Creating the mobile apps independence rating

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Abstract. Nowadays the mobile apps market is experiencing unprecedented growth. The quantity of mobile applications, which is proposed for installation, has exceeded 6 million. It causes, that it's difficult for common consumers to choose a safety and high-quality product from this amount. The proposed independent rating called up for helping ordinary consumers. It is based on the special standard of mobile apps quality requirements and group of test procedures, that allow to evaluate the quality of mobile software.

1 Introduction

Nowadays the market of mobile applications has an unprecedented growth. Users often buy smartphones instead of classical computers. Mobile app is the software, which is intended for working on smartphones, tablets and other mobile gadgets. On average, the usual consumer uses mobile applications for 3 hours every day. The most active users of mobile devices spend on interaction with smartphones up to 5 hours daily. In this case, the number of smartphone apps in the two largest application stores – App Store and Google Play – totaled more than 6 million units. And the total number of downloaded applications in both stores (not including reinstallations and updates) in January 2018 reached 27 billion. The main reason for such rapid growth of the mobile market is a great growth in sales of tablets, smartphones and other mobile devices. Considering a huge number of applications, it may be quite difficult for an ordinary consumer to choose a software product which corresponds to his needs and the proper level of safety and quality. Independent surveys of mobile applications with subsequent assessment and rating creation are needed to help in sort outing in such an abundance of applications and help to make the right choice.

2 Standard of quality requirements

For organization, independent research and creating mobile apps ratings first of all, it is necessary to have standardized requirements to the quality and safety of mobile software products [1]. Up to this point, there were no Russian and international standards that would give an exhaustive answer to the question of what a quality of mobile application should be. The questions should be taken into account in order to develop a high-quality software product for smartphones. In this regard, it was decided to develop the standard of special requirements for the quality of mobile applications. During developing the standard about 60 existing standards, methodologies and manuals from leading companies in the sphere of mobile software & IT were learned. As a result, 16 State standards, 5 international standards, guidelines and methodologies of corporations (Apple, Google, AQuA and OWASP) were used and the Standard of Autonomous Non-profit Organization "RusQuality" STO 46429990-065-2017 "Mobile applications for smartphones"[2]. Special requirements for quality" was developed. It includes 87 requirements for the quality of mobile apps for smartphones. The Standard was discussed by the working group of the Project Technical Committee PTC 702 "Russian System of Quality", which includes IT and app's experts and was repeatedly refined [3–8].

The Standard STO 46429990-065-2017 is suitable for conducting of comparative tests of mobile software products. It includes the requirements of seven categories: Functionality, Usability, Performance and Reliability, Security, Portability, Accompaniment and Mobile App Description.

Criteria of functionality, usability and safety are the most important because ordinary consumers are primarily interested in the possibilities, their simplicity of use and safety. "Functionality" includes 9 requirements of the quality of mobile applications. Among which:

– The mobile application must have all the functionality specified in the description and title of the software product, shown in the screenshots and demonstrated in the demo video.
– The paid version of mobile application should be able to free trial acquaintance, regardless of the business model of its distribution.
– The mobile application must support the services and platform extensions corresponding to the target functionality of the application: Health Kit and Google Fit (for Fitness and Health applications), Siri voice

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assistant, Wallet (for applications that allow buying tickets), iMessage and others.

– A mobile application that has built-in purchases must have a restore tool that allows you to return an additional (enhanced) functionality purchased earlier after reinstalling or updating an application.

As for "Usability" the requirements of this category are devoted to the simplicity and quality of navigation, russification, design, advertising, etc. (total 29 requirements):

– The navigation process should be designed in such a way that the user can determine where he was, where he is and where he can move in the future. During the using of the application, the user should not be in a situation in which it is not clear what is happening and what to do.

– The quantity of navigation steps, which are necessary for access to a certain part of the information should be minimal.

– The mobile application must use the Standard navigation components of the platform such as navigation panels, page controls, tab panels, and do not change the system navigation functions. If the platform supports the "Back" button, clicking on it should always lead to the previous screen. If the platform supports the "Home" button, pressing on it should always lead to the home screen of the device.

