

IVU Lotto Application

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Abstract — Today the people of Puerto Rico fail to participate in the system of the IVU-Lotto because they say that it is tedious and complicated. There is a need to have an application that offers a simple way for the corroboration of the winning numbers in the draw of the IVU-Lotto. This project tries to meet this need using mobile technology. The developed system is an Android application that offers a simple alternative to the people of Puerto Rico for the option to process their search of winning numbers and register the IVU-Lotto Number to participate in the draw.

Key Terms - Ordering, Speed, Time Waiting and Winning Money.

INTRODUCTION

This paper consists in providing a more effective method for the people of Puerto Rico to verify the IVU-Lotto number, create a greater participation in the IVU-Lotto draw and increase the tax revenue for the government of Puerto Rico. The purpose of this draw is to oversee those businesses that are evading taxes.

The project is organized by describing the problems of the IVU-Lotto system, offering recommendation to reach a solution. This works will present the goals to achieve, the critical points in the programming and the areas to focus in the solution for the project. Included are the steps related to development, following the methodologies, strategies, patterns of design and architecture learned in the Master's Program in Software Engineering.

The Department of the Treasury of Puerto Rico hereinafter referred to as "Hacienda". Hacienda has more than 2.7 million dollars in accumulated IVU-Lotto prizes that winners have not claimed [11]. The current model of the IVU-Lotto has not had much

success with the Puerto Rican consumers since they have not claimed IVU-Lotto prizes. The reasons are that they do not carry with them the receipts of the numbers that would be playing nor check the winning numbers to verify if any of them are in the winners list provided by Hacienda. This fact undermines the purpose of the system, which is that the consumer claims a receipt for payment of the IVU, thus forcing all retailers to charge the tax. In this way Hacienda collect taxes paid by taxpayers in acquiring consumer goods and services.

Figure 1 presents that there are 1,705 prizes in money issued by Hacienda of which only 431 prizes have been claimed, which is a total of \$706,500, representing 25% of the totality of the awards [7].

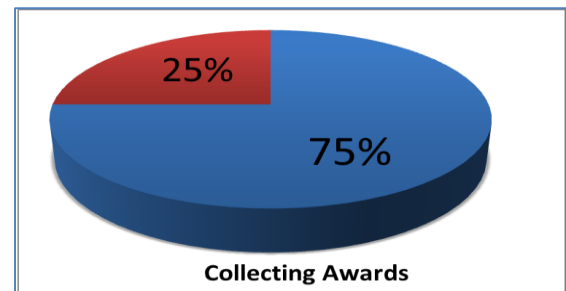


Figure 1
Prizes claimed and not claimed by Hacienda

According to the economist Mr. Juan Lara "It is clear, after two years of experience, that the IVU has been a disappointment. That it has not worked as intended. It has not been an efficient and effective tax as it was thought to be when it was designed. The lack of effectiveness of the IVU has led the Government to implement modifications in order to make it work, which have become patches" [10]. The IVU has problems not only of revenue collection, but also regarding its design. The design problem resides with the exclusions and exceptions inherent of the system. The IVU-Lotto problem is that it is a system that is

complex to merchants and not necessarily attractive to consumers.

The Industrial Association and the College of Certified Public Accountants have made a series of proposals and suggestions to the Legislature during public hearings. They presented the possibility that the puertorrican consumer while making purchases can receive the prize granted by the IVU-Lotto system. Using this system the consumer would know instantly that his receipt is a winning ticket in the lottery. The College of Certified Public Accountants also suggested the possibility that instead of having \$25,000 awards; \$1,000; or \$500 in each draw, the legislature could evaluate the possibility of awarding smaller prizes with immediate gratification for the consumer and perhaps even for the merchant. That is, many prizes of \$50 and \$25, by issuing a certificate of receipt instead of the number of the IVU-Lotto, so the merchant can automatically pay the prize immediately [11].

The main problem is that at the moment the Government of Puerto Rico is undergoing an economic crisis and to carry out these ideas or solutions will negatively impact the budget of Hacienda. Solutions such as this would have a large impact on programming and computer systems operated by the firm Evertec. When we talk about a large impact, we mean time of development and testing, which translates into significant monetary costs. On the other hand, the consumer currently needs to have a more efficient and effective way to claim prizes and thus participate in the lottery. Having achieved this, the consumer will be more interested in the collection of the IVU tax and in overseeing those businesses that are not paying the IVU to Hacienda so that they may be subjected to the applicable penalty for noncompliance.

The objective of this project is to provide a short term, cost effective solution to solve the IVU evasion problem for Hacienda and to provide a method to motivate consumers to actively participate in the drawings for the IVU-Lotto. This research is based on a search in gathering information for the development of a mobile application which will compile

the information of the sales receipt in a simple way and in a single step.

In accordance with this development the consumer, when they offer him the receipt of purchase, he takes a simple photo with his mobile phone and the application will do the rest. This includes the registering of the IVU-Lotto number with Hacienda and information of the merchant. If the number is a winning number the consumers will be notified by email, text message or by notice on the cell phone. Otherwise the non-winning number will be stored for future drawings.

Given the grand acceptance and demand in the use of mobile equipment the island of Puerto Rico, the proposed application will be developed for a mobile platform. The developed system is an Android application. First, you will be asked for username and password to be able to connect to the database of Hacienda. We must have an API to perform the connection with Hacienda.

Second, the application has the option of a photo entry, to capture the number of the IVU-Lotto, natively by your Android device and store it in our database. We then process the image using the tesseract ocr libraries. Tesseract is a library open to an OCR (Optical Character Recognition) that can read a series of images in different formats and different languages [5].

After acquiring the image of the receipt and being processed by OCR, we can capture the word IVULOTO. Within this processing we can acquire information of the draw date and number of the IVU-Lotto. With the link that we have with Hacienda database and with the number of the IVU-Lotto, we can obtain the date and location where that ticket was purchased.

The application will internally store the information of the IVU-Lotto, the business where the receipt was obtained, the location of the business and the draw date. The application will have a control, which is refreshed every 8 hours, with a functionality check to verify the IVU-Lotto numbers and draw date with the database that has been stored within the award-winning lottery numbers.

IVU-LOTTO

On 4 July 2006, the Legislative Assembly of Puerto Rico approved law No. 117, known as "2006 Tax Fairness Act", on the grounds that a general tax on broad-based consumption and income tax revenues are complementary. This law allows the State to reduce the income tax insofar as the universe of contributors increases with the consumption tax. Thus this would bring those taxpayers which were not previously contributing to the tax contribution system [12].

With this new system, it was felt that they could increase the revenues of the State Exchequer funds, which in turn would it make possible to pass additional legislation to reduce the burden on employees, as a result of the payment of income taxes. The implementation of a tax on consumer products and services (IVU in Spanish) has the purpