Android web application for insurance companies as innovative mobile marketing

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Abstract
An innovative way of calculating the salary for insurance companies' employees, through their smart phones running the Android OS is presented in this paper. The smart phones' specifications and features had achieved the highest level of quality, allowing performance of mobile computing, improving the strategies of mobile marketing. The application proposed in this work allows calculating salaries of insurance companies' staff, proposing original, efficient way of documentation managing at insurance companies. The significance of insurance companies' contribution in the financial sector is essential. Our approach improves the Quality of Experience (QoE), providing the users all necessary resources and performances, which refers to an user-friendly mobile application, using web services, QoE evaluated referring the quality of the graphical user interface, efficiency and time saving, enabling Cloud connected experience possibility.
Keywords- Android Web application development; insurance companies; salary calculation; Mobile marketing; Quality of Experience (QoE)

1. INTRODUCTION

Android is an open source and its code is released under the *Apache License* which allows the software to be modified and distributed by device manufacturers, wireless carriers, as well as individual users [8][9].

The history of *Android* raises through some versions*: 1.0, 1.5, 1.6, 2.0, 2.1, 2.2, 2.3, 3.0, 3.1, 3.2, 4.0, 4.0.3, 4.0.4, 4.1, 4.1.1, 4.1.2, 4.2, 4.2.1, 4.2.2, 4.3, 4.3.1, 4.4, 4.4.1* and *4.4.2*. In this work we've chosen *Android 4.0* because it provides new graphical interface, there is *security* concept improvement and it involves the cloud environment connection. One of the main features of *Android 4.0* is the new *connected Cloud experience, Android Beam, refined UI*, security for applications, content and enhancement for enterprise (*VPN client API*). The design of this application is developed consistently with the new *refined UI* which allows easier usability and easier transition of the salary calculation. This application is connected to the *Web server* which allows dynamic download of the necessary information for calculation of the salary. The features of this application are described in the third section of this work.

In the next section of the paper performed tests and results are presented, continuing at the fifth section of this work with *Quality of Experience (QoE)* evaluation concerning mobile computing. This paper's original approach for managing the documentation of insurance companies provides saving time, energy and money. It provides comparison to previously developed *Android* applications and gives the reasons why this application is more suitable for usage. This work provides the features of the application and how they can be used. The results of the tests done to the application are presented. The conclusion and our concept for working on this type of application are given. The *Cloud connected experience* allows the users to synchronize: photos, e-mails, applications and contacts [2]. *Android 4.0* provides easier implementation of the applications to manage the authentication and the *secure session* [2]. One of the important security features is that *Android 4.0* allows encrypted storage and remote data deletion [2]. This feature is the most helpful when the device is lost. The last feature of *Android 4.0* is the Enhancement for enterprise (*VPN client API*), this features allows us to construct the application to configure the addresses and routing rules, process outgoing and incoming packets and establish secure tunnels to remote server. This feature allows the application to be configured with *centric networks*. The main point of this application implementation is the usage of *Web services* and *Cloud Connectivity* which is going to provide better performance and possibility for calculation of the salaries for insurance companies having thousands of employees. By using the *Cloud Connectivity* possibility, the application is going to result in saving energy, time and money to the institutions and numerous users, stated in the conclusion and future work

concepts of the paper. *Mobile marketing*, as *app-based marketing*, with the increasingly widespread use of smartphones, also greatly increased. Therefore, mobile marketers have increasingly taken advantage of smartphone apps as a marketing resource. This allows direct engagement, payment and targeted advertising [14].

2. RELATED WORK

The *Android* market offers applications giving the users great choice, but not each of them provides excellent quality to the user. There are many applications that have great marketing characteristics, but poor performances in terms of usability and efficiency. On the Android market there can be found several applications for calculating the salary [10] [11] [12]: *Salary Bot by CAB Designs, Paycheck by Green App Developer, Quick Wage by CWE Software LLC*. Testing and analyzing these applications, *Salary Bot* [10] has the best performances among three of them, which allows the results to be broken yearly, monthly, weekly, daily and hourly data, so the design is much better than the other two applications. The common feature of these applications is the calculation of the gross salary with the additional work of the user. The *Paycheck* application [11] has simple and old design which is not consistent with the updates of Android and it provides approximate calculation of the salary. *Quick Wage* [12] allows the user to calculate the salary according to the wager, it also has old design which is not consistent with the Android updates and provides yearly, monthly, weekly, daily, hourly salary calculation, providing several years' salary calculation. The disadvantage of *Quick Wage* is that it has approximate calculation of salary.

The applications already developed allow the user calculating the salary according to user's gross earnings, but the gross earnings must be also calculated. The application that we decided to develop allows *Web* integration which gives the user easier way to calculate the salary. The user doesn't need to have previous knowledge how to calculate the salary. This application is mainly developed for calculating the salary of the Insurance Company's, but it can be easily adjusted to other companies as well. It is user-friendly, web integrated mobile application, and its structure is presented more detailed in the next section.

3. CHARACTERISTICS OF INSURANCE SECTOR IN THE FYROMACEDONIA

Insurance sector in the FYROMacedonia is very important for economy and as a part of financial sector, it's crucial for the development of total economy in the country. Main characteristics of insurance sector in the country are emphasized through many offered possibilities for improvement. Insurance is multidisciplinary discipline-economic, law and mathematical. From the law point of view, it is contract and part of Civil Law and Law of obligations [16] [17]. Mainly, it is regulated by four Laws: Law for supervision of insurance, Law for obligations, Law for obligatory insurance in traffic and Law for trading companies.
At the end of *2012*, there are *15* insurance companies in the country operated in the insurance market, out of which *11* are concerning non-life insurance and *4* are dealing with life insurance. The number of insurance brokerage companies is *20*, and the number of insurance agent companies is *10*. Considering the analysis per insurance segments, the total non-life insurance segment covers *92 %* of the insurance industry and life insurance segment covers *8 %* [14]. In *2012*, the *Gross Written Premium (GWP)* of the insurance market reached the amount of almost *120* million euros, so the possibility of development is quite big. Under some estimation of relevant world institutions, capacity of Macedonian insurance sector has to reach almost *500* million euros, which shows that this sector and its employees will grow, as well as the salaries and payments will be increased. That's why all relevant Android web applications are developed leading to easier, more effective and faster mode of performing this activity.

4. ANDROID APPLICATION

UniSal Android application is created to help Insurance Companies mostly to calculate the salary in user-friendly and efficient manner. The necessary information for calculating the salary is downloaded from the *Web server* and parsed into usable information within the application (Figure *1*). The information for calculating the salary is stored into *MySQL* database which is stored into the *Web server*. For the future development this application is going to give the *Cloud experience* to the user, so the application will be used by thousands of employees. The application is calculating the gross salary based on monthly data for each employee in the institution, as well as on the basis of the prescribed rates and monthly average salary in our country. The variables for calculating the Gross salary *(GS)* are given as follows: *Net salary (NS), Personal Income Tax (PIT)* and *Contributions (C).* The equation for calculating gross salary is [6]:
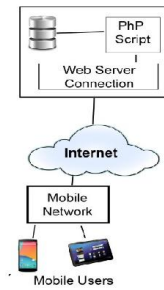
$$GS = NS + PIT + C \qquad (1)$$

Figure 1: System architecture for mobile computing using Web services

The category of salary is determined according to the Law, the collective agreement and the employment contract. In order to calculate the salary, it is necessary to submit the data for its calculation to the salary referent in charge of data entry on the part of the authorized departments and managers in the firm. For calculating the salary the insurance company also has to calculate the personal income tax and the contributions. To calculate the amount of personal income tax and salary contributions starting from the 1st of January *2009*, the rate of the personal income tax in the taxation of salaries is *10%* regardless of the amount of the employee's salary [24]. Thereby the basis for the calculation of the personal income is the basis for the calculation of contributions (gross salary), diminished for the total amount of the contributions and the personal exemption determined in monthly amount [6]. The variables for calculating the *Basis for personal income tax (BPIT)* are: *Gross salary (GS), Contributions (C) and Personal Exemption (PE).*

$$BPIT = GS - C - PE \qquad (2)$$

Contributions are calculated according to the rates determined into the Law regulations of the country. The rates for the contributions are given [4] [5] [22] [23]. The total sum of contributions for *2013* is described as (TSC). Contributions for calculating the salary are presented as follows: *Mandatory pension and disability insurance PDI 18 %; Mandatory health insurance 7,3 %; Mandatory insurance in case of unemployment 1,2 %; Additional contribution for compulsory health insurance in case of injury at work and occupational disease 0,5 %.*
The equation (3) represents the way of calculating the Gross salary of the employer [7].

$$GS = \frac{NS + ((NS - PE) \times 11{,}111111\ \%)}{0.73}$$

$$(3)$$

$$*0{,}73 = \frac{100 - TSC}{100}$$

The Android application *UniSal* is connected to remote database (*MySQL*) and all required information for salary calculation is stored into the database. The information retrieved from the database is *JSON* code which is parsed when it is received into the application. Before it is parsed, the *JSON* code is received as a *JSON* Array and then each Object is accessed separately. All the values that are received from the database are stored into the Android device and are used for offline calculation of the salary. The *MySQL* database is saved into *Apache 2.0 Web Server* with *PhP 5 installation*. The *PhP scripts* are very important for this application, because the Android application does not need to have authentication information with the *MySQL* database. This provides *secure communication* between the *Android* application and *MySQL* database because all the information for authentication with the *MySQL* database is stored into the *PhP* scripts which can be accessed only from the server. When the Android application makes *Http Post* request to the server, the server executes specific script for returning the *JSON* code to the Android application. Once the application is launched, it checks the contributions on the remote server. If the *Android* device is connected on the *Internet*, the values for the contributions are downloaded automatically and stored into the device for offline calculation of the salary. The values are downloaded by sending *Http Post* request to the server. The remote server holds *PhP* script for sending the values from *MySQL* database to the Android device. The script authenticates with the *MySQL* library and queries the values. Once the values are queried, they are parsed into *JSON* code and the code is sent to the *Android* device. When the *Android* device receives the *JSON* code it is parsed and the values are saved into *xml* file for offline calculation of the salary. The Settings panel is also available and allows the user to change the contribution values manually. Due to improper changes into the Settings Panel the application is not going to calculate the proper value of the salary for the employer. For this case scenario the application generates error log holding the error values for the contributions. The error log is displayed to the user when he/she wants to calculate the salary. When the user presses the

"Calculate" button the error log is displayed. The error log holds the exact contribution value which has error i.e. a value which is not reasonable for calculating the salary of the employee.

If the user wishes to calculate the salary for the insurance employee, he/she has to open the options menu on the *Android* device and tap on "Insurance Company Salary". When this option is selected the application is going to launch the Activity for calculating the salary for the insurance agent. The salary for the insurance agent contains the following *Android* components: *EditText, Button, CheckBox* and *TextView*. The *EditText* is used for entering the amount of sold policies, the *Button* is used for calculating the salary for the insurance employee, the *CheckBox* is used to determine whether the insurance employee has been on sick leave and the *TextView* is used to display the information of the salary. The information for the basic salary and the percentage gained from the soled policies is downloaded from the *Remote Web Server*. Once this information is downloaded is stored into the *Android* device of the user for offline calculation of the database. The administrator of the *Remote Web Server* can change and update the information of the employee for calculation of the salary. If the *CheckBox* is checked the salary of the insurance employee is going to be calculated *70%* of his basic salary.

5. TESTING AND RESULTS

The application testing is performed in a couple of steps: testing the Gross and Net salary, testing the Settings Panel, testing of Insurance companies' staff salary. For the gross and the net salary we have applied the test scenarios - how the application responds when there is not active Internet connection, how the application responds when *0* is entered as a value and the last test is how the application responds when negative button is returned as a value. For the first test scenario we have entered gross salary which is below the minimum gross salary determined by the Law regulations. The result is given when the application is notifying the user that the employee needs to enter salary greater than the minimum salary - the result is the same when the user enters *0*. Of course, the user can enter only positive numbers. In the next test, we have left the field for the salary empty and tried to calculate the salary. When "Calculate" button was pressed the application responded with a message that the user has to enter salary. If the user is trying to download the data from the *Web server* when there is no Internet connection, the user is going to receive notification that there is problem with the Internet connection. The same test scenarios were applied for the net salary. The difference between these two types of salaries is the minimum salary determined according to the Law regulations. This test is used to determine whether the user has made any mistake inserting the values for the contributions when there is no internet connection. The information for the contributions which is downloaded from the *Web server* is updated according to the Law regulations and the application is updating accordingly. When the user is unable to connect the Internet and there is a need for calculating the salary urgently, the user can enter the values for the contributions manually. When the application is performed by the user, the latest values for the salary contributions are already inserted. This scenario gives the result when the user has made mistake entering the contribution values. Figure *2* presents the result when the user has made mistake entering the values manually. This type of error dialog is only generated if the user has entered value below zero, value above one hundred and instead of number has entered alphabetic character.
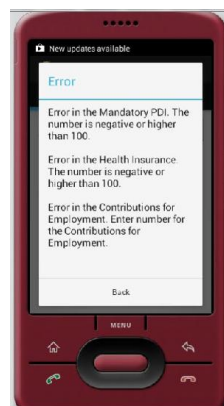

Figure 2: Settings Panel test result

This test is performed to determine whether the information is successfully downloaded and the salary is correctly calculated. When the Activity for the *Insurance Company Salary* is launched the necessary information is downloaded to the Android device, once the information is downloaded to the Android device it is stored for offline salary calculation. If the user is not connected to the *Internet* a message is going to be displayed to the user. The other test done to the application is to check whether the salary is correctly calculated. If the user enters zero as a value to the soled policies the application is going to display message to the user that the policies number must be larger than zero, also If there is mistake into the downloaded information, the application is going to display message to the user to contact the

Administrator for further information. If the user has checked the CheckBox and pressed the "Calculate" button *70%* percent of his basic salary is going to be calculated, according to the Law regulations. Insurance companies' employees, agents and brokers need fast, exact and efficient information about their salaries because they work on terrain. Their work is stressful and their decision should be brought in short time – they need to think fast and to know how much money do they earn with each concluded contract and policy [16].

6. QUALITY OF EXPERIENCE FOR MOBILE COMPUTING

Quality of Service (QoS) refers to the technical operational aspects of a service such as time to support services, capacity, transport. *Quality of Experience (QoE)* measures the difference between what users expected and what they actually received. Using the *QoE* is beneficial to estimate the perception of the user about the quality of a particular service and it depends on customer satisfaction in terms of usability, accessibility, retain ability and integrity of using specific service [13]. *QoE* means overall acceptability of an application or service, as perceived subjectively by the end-user and represents multidimensional subjective concept that is not easy to evaluate. In our work we've used *QoE* evaluation in order to measure the quality of mobile application usage.

The results presented on the following Figure were obtained according the Quality of Experience evaluation performed with the Insurance Company. The application is tested and evaluated by different scenarios. The survey questions were answered by a group of *47* insurance companies' employees – agents, brokers of different significant Insurance Companies from our country, that participated in the *Android* application implementation locally (*UniSal*) and using Web services (*UniSal Web*) as well. Analyzing the answers from the Mobile application implementation using *Web* services has provided with the summary given in histogram presented in Figure 3. The first concept evaluation was the quality of the *Graphical User Interface* of the *Android* application. From the observation the following things can be concluded: *85 %* of the insurance staff concluded that the graphical design of the *Web* application was *Android* consistent and easy to use; they were supportive for the design of the application. The second evaluation concept was Usability of the Android application. As presented in Figure 3, *90 %* of the insurance companies' employees concluded that the application is very efficient and usable because it is *Web* based application and all necessary information for calculating the salary is downloaded automatically. The third evaluation scenario was concerned with the Efficiency and Time Saving - *85 %* of the Insurance companies staff concluded that by using this application time is saved when calculating the salary, because all the information is downloaded from the Internet, so energy, time and money are saved, it is an efficient mobile application, while *64%* were declaring the efficiency of *UniSal Android* Application which is not *Web* oriented - *96 %* of the insurance companies' employees concluded that it is easy to focus to the web oriented Android application, while *45 %* were focusing on the *UniSal*, local application. Most of the users were satisfied with *Web* oriented mobile application, its usability, efficiency, availability referring to the *Web services* users and of course, *Cloud connection possibility* providing to the application.
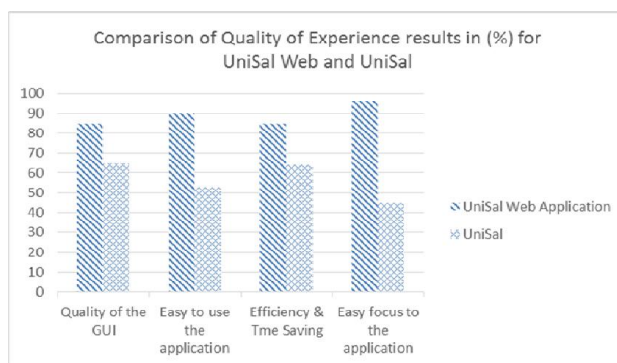

Figure 3: Comparison of QoE results in %

7. CONCLUSION

The *Android UniSal Web application,* divided in two sections for calculating the Gross and the Net salary for the Insurance companies' staff, has the functionality that allows the user updating the contributions if they have been changed according to the new Law regulations. Insurance is very significant part of the finance sector and the overall economy of every country, these modern tools help in its further development. To ensure that the application is working according to the inserted parameters the application has passed couple of tests scenarios - tests *Insurance companies staff* gross and net salary calculation, tests for Setting Panel and the menu of contributions, entering unreal numbers in order to check whether the application will accept the inputs or it will generate error log to the user. The *mobile web application* presented in this work, as mobile marketing innovative tool, proposes original, efficient way of managing

the documentation in an institution. There are numerous advantages to using *Mobile Marketing (MM)* and many people are still not aware of the potential benefits it creates: *MM* Creates a personal connection with the audience, it is highly affordable; *MM* creates brand awareness, building consumer relationship and attracting potential customers. Our approach improves the *Quality of Experience (QoE)*, provides the users all necessary resources and performances, which refers to a user-friendly mobile application, web services oriented, evaluated by *QoE*, referring the quality of the *graphical user interface, usability, efficiency and time saving*. Observing the *QoE* survey results the advantages from using this application have significantly increased users attention. Possibility of *mobile computing* technology has provided improvement in the process of *Android web application* development, in the direction of increasing the quality of services. These web based configuration of mobile applications will be especially beneficial for insurance companies, their staff, by promoting the advantages from using such an application in terms of saving energy, time and money. The employer who is using the app can set a security lock from his face and he will be the only person who can load the application calculate the salary, analyze the work of the employee and much more. This mobile application will be easily considered as an adjustable content for *Content Centric Network (CCN)* and *Information Centric Networks (ICN)* approach, aiming to achieve efficient & reliable distribution of the content by providing general platform for communication service. As mobile marketing has become most popular, some mobile advertising is sent without a required permission from the consumer causing privacy violations. The privacy issue became even more salient as it was before with the arrival of mobile data networks. A number of important new concerns emerged mainly stemming from the fact that mobile devices are intimately personal and are always with the user concerning mobile spam, personal identification, location information and wireless security. The presence of mobile phone users could be tracked in a privacy-preserving fashion, which will be the future work issue.

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