– The mobile application must comply with the guidelines (recommendations) for the design and usability of the platform for which it was created. The mobile application for the iOS operating system must comply with the Apple guidelines, and the mobile application for the Android operating system must comply with Google guidelines.

– Users should easily distinguish the basic information of the mobile application from the advertising materials.

– The mobile application should be adapted for using by disabled people: full support for dynamic font is provided (or the application has its own font size settings, allowing it to be increased 2 or more times) and voice input control is implemented. If there is video content or audio recording, you can display subtitles.

– The mobile application should demonstrate large amounts of information (organized in the form of dimensionless lists) according to the principle of "information environmental friendliness": to show first of all the desired and most relevant information to a particular user and then the rest, if it is possible and expedient. For example, using advanced search options.

– The mobile application must be protected against user errors. A mobile application designed to work with text, graphics and other editable documents should allow you to undo at least the last action associated with manual input or editing of data, committed by the user. The mobile application should warn the user about the consequences of its actions, if any of them are serious and irreversible, and ask for confirmation before performing such actions (for example, when deleting data).

As mentioned earlier, in addition to functionality and usability, the security of mobile applications is extremely important. This category has 21 requirements. The main of them are the following:

– The processes of using and storing data by a mobile application must correspond to the requirements of Federal Law No.152 of 27.07.2006 "About Personal Data".

– When collecting personal data, developers of mobile applications are required to provide recording, systematization, accumulation, storage, updating (modification), extracting personal data of Russian citizens using databases located in the territory of the Russian Federation. This is according to the Federal Law of July 21, 2014 No. 242 "About Amendments to Certain Legislative Acts of the Russian Federation Regarding Specification of the Procedure for the Processing of Personal Data in Information and Telecommunications Networks".

– A mobile application must require an absolute minimum of permissions for the core functionality (and do not require unambiguously redundant permissions).

– The mobile application must have an unequivocally interpreted privacy policy, which must be placed in the application or given a direct link to it.

– The mobile application must successfully withstand the 10 main current threats to mobile application security according to OWASP and not have critical vulnerabilities.

– If the application collects, stores, or transmits personal data, it must ensure the security of these operations using up-to-date reliable encryption methods and ensure data transfer over a secure channel (for example, the HTTPS protocol) using interception techniques of the communication channel (for example, SSL Pinning).

Also, the Standard sets requirements for the performance and reliability of mobile software products (12 requirements):

– The amount of memory occupied by the mobile application should be minimally possible and justified.

– The mobile application must notify the user about the long time starting. If the application starts longer than a reasonable time, it should show a download or message indicator informing the user about the time remaining before the application will open or about the progress of opening the application.

– The mobile application should work correctly on all supported versions of the mobile OS without unexpected falls and damages to the main functionality.

In addition, the requirements for Accompaniment and Portability are standardized (there are 5 requirements in these categories):

– The mobile application must be updated by the developer at least once a year, otherwise this application is qualified as "abandoned".

– A mobile application must be able to synchronize user data between different devices on different mobile platforms (if there are versions of the mobile application for different OS).

Separate attention deserves the last category of requirements – "Mobile App Description". Any user should be able to learn about the functions and purpose

of the mobile application even before it is downloaded and installed. Therefore, the information posted by the developer in the application stores should be as complete, competent and, most importantly, relevant reality. Among the 11 requirements for Mobile App Description are listed below:

– The name of the mobile application displayed in the application store should be brief and capacious, reflect the essence of the service offered to the user and its name, also be translated into Russian.

– The description of the mobile application should contain detailed information about the key functions of the application and the main tasks solved with it. The description should be translated into Russian, not contain grammatical, syntactic and lexical errors. The description should include a list of functionality that is not available for free use or provided only for money (for applications with built-in purchases). The description of the mobile application should be correctly written in Russian (translated into Russian) with the observance of grammatical, syntactic, lexical and other norms.

– The description of the mobile application should contain information only about the implemented functionality.

– The page of the mobile application in the store should contain actual screenshots corresponding to the current version of the application, and the current video demonstrating the work of the software product. Screenshots and video should only show the existing (already implemented) functionality of the mobile application.

– The mobile app page in the application store should contain a link to the developer's site and Privacy policy.

Apart from quality requirements, the Standard contains a description of test methods and technical requirements. They are directly verified in comparative tests.

The fact is that not all requirements of the mobile applications quality described in the Standard can and should be checked in the framework of testing and rating. Some of them are designed to inform developers about what a quality and safe mobile application should be, but it is superfluous for consumer testing. So, there are 3 testing methods described in the Standard: Manual testing, Instrumental testing and Visual assessment.

1. **Manual testing** is an operational method for apps' testing by an expert on a mobile device without the use of special tools or software. Within this type of testing, the expert uses the mobile application as an ordinary user, assessing the degree of correspondence app's feature to criteria set in quality standard.
2. **Instrumental testing** is an app testing method by an expert using special tools and software, followed by analysis and evaluation of the results obtained with the help of tools based on an expert understanding of the subject matter of the research and converting them into a final rating.
   Types of tools:
   – Software for malware detection;
   – Software for analyzing network traffic;
   – Stopwatch.
3. **Visual assessment** is an expert's assessment of the degree to which the properties of the mobile application or its information characteristics correspond to criteria without manual or instrumental testing. The visual assessment can be used to obtain general information about an app (such as the size of the downloadable application package, the date of the last update, the user rating, etc.) from public sources (application store and developer site).

3 Test procedures

To create an independent rating of mobile applications unambiguously interpreted test procedures in addition to the Standard are also required. Testing software products using them will allow obtaining final ratings of mobile applications, which will make it possible to compose the rating.

Test procedures are developed on the basis of the Standard of mobile apps quality requirements. The list of test parameters may vary depending on the category of mobile applications under investigation and the mobile operating system for which the researched applications are developed. The test procedure, the test plan and the weights of the criteria and their groups are determined separately for each researched category.

The universal category map was developed and socially significant topics for research were identified in order to determine the most priority for the researches groups of applications (see the Figure 1). Socially significant categories are groups of apps that concern the majority of citizens and affect their quality of life. These include Work, Realty, Personal Finance and Productivity, Health and Fitness, Social, Travel, Education and others.

Any developed test procedure contains general paragraphs that include test principles and methods, testing tools, conditions, plan, criteria and weights which experts will use while testing mobile applications.

Criteria of the test procedure can be conditionally divided into two groups:

1. Applicable and current requirements for this apps' category from the relevant chapter of the Standard.
2. Functional criteria not contained in the Standard and separately discussed with the expert community.

The necessary functionality is determined by studying the most popular software products from the application stores and discussing them with profile experts on the working group's meetings of the Project Technical Committee PTC 702 "Russian System of Quality".

An assessment must be made for each individual criterion to obtain an app's final rating. The testing method specifies the uniquely determined attribute or the value of the application and its corresponding rating.

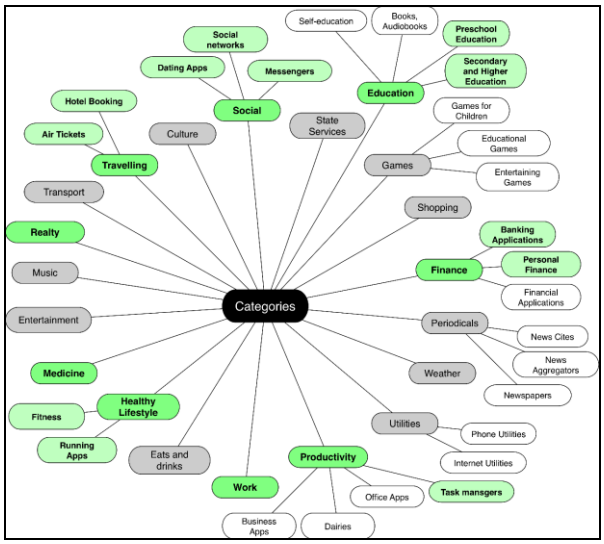

Fig. 1. Apps categories

Example:

