



Mobile Software Development Survey - Response Summary -

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1. Introduction

During the last few years, we have experienced considerable growth of diverse technologies for different communication devices. Especially the adoption of cell phones has significantly increased offering the possibility of digital inclusion and broad access to information.

Based on Wasserman (2010), developing mobile applications is similar to software engineering. But, mobile applications also present some additional requirements, including:

- Potential interaction with other applications
- Integration with device sensors
- Native and hybrid (mobile web) applications
- Families of hardware and software platforms
- Security requirements
- Variability of user interfaces
- Complexity of testing
- Power consumption

These differences indicate that consequently the software development process has to be customized to this specific type of applications/devices. Yet, the first question is on what are exactly the differences/similarities between “traditional” software development for computers and the development of software for mobile devices.

2. Method

In order to identify these differences/similarities and to understand on how software is developed for mobile devices, we run a survey. The survey aims at improving our understanding of characteristics and practices in the development of software for mobile devices, such as cell phones, tablets, etc. The results of the survey will be used as a starting point to identify specific needs in the area of mobile software engineering.

In order to obtain this information an online questionnaire has been designed, with questions related to product characteristics (such as platform, application type, application domain, etc.), importance of product quality characteristics based on ISO/IEC 25000 as well as software process characteristics. In addition, we collected demographic data and additional comments.

Relevant stakeholders have been invited via development forums and via email. The

participation in the survey has been entirely voluntary.

3. Results

We run the survey in October-December 2011. During the data collection period, we received 17 answers only, representing a very low response rate.

3.1 Profile of the survey participants

We received responses from 8 countries with the majority of responses from Brazil (Figure 1).

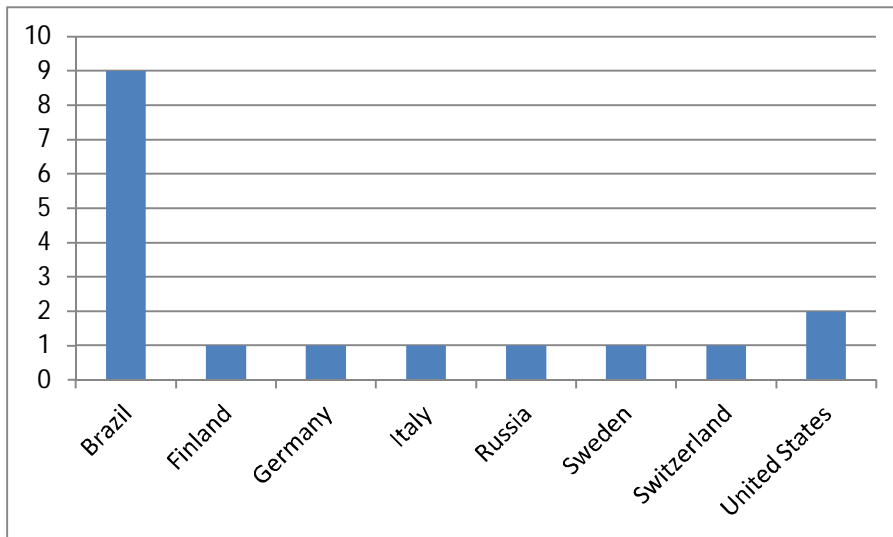


Figure 1. Number of participants by country

Most participants, who answered the survey are programmers (Figure 2).

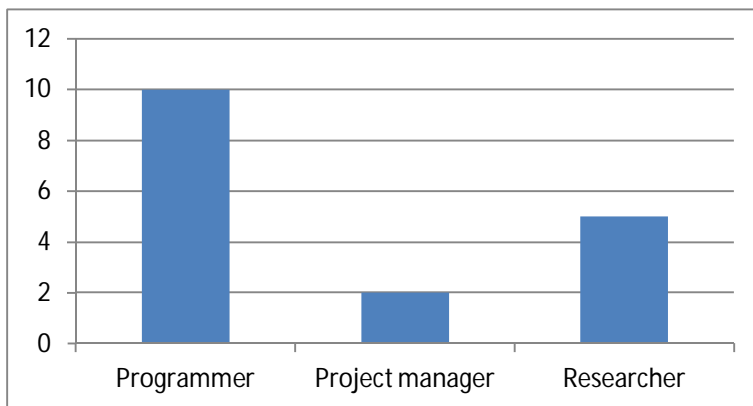


Figure 2. Number of participants by role

The degree of experience of the participants varied largely (Figure 3).

