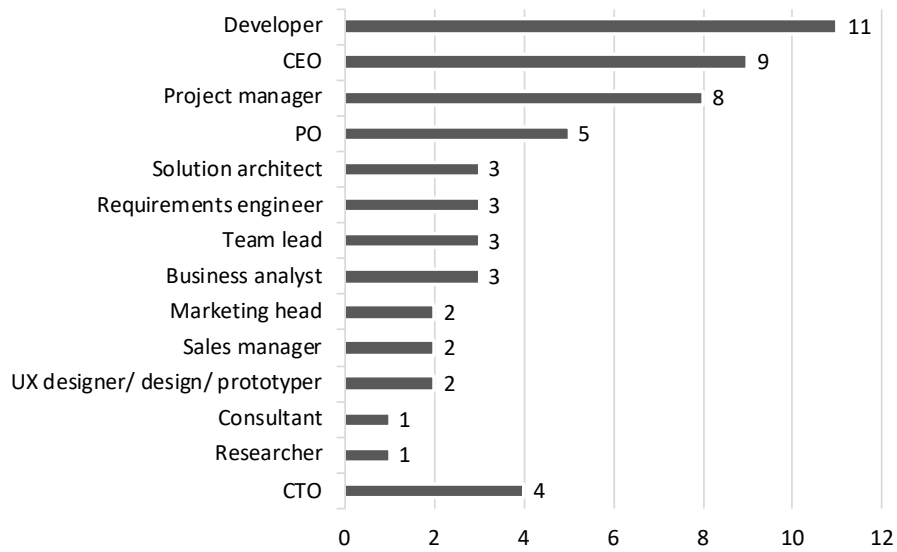
Fig. 1: Participants roles in their company
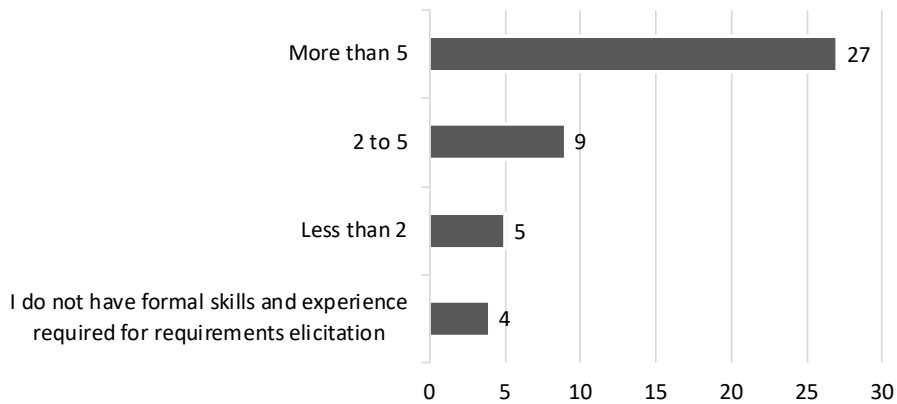
Fig. 2: Participants experience in years with requirements elicitation
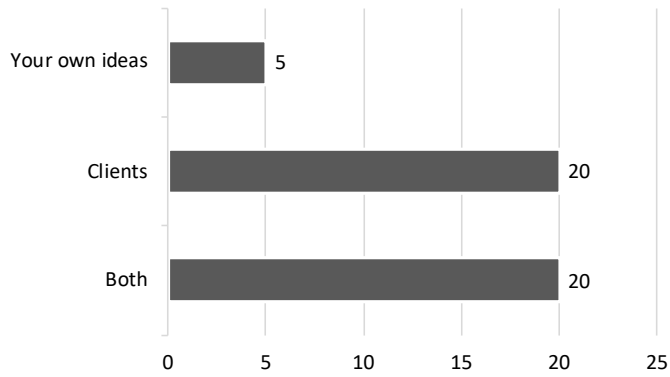
Fig. 3: Participants company builds apps for
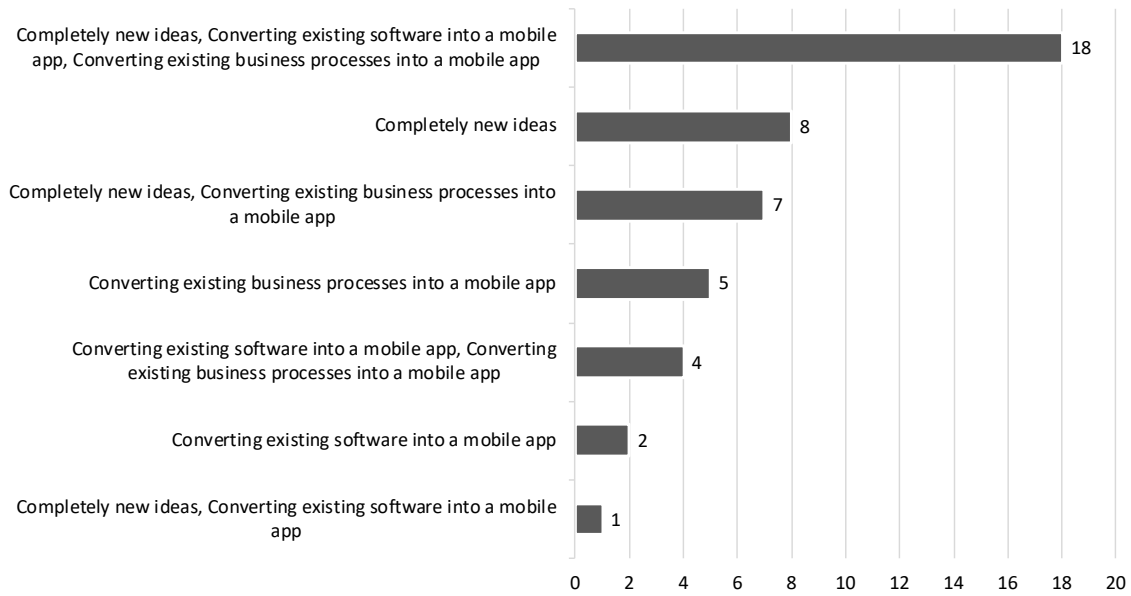
Fig. 4: Mobile apps built by the participants are essentially one of the following
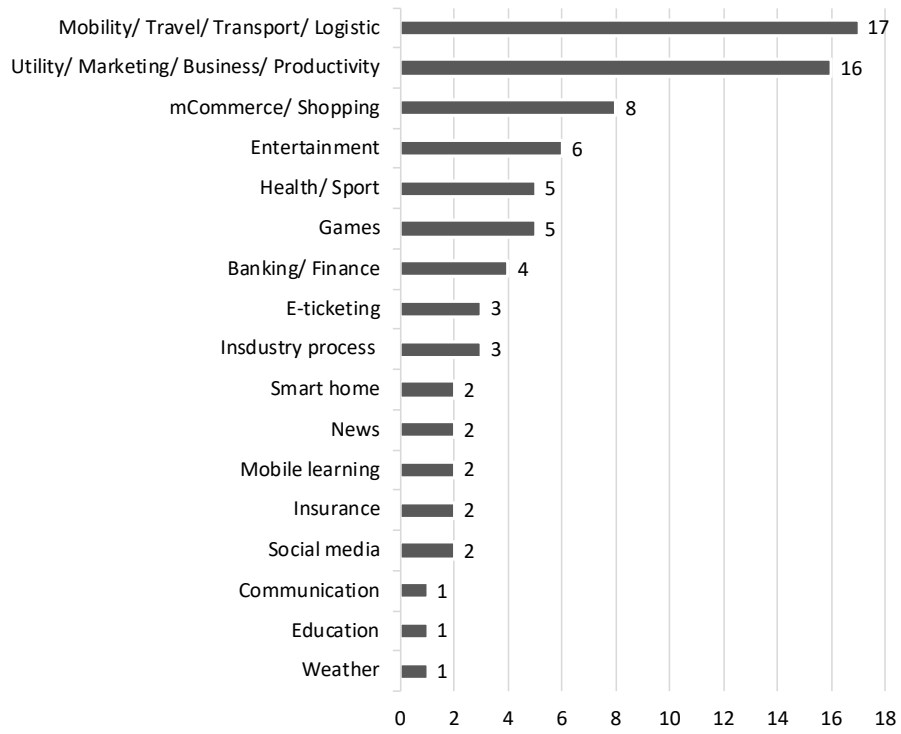
Fig. 5: In which categories apps from participants belong
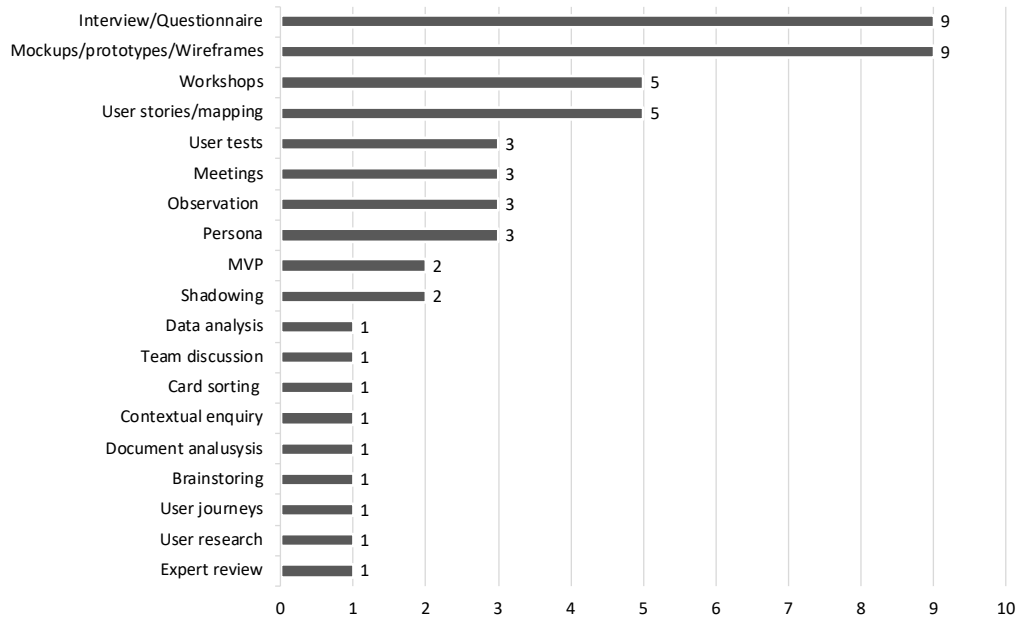
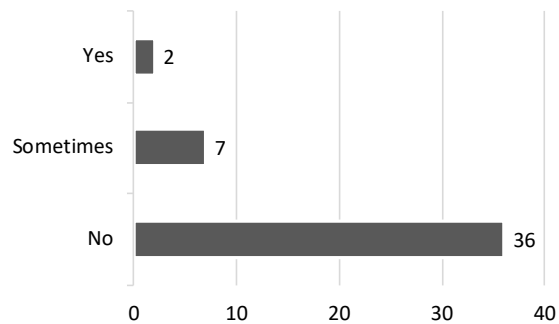## 3.2   Current practices in the mobile app industry

Fig. 6: Which elicitation techniques are used

Fig. 7: Whether participants' outsource elicitation tasks