Privacy policy. *The mobile application has a privacy policy with the digest of the main paragraphs formulated in a comprehensible language. They are located in the application or there are direct links on them in the mobile app.*

Valuation options:

5.5 – There are full version of the privacy policy and the digest of the main provisions of the confidentiality policy formulated in a comprehensible language;

5.5 – Privacy Policy is a short document (no more than 15 paragraphs) formulated in a comprehensible language;

4.0 – There is no digest of the main paragraphs formulated in a comprehensible language; the privacy policy is a long document (more than 15 paragraphs);

0.5 – No reference to the Privacy policy.

Additionally, subtract from the rating:

1.0 – Privacy Policy (or a link to it) is shown in the application only while registration.

Each group of criteria and each separate criterion mentioned in current test method has a different weight because of it's different significance. The criteria have a different effect on the final evaluation of the application. Weights are assigned to each parameter in such a way that their sum in each criteria groups is equal to one (100%). The more important the parameter, the greater its weight. In the same way, weights are assigned to the groups of criteria, in this case, not only the importance of the group of criteria plays a role, but also the number of parameters contained in it. If the parameter is not applicable to this application, a dash is placed in the corresponding field, and a rating equal to the arithmetic mean of the values of all applications for this parameter is used for calculating the final rating for the entire research. The calculation of the final evaluation of the application is carried out as follows: the value of each parameter (rating from 0.5 to 5.5) is multiplied by the corresponding weight. All resulting weighted values are summed up within each group of criteria, thus assessing the criteria groups themselves (Mobile App Description, Functionality, Usability, Performance and Reliability, Security, Portability). Then the obtained estimates of the criteria groups are multiplied by the corresponding group weights, and the multiplication results are summed. As a result of the calculation, the final rating of the application is obtained. See the formula:

$$I = \sum_{m=1}^{M}\left(z_m \sum_{n=1}^{N}\left(x_n y_n\right)\right).$$

Here: I – the final rating of the application; x_n – the value of the criterion; y_n – the weight of the corresponding criterion; N – the number of criteria; z_m – the weight of the corresponding group of criteria; M – the number of groups of criteria.

The following test principles should be observed while evaluating the quality of mobile applications:

1. Tests of mobile applications should be conducted by an expert group of at least two experts.
2. Tests must be conducted on at least two mobile devices. All mobile devices used for testing are released not earlier than two years from the date of testing and belonged to different price categories.
3. Experts should strictly follow the test plan and perform all operations on several mobile devices.
4. As a result of the discussion, the expert group comes to an agreement on each of the criteria and presents a final rating on it.

4 Discussions

In one article it is impossible to describe all process of making the mobile apps independence rating and the way people use it after creation. However, analysis shows that consumers handle researches results to make a choice what application to download if they don't know the apps market enough. First of all they pay attention to the final rating of apps and then look at the security and functionality ratings to make more informed decisions. This proves the relevance and importance of creation the mobile apps independence rating. Of course, there are a lot of different sites in the Internet where different apps reviews and compilations are published but they don't provide exhaustive independent and transparent information. Sometimes developers pay for these reviews, so people increasingly do not believe them. Taking this into consideration making the consumer applications navigator is needed by ordinary people. But it's worth considering that developers update their apps very quickly (sometimes every week). So the rating may become obsolete after a few months, and it will be needed to test applications again. In turn, this requires large human and time resources.

5 Conclusions

As a result of testing and assessment of applications, it becomes possible to compile an independent rating of mobile software products of a certain category. All mobile applications have specific final ratings and are sorted in descending order.

Moreover the Standard of mobile apps quality requirements is not only a normative base for creating test procedures, but also a guide for developers to develop high-quality software products. From this, first of all, ordinary users win. And thanks to the proposed independent rating of mobile applications, consumers can now easily select the mobile software products that suit their needs and correspond to the proper level of security, functionality and usability.

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