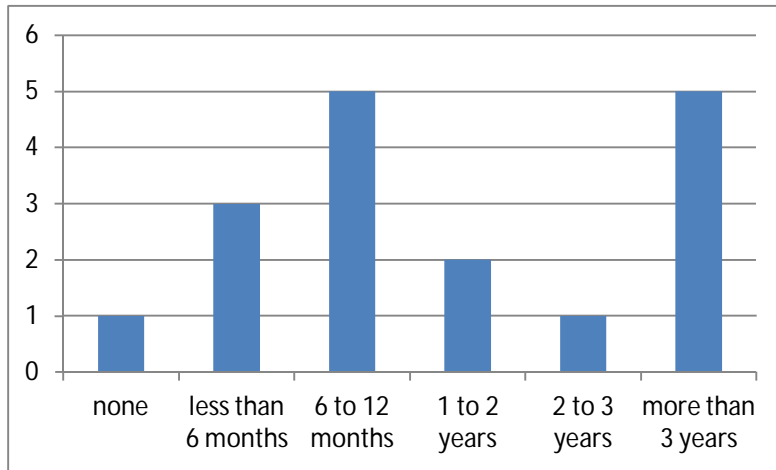


Figure 3. Number of participants by years of experience with mobile software development

Most of the participants are independent developers (Figure 4).

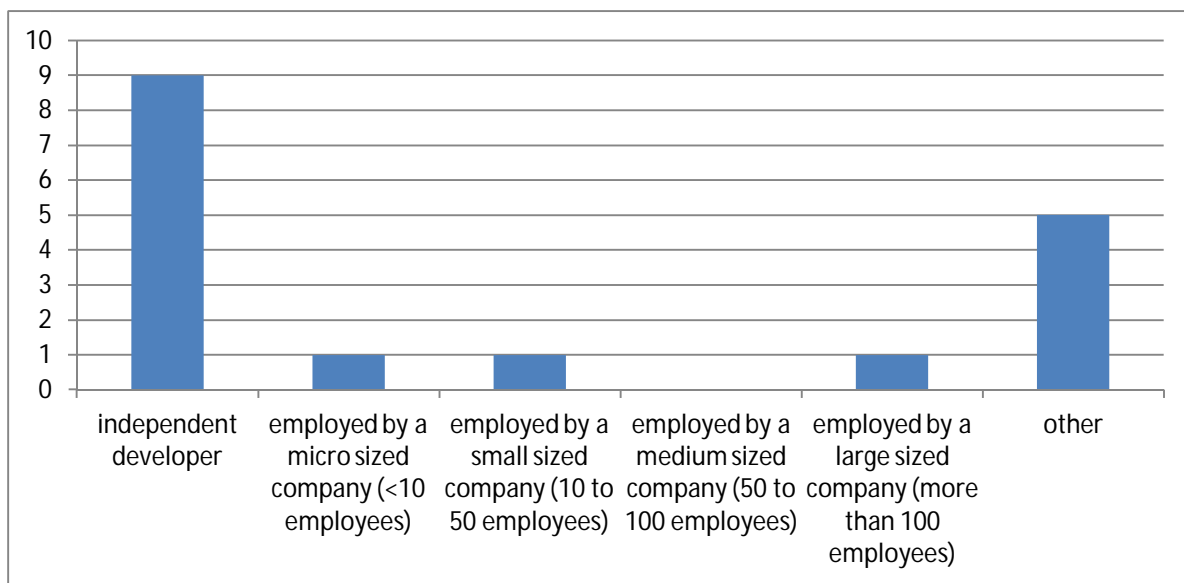
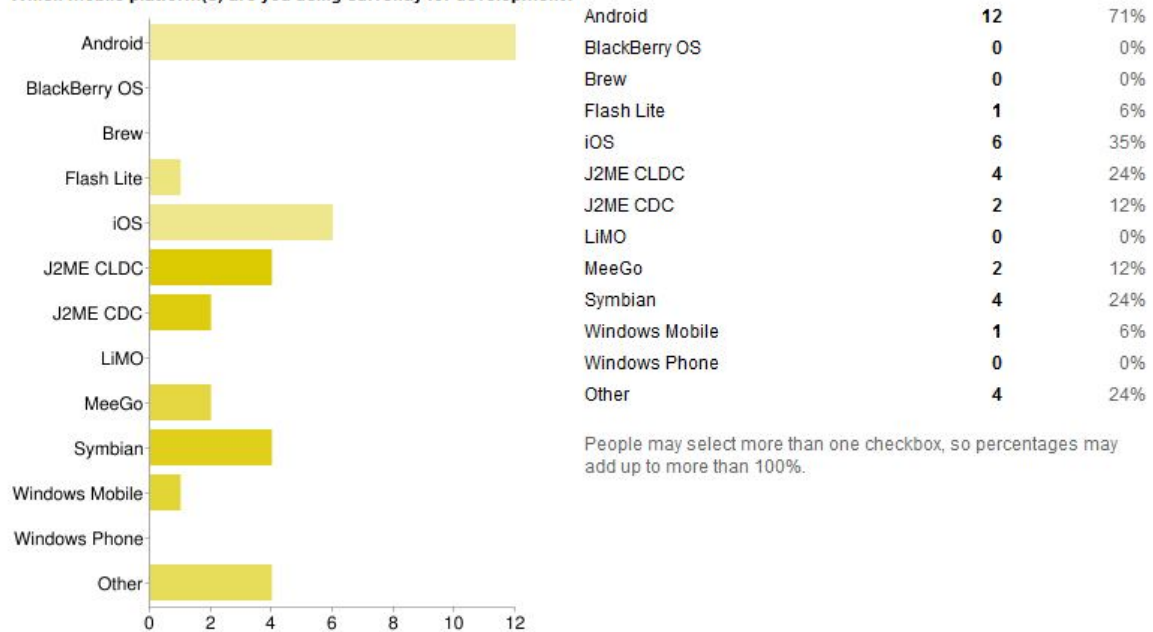


Figure 4. Number of participants by employment type

3.2 Data analysis and interpretation

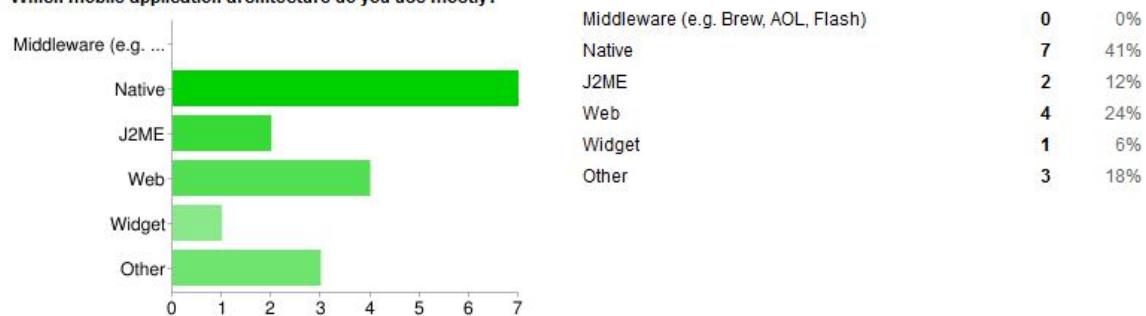
3.2.1 Product characteristics

Which mobile platform(s) are you using currently for development?



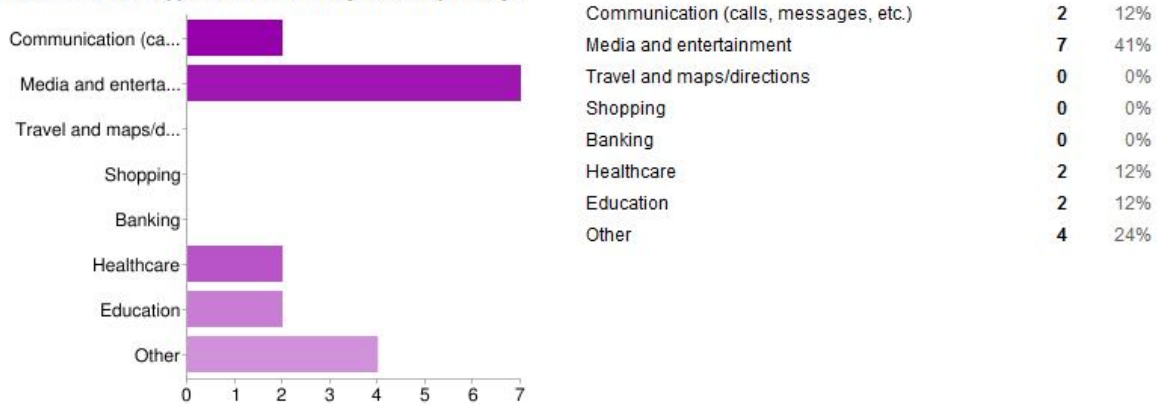
In conformance with market trends, the results show a strong focus on the android platform.

Which mobile application architecture do you use mostly?



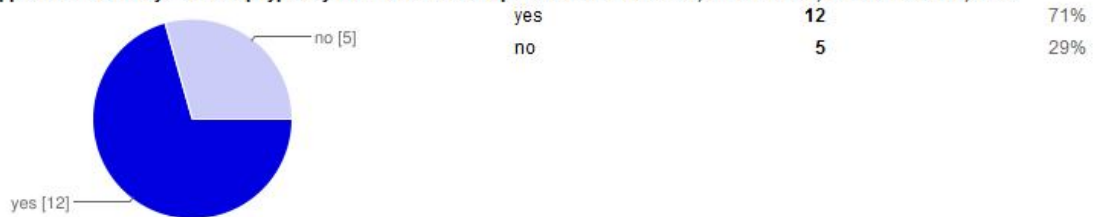
Main emphasis is on native applications followed by web applications.

For which kind of application domain do you develop mostly?



Principal focus on media and entertainment applications.

Do the applications which you develop typically involve the use of specific device features, such as GPS, accelerometers, etc.?

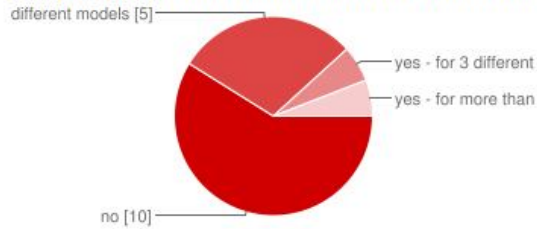


The majority of the applications involve the use of specific device features.

Do you typically develop applications derived from existing ones which originally have been developed for non-mobile devices (computers)?



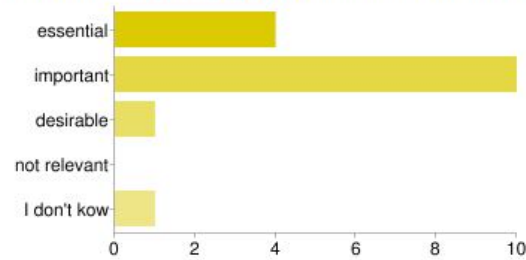
Have you developed more than one version of your product because of differences among devices for that OS?



Response	Count	Percentage
no	10	59%
yes - for 2 different models	5	29%
yes - for 3 different models	1	6%
yes - for more than 3 different models	1	6%

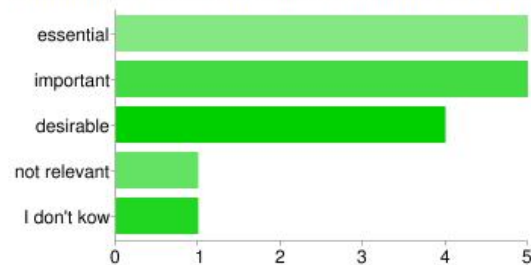
Product qualities

How would you classify the importance of the following quality in use characteristics in the context of mobile sw development? - Effectiveness: accuracy and completeness with which users achieve specified goals.



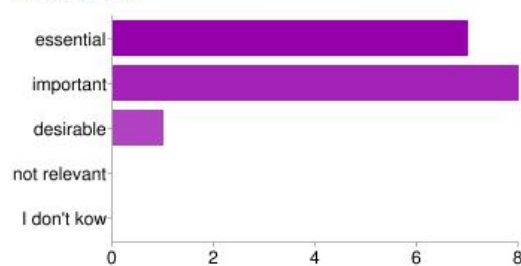
Category	Count	Percentage
essential	4	24%
important	10	59%
desirable	1	6%
not relevant	0	0%
I don't know	1	6%

How would you classify the importance of the following quality in use characteristics in the context of mobile sw development? - Efficiency: resources (HR, materials or financial cost) expended to achieve goals.



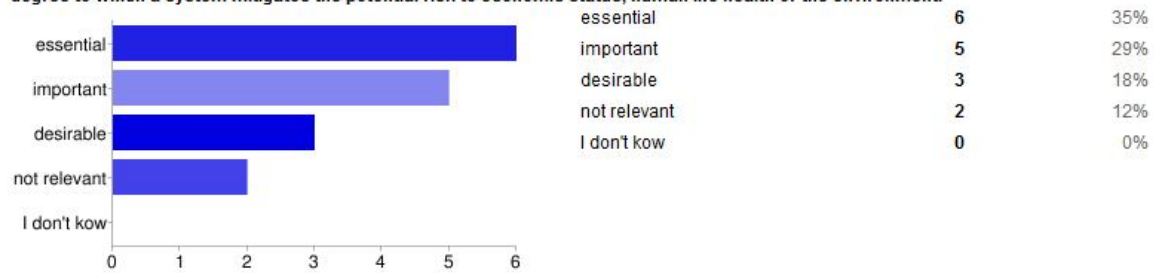
Category	Count	Percentage
essential	5	29%
important	5	29%
desirable	4	24%
not relevant	1	6%
I don't know	1	6%

How would you classify the importance of the following quality in use characteristics in the context of mobile sw development? - Satisfaction: degree to which users needs are satisfied when a system is used in a specified context of use (usefulness, pleasure, trust, comfort).



Category	Count	Percentage
essential	7	41%
important	8	47%
desirable	1	6%
not relevant	0	0%
I don't know	0	0%

How would you classify the importance of the following quality in use characteristics in the context of mobile sw development? - Safety: degree to which a system mitigates the potential risk to economic status, human life health or the environment.



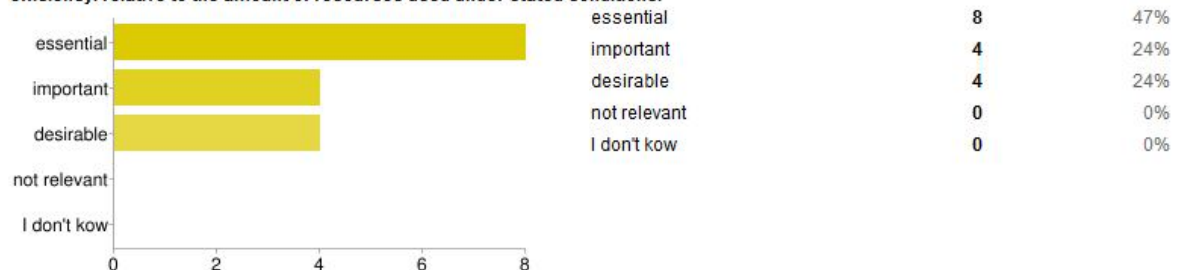
How would you classify the importance of the following quality in use characteristics in the context of mobile sw development? - Context coverage: degree to which a system can be used in both specified contexts of use and in contexts beyond those initially identified.



