

TYPOLOGIES OF MOBILE APPLICATIONS

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ABSTRACT

Mobile applications and their particularities are analyzed. Mobile application specific characteristics are defined. Types of applications are identified and analyzed. The paper established differences between mobile applications and mobile application categories. For each identified type the specific structures and development model are identified.

Keywords: Mobile Applications; Typologies; Characteristics; Application Development

1. BASIC ELEMENTS IN STUDYING MOBILE APPLICATIONS

Mobile applications are analyzed in detail due to the personal characteristics shown by them. If a traditional application which runs on a machine is used by several users, a mobile application running on a handheld device is used only by the person interacting with the device at that time. This is why an important point in developing mobile applications is establishing the target group.

The target group contains the users for which the mobile application is designed. According to the elements in the target group the application features are established as well as its components.

Another essential element for mobile applications is the interaction with the user, the controls used to determine how fast the user interface communicates with the application and the speed with which the desired results. In certain applications the interaction is achieved by selection without the user having to enter text, which is quite difficult on mobile devices equipped with small keyboards or via touch-screen. Selections save time, the user interacts with the mobile application much faster. In [1] a system with a 3D camera which records user gestures and thus enables users to interact with mobile devices is presented.

Presentation of results also has a very important role in the analysis of mobile applications.

The amount of data upon a time is an aspect that should be considered in the development of mobile applications due to the fact that mobile devices have a small screen.

In light of these elements are grouped in mobile applications distinct categories that make their analysis be done on homogeneous sets of applications.

A lot of mobile applications represent a homogeneous group of software for mobile devices that:

- data entry is done in a similar manner for all users to be easier to interact with all applications from the homogeneous group;
- presentation of results is done in the same way for all application to be easier to understand the results of all applications from the group;
- problem is solved in the same area otherwise the users are not familiar with the domain;
- resources used are analogous to be possible to be used in all applications the same inputs.

Thus all applications that share similar characteristics are part of the same homogeneous set. By unifying all homogeneous crowds we obtain all existing mobile applications.

2. THE DEVELOPMENT CYCLE OF MOBILE APPLICATIONS

In [2] the authors present the context using mobile applications and describe complex dependencies between the development of interactive mobile applications and their use.

In [3] the development cycle stages are presented, and besides the normal steps include testing phase by emulator for developing applications for mobile devices:

- *Establish the target group* is the stage in which the devices are set for running the application; the platform for which the application is developed and the users that will interact with it are set; at this stage depending on the chosen platform and develop devices that are established and resources available, the application is tested using emulators platforms set at this stage, and actual testing environment is made for these devices, because of this, setting the stage for the target group is a very important step in making mobile applications development;
- *Defining the problem* in this phase which defines the problem to be solved taking into account existing restriction system for the machine running the mobile application and the need to resolve that issue via mobile devices, are problems that are solved through mobile devices, but some problems are solved only through computers with high computing power, or servers, if these problems can opt for the solution of using computing power of servers and the results will be provided to the user through mobile devices, such mobile devices is an interface between the user and the remote server, ensuring pervasive applications in this way the user has the ability to solve the problem regardless of time and space;
- *Develop specifications* is the stage when considering functional requirements, analysis of input and output of documents in this stage are set all interactions with the external application with other applications, with web services, or servers, document exchange are established or application resources by the external environment and change the way of these resources, it is recommended that the application be performed on modules which in turn are integrated with other applications or with other modules within other software present on the device running the newly developed application, modular development provides both greater integration ability and regeneration of the application code if possible attacks, also with certain updates, will change some modules in the application but not the entire application, the user will not have to observe this and will be only announced that a particular module was modified to improve the application;

- *Develop of solutions* is meant to improve identification and planning solutions that are used in application development; solutions identified at this stage form the base of the application when code is developed, developing the application is done on top of prototypes determined strictly in this stage;
- *Coding* is the implementing the source code for application development, coding is performed based on solutions developed in the previous step;
- *Testing* involves checking reactionary mode of application in the real world, it is verified application behavior on devices and platforms for which it was developed;
- *Implementation* is the stage at which the application is deployed to end users to use, is made both installation and user training on how to use;
- *Using* the stage at which the application is used by customers, is the stage where the application in the hands of end-users and is used to solve problems for which it was developed;
- *Maintenance* is the stage that the developers solve problems found in the use of applications by customers, is an important step because the application has improved each time and adapted to the requirements of end users;
- *Reengineering* involves the fundamental rethinking and redesigning its application to improve the performances, it is necessary for the devices, platforms and needs have evolved a lot and change the current application is too expensive and it is preferable to develop a new application.

These steps are shown in Figure 1 and Figure 2.

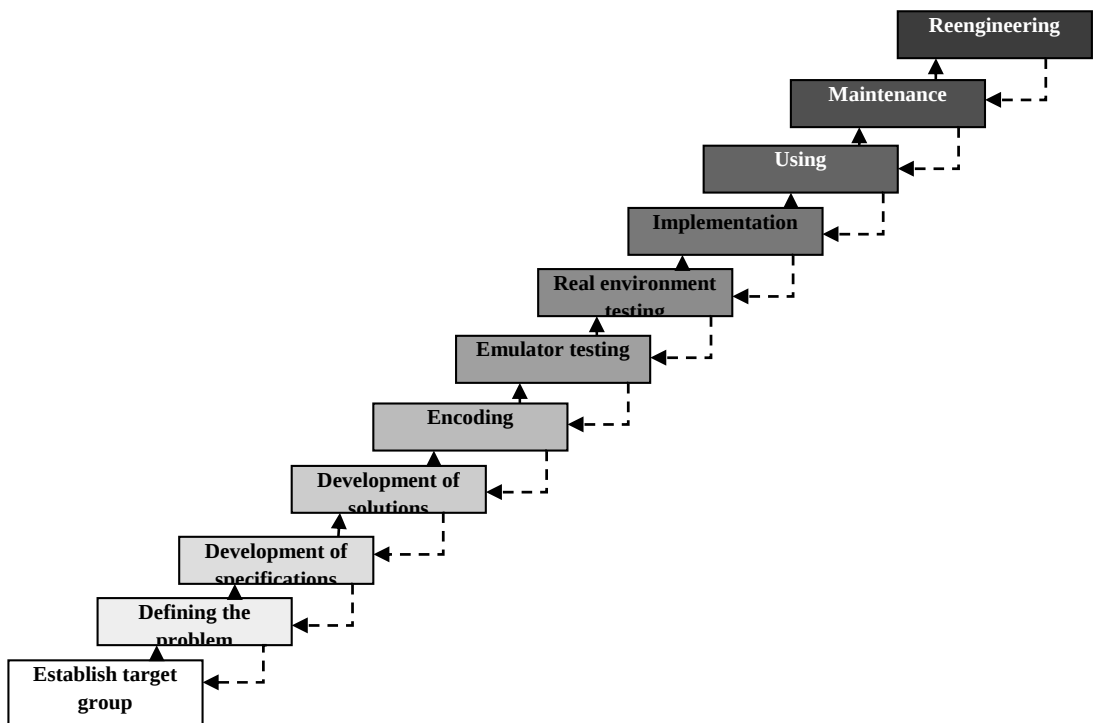


Figure 1. Stages of the development cycle with return to the precedent stage

Figure 1 shows the development cycle to return to the previous step. After completing each stage considering the results of the round. If they do not meet recovering stage, so the process continues at the completion of the last stage. When the results correspond to expectations the next stage is started, the current one is considered completed.

Figure 2 presents the development cycle with repeting each step where a stage does not have a satisfactory outcome. Thus, at any stage of the cycle, if the result does not meet expectations, resume development of the other stage. In this way if the testing stage is not all right the return is to encoding, development of solutions or development of specifications. The reengineering of application is with return to the first stage to establish the target group.

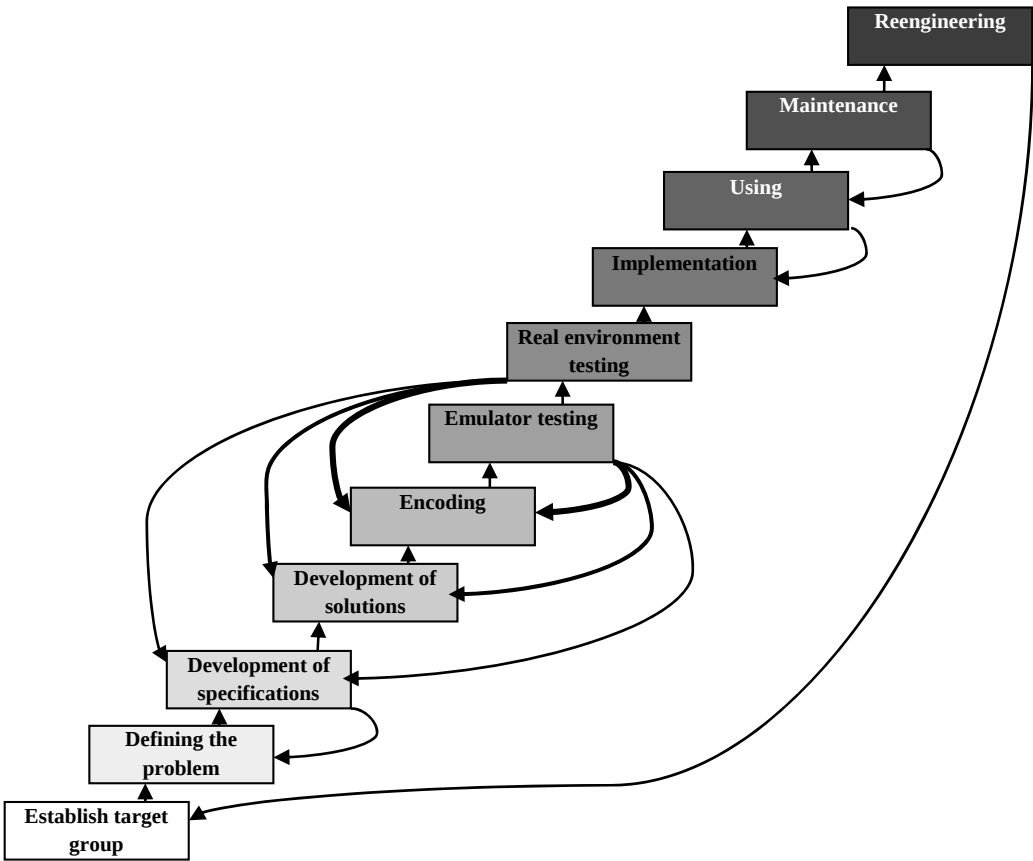


Figure 2. Stages of the development cycle with reiterating each stage

The development cycle is ensured and iterated for each mobile application such that the resulting software will correspond to end user requirements.

3. TYPES OF MOBILE APPLICATIONS BY THE VOLUMES OF DATA USED

The applications are characterized in terms of information criteria used for solving the problem. This information may exist in the database, in files, or can be entered by the

user. In [4] are mobile ad hoc networks. Applications are reviewed according to the volume of information found in each of these three categories. So consider:

- V_1 - the volume of data in the database;
- V_2 - the volume of data in files;
- V_3 - the volume of data given by users.

Analyzing the three types of data mobile applications use yielded the data from Table 1. Thus we obtain the set of types of mobile applications:

$$TMA = \{TMA_1, TMA_2, TMA_3, TMA_4, TMA_5, TMA_6, TMA_7\}$$

Table 1. Types of applications according to the volume of data used

Group	Existent data	Application examples
TMA1	$V_1 = 0;$ $V_2 = 0;$ $V_3 \neq 0$	Applications for establishing the ideal weight; Calculators; Body Mass Index calculators
TMA2	$V_1 = 0;$ $V_2 \neq 0;$ $V_3 = 0$	Applications for computing exchange rates
TMA3	$V_1 \neq 0;$ $V_2 = 0;$ $V_3 = 0$	Applications for quering data servers through the internet
TMA4	$V_1 = 0;$ $V_2 \neq 0;$ $V_3 \neq 0$	Applications where the user enters some information and correlated with existing information in files are obtained results which are provided to the user
TMA5	$V_1 \neq 0;$ $V_2 = 0;$ $V_3 \neq 0$	Applications where the user enters some information, the selections are based on information entered in the database and it provides results.
TMA6	$V_1 \neq 0;$ $V_2 \neq 0;$ $V_3 = 0$	Applications where the user makes selections based on existing information in files and on the selection made by these other selections are made in the database to obtain the final results.
TMA7	$V_1 \neq 0;$ $V_2 \neq 0;$ $V_3 \neq 0$	Applications in which the results are obtained based on the information entered by the user, based on selections made by the user and based on existing business information in large databases.