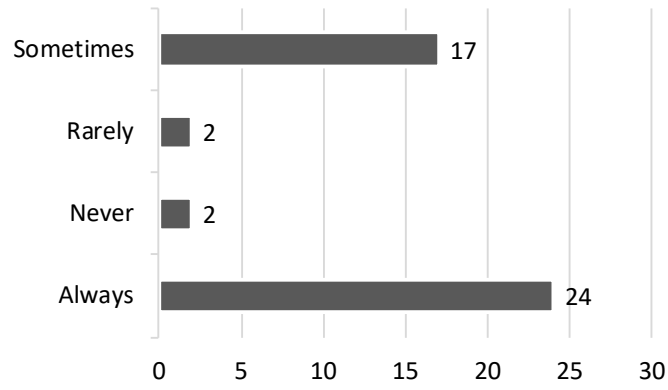
Fig. 8: Whether participants' are aware of the problem domain
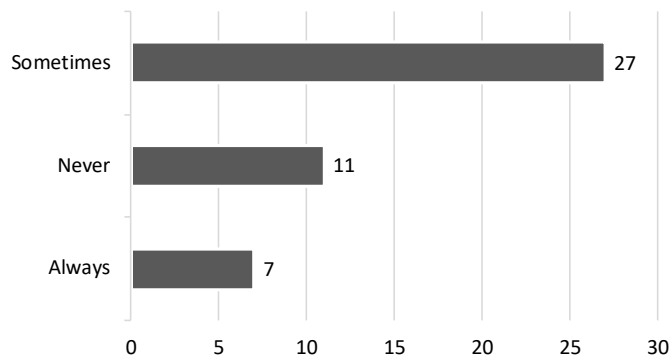
Fig. 9: Whether the participants consider app store reviews to improve their app
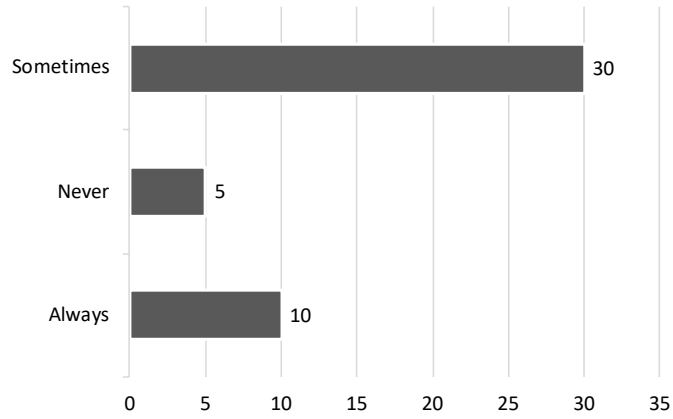
Fig. 10: Whether the participants consider contextual data such as location
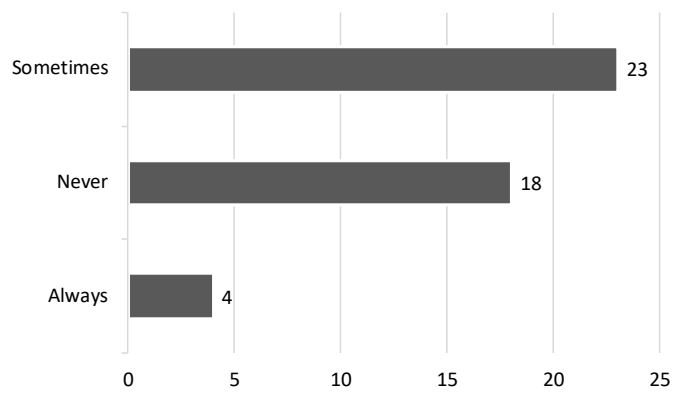
Fig. 11: Whether the participants consider comments on social media sites to improve their own app
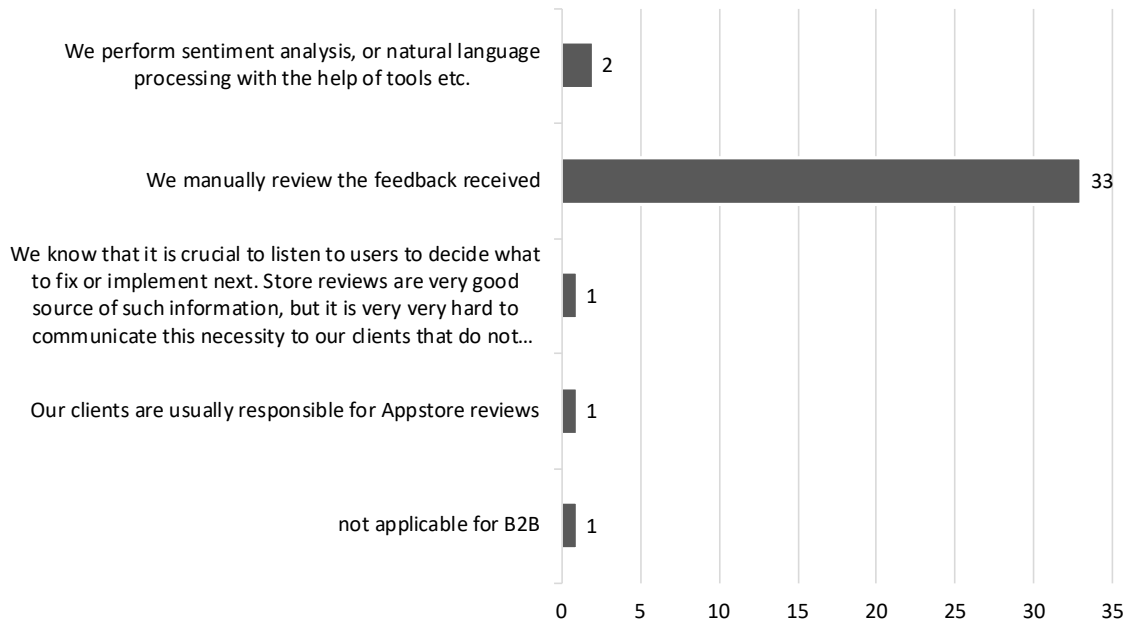
Fig. 12: How do the participants process the app store reviews
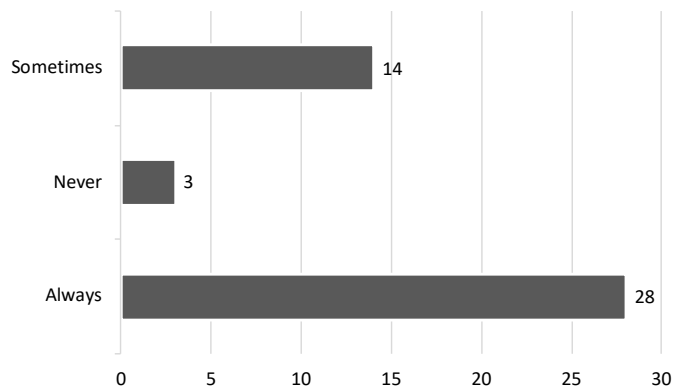
Fig. 13: Whether the participants consider similar apps to improve their own app
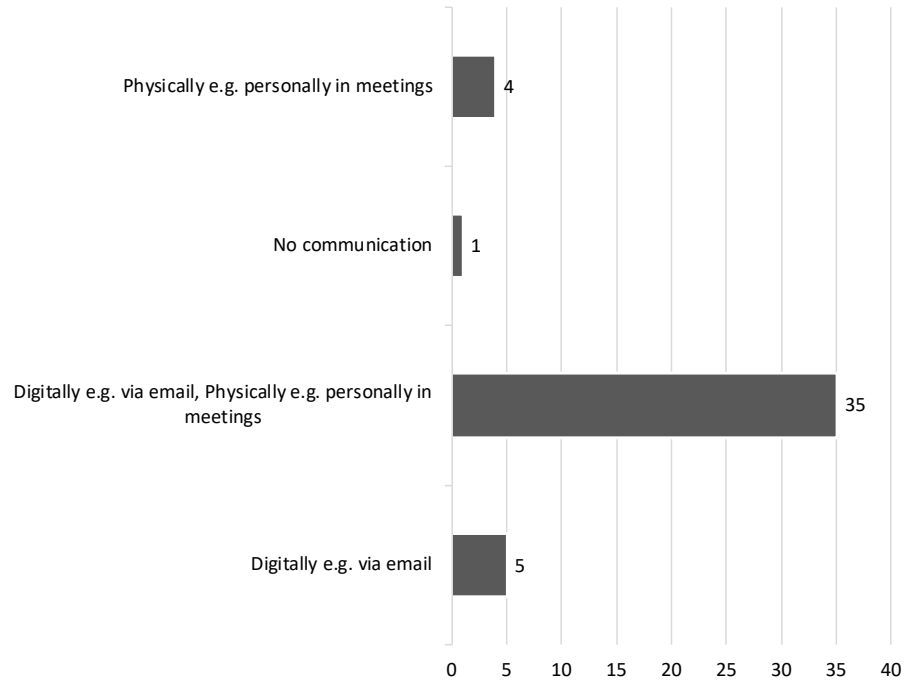
Fig. 14: How do the participants communicate with their customers
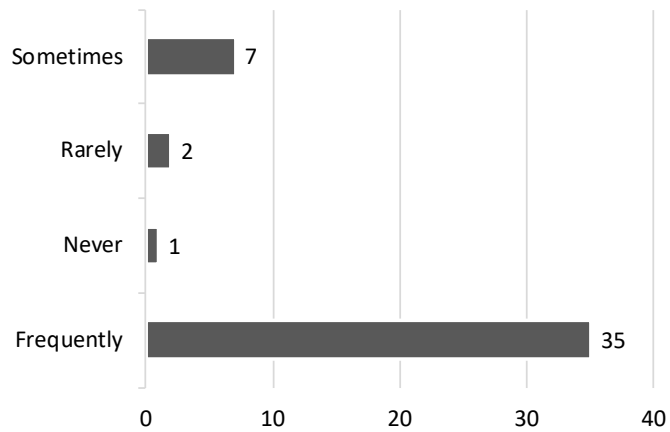
Fig. 15: How often do the participants communicate with their customers

3.3   Factors that potentially affect requirements for mobile apps
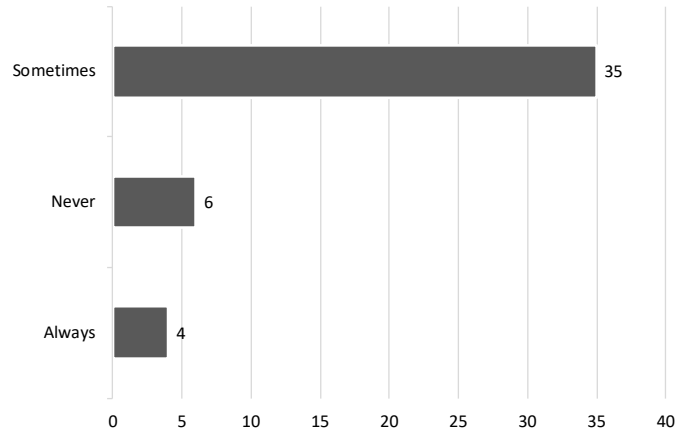
Fig. 16: Whether the end users are anonymous
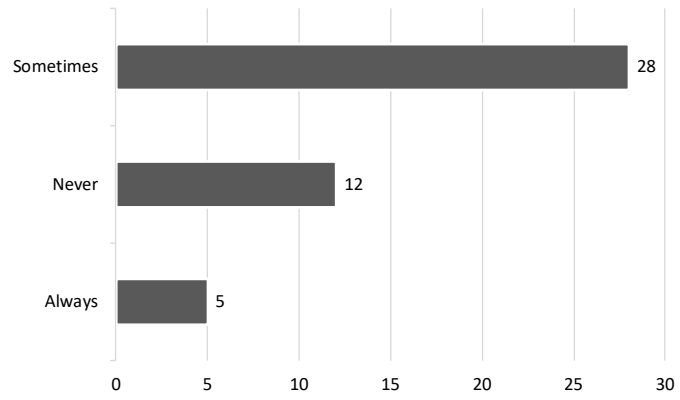
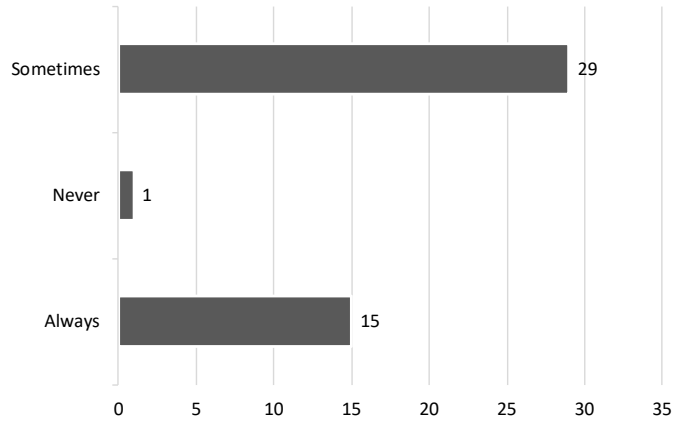Fig. 17: Whether the participants consider special needs of the users such blind users

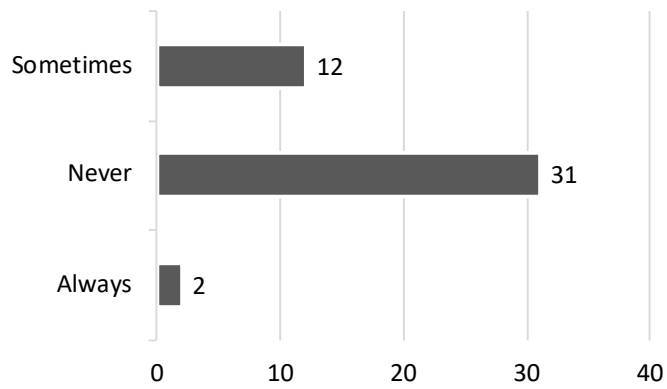Fig. 18: Whether the locality of end users matter
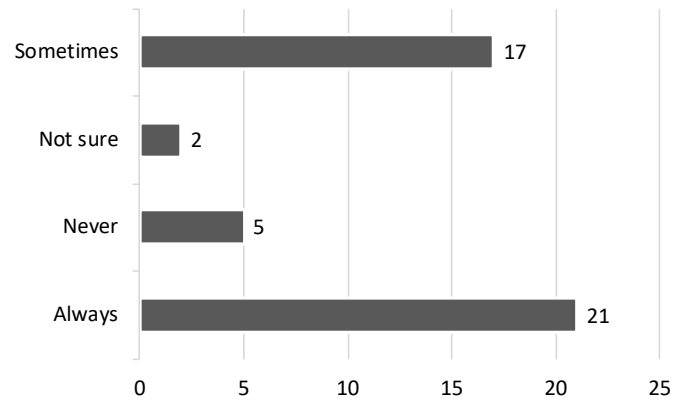

Fig. 19: Whether the ethnicity of end users matter

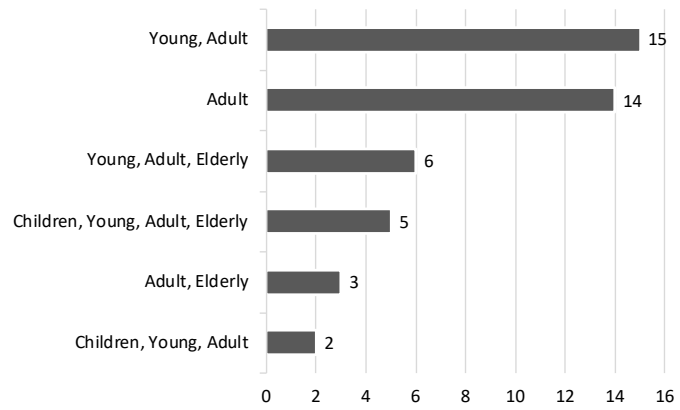Fig. 20: Whether the co-location of developers and requirements engineers matter

Fig. 21: The age groups considered by the participants for their mobile app
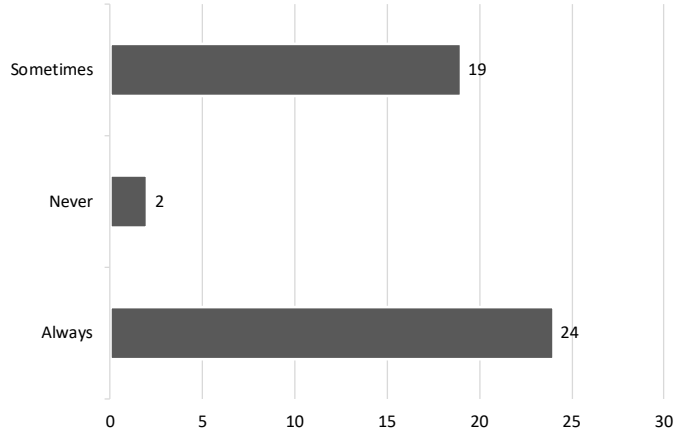
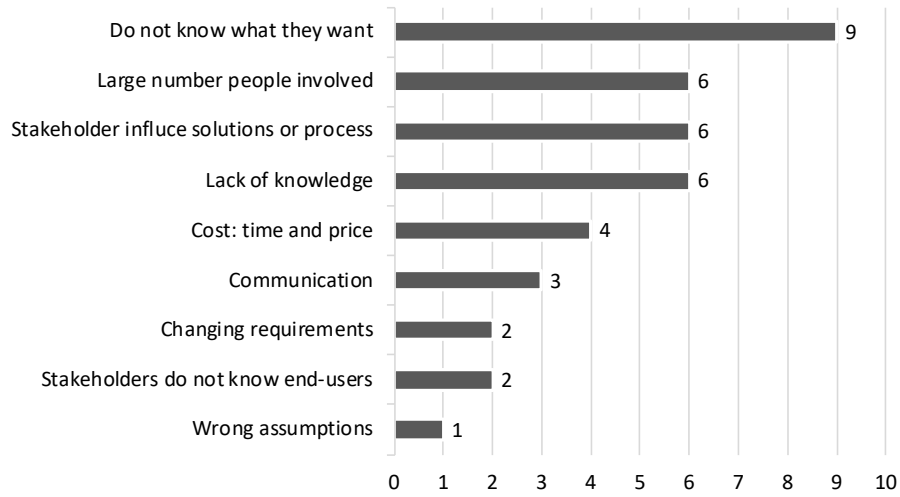Fig. 22: Whether the participants build prototypes

Fig. 23: Difficulties in mobile RE

4   Results of the interview

Table 1: Tooling used in industry

Purpose	Tools
Design, mockups, wireframing	Balzamiq, Invision, Photoshop, Figma
Analytics	Instabug, Google Analytics
Communication	Slack, Skype
Project management	Trello, Microsoft Teams, Jira, Basecamp, Asana, Harvest, Forecast
Documentation	Confluence, Google Docs
Development	BitBucket, GitLab, Mendix,