How would you classify the importance of the following product qualities in the context of mobile sw development? - Functional suitability: degree to which a system provides functions that meet stated and implied needs when used under specified conditions.



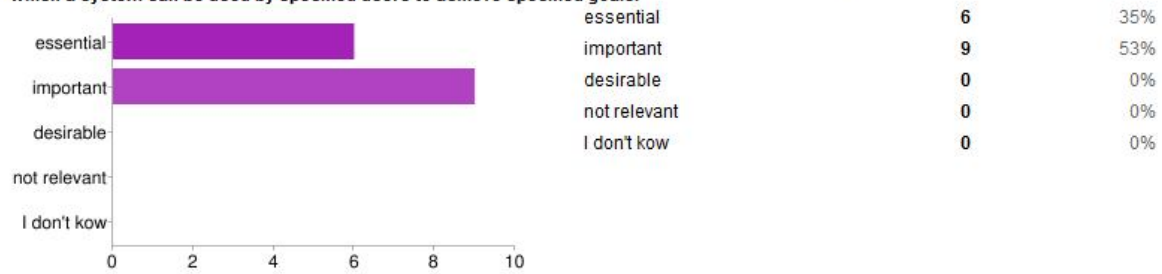
How would you classify the importance of the following product qualities in the context of mobile sw development? - Performance efficiency: relative to the amount of resources used under stated conditions.



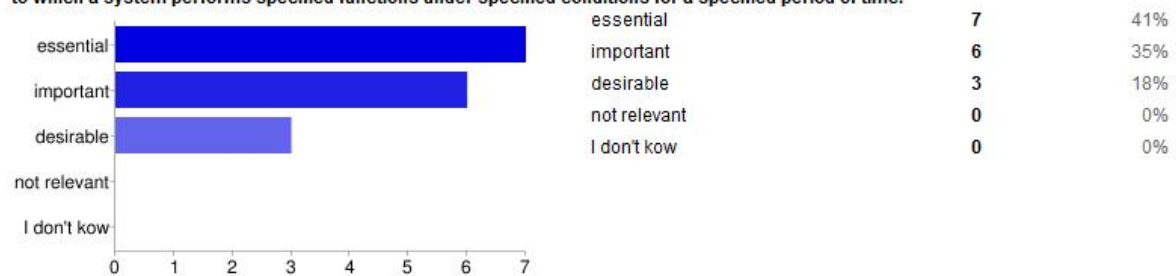
How would you classify the importance of the following product qualities in the context of mobile sw development? - Compatibility: degree to which a system can exchange information with other products while sharing the same environment.



How would you classify the importance of the following product qualities in the context of mobile sw development? - Usability: degree to which a system can be used by specified users to achieve specified goals.



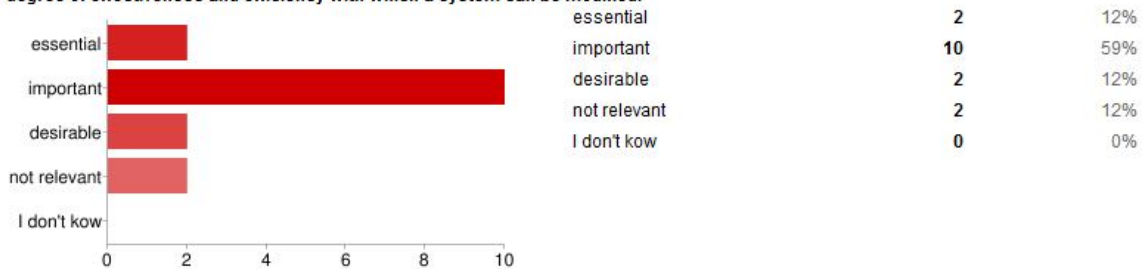
How would you classify the importance of the following product qualities in the context of mobile sw development? - Reliability: degree to which a system performs specified functions under specified conditions for a specified period of time.



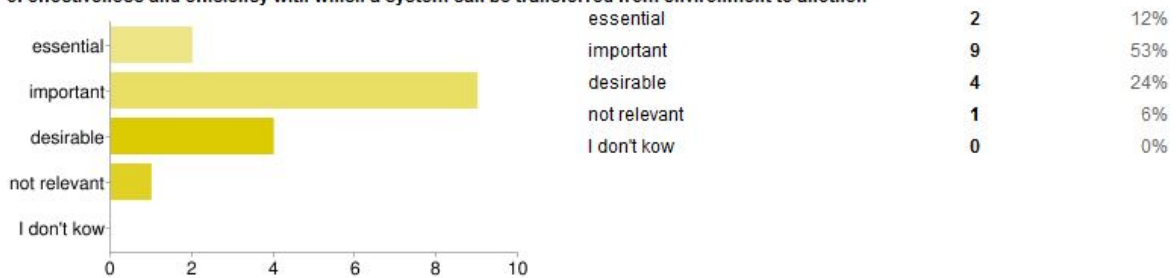
How would you classify the importance of the following product qualities in the context of mobile sw development? - Security: degree to which a system protects information and data so that persons or other systems have the degree of data access appropriate to their types and levels of authorization.



How would you classify the importance of the following product qualities in the context of mobile sw development? - Maintainability: degree of effectiveness and efficiency with which a system can be modified.

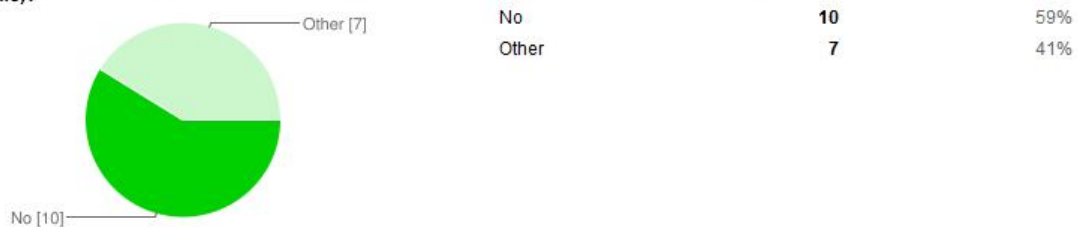


How would you classify the importance of the following product qualities in the context of mobile sw development? - Portability: degree of effectiveness and efficiency with which a system can be transferred from environment to another.



Based on the results, the most essential product qualities involve security, satisfaction, reliability, performance efficiency and functional suitability. Compatibility seems to be least important.

Do the mobile sw you develop typically have to comply to a standard (such as e.g. iOS Human Interface Guidelines or sector specific regulations)?



3.2.2 Process characteristics

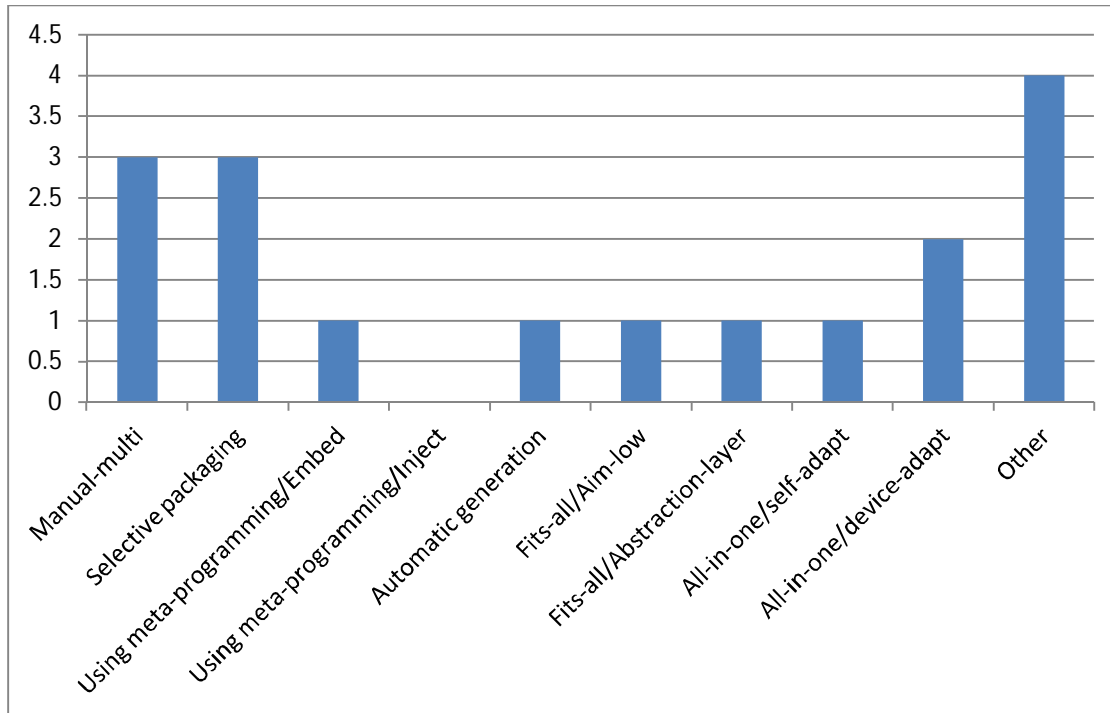
Do you use any specific approach/techniques (e.g., Test-driven development, XP, Framework for Software Product Line Practice etc.)? Which?