Based on the data in Table 1 the applications are divided into seven categories. These types of applications are plotted in Figure 2.

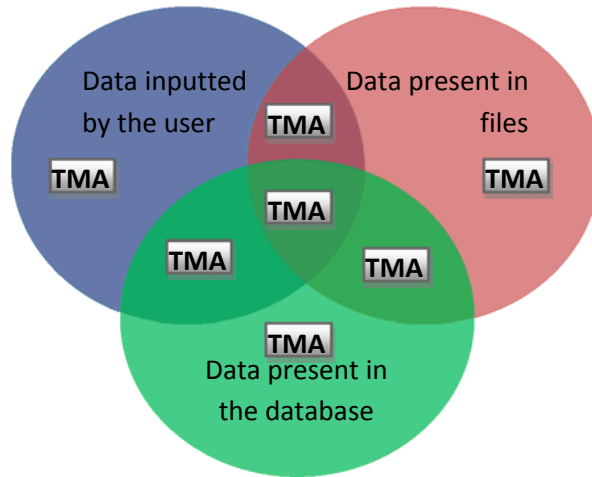


Figure 2. Mobile application categories

Based on this hierarchy of mobile application in the specification development stage the decision is taken of which category an application to be part of, and also the existing data set or how to enter the data from the user is established.

An application is only part of one category so the intersection of two subsets of seven leads to empty set.

$$TMA_i \cap TMA_j = \emptyset \text{ cu } i, j = \overline{1:7}$$

Applications are classified by other criteria such as the complexity the security provided by the application and the volume of results.

4. ILLUSTRATION CATEGORIES IN DIFFERENT STAGES OF DEVELOPMENT

For staged development and application can be part of different categories in different stages of development. At one time an application is part of only one category.

Considering the development of the MCS application shown in [5]; In developing its first application development cycle the software contained information in files stored locally on the mobile device and provide this information to the user. Information was the description of the application and how to use it. The instruments were set to be available in future versions of the application. The MCS application in this step is part of TMA2

In the second stage of development the application selects the necessary information from the database. The application is part of TMA3. Such information is modified directly in the database which is on the server; the developer does not need to modify files on mobile devices of the users who have already installed.

In the third stage of development of the user application must provide information to log into the application and only then give selected information from the database. In this way, the application becomes part of the group TMA5.

In the final stage of the application development by providing the information necessary to log the user has to answer some questions for profiling. The questions are taken from the files stored on the mobile device. After creating the profile data is selected from the database according to the profile information established and displayed in the MCS application. At this stage mobile application is part of TMA7.

Such mobile application evolved from a simple application included in the TMA2 group to a complex application in the TMA7 group.

5. CONCLUSIONS

The development process of mobile applications has more restrictions than most PC mainstream applications. These restrictions come from the fact that the same mobile OS can run on a multitude of hardware that tend to have strict operating rules. Thus mobile applications need to be flexible and optimized to be able to run on a larger set of mobile devices.

The development cycle for mobile applications is closely linked with the general purpose of the applications, the types of data it uses and the set of end users that are targeted. Development and QA teams should bear in mind while they work on the mobile software:

- functional specifications on which the application design will be based on;
- device restrictions that may impact GUI design, database and internet connectivity, information storage on the device and overall device performance;
- security concerns relating to data transfer, from the device to the data servers, from the data servers to the device and interaction with third party applications that may require access to the application data.

Data management in the application will have to be done considering device storage and internet bandwidth. There should be a balance between the two, considering that not all data connections are free, and the more bandwidth the application uses the more the carrier will charge the user. The optimal path can be chosen based on the volume of data, the storage type available and the type of internet connection of the device be it carrier delivered or WiFi.

6. REFERENCES

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