A great variety of answers has been given to this question, including: XP, Eclipse for Android, Test-driven development, ad-hoc, User-centered design methods, spiral model, etc.

Considering the fragmentation of the mobile context, how do you deal with the problem of develop an application against a reference operating context (OC) and achieve the intended behavior in all OCs suitable for the application?

Based on <http://www.comp.nus.edu.sg/~damithch/df/dfApproches.htm> the following answer categories have been defined:

- Manual-multi: Manually developing distinct versions to suit each different OC (“Copy-paste-modify “ techniques)
- Selective packaging: Variations are localized into interchangeable components (e.g., classes, files, etc.). A build script (or a linker) creates one version for each OC, picking out only the components required for that particular OC.
- Using meta-programming/Embed: Embeds OC-specific variations in the source files using meta-programming directives/tags. A preprocessor derives multiple versions by processing these directives/tags.
- Using meta-programming/Inject: Requires the developer to write the OC-specific instructions separated from the application code. A preprocessor combines the generic application code with the OC-specific instructions to derive OC-specific versions (e.g. using aspect-oriented development).
- Automatic generation: Multiple versions are automatically generated by a generator that knows how to adapt a software (written in a generic way) to suit a specific OC. Instead of merely following directives embedded by the programmer, generator uses its inbuilt knowledge in the generation process.
- Fits-all/Aim-low: Use only the features supported in the same way in all OCs. For example, the UI will be designed to fit the smallest screen size of the targeted device range. This approach is sometimes referred to as the "lowest common denominator" approach.
- Fits-all/Abstraction-layer: Use an abstraction layer that hides variations. The application will be developed using the API of the abstraction layer.
- All-in-one/self-adapt: The application discovers information about the OC and adapt itself to the OC at run-time.
- All-in-one/device-adapt: Software is written in an abstract way, and the device decides how to adapt it to the prevailing OC, at run-time. This approach is commonly applied when dealing with fragmentation in the UI part of an application.
- Other



Regarding the software process, are there any processes that differ significantly from “traditional” software development or which become more or less important?

Again, a great variety of answers has been given to this question including: requirements analysis (user driven design), usability engineering, performance improvement and resource management, none.

Does your software process need to be in conformance with any software process standard(s) or maturity/capability model such as CMMI, ISO/IEC 15504 etc.? If yes, which one(s)?

This question has been answered with no by the participants.

3.3 Threats to validity

The survey has been designed based on our experience and literature in the area of mobile software engineering. The quality characteristics have been derived from the international standard ISO/IEC 25010.

Yet, of course, due to the very low response rate, the results of the survey are

questionable and surely not representative.

Acknowledgements

We would like the participants of the survey for their time and valuable information.

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References

- A. I. Wasserman. Software Engineering Issues for Mobile Application Development. Proc. of Workshop on Mobile Software Engineering/MobiCASE, Santa Clara/USA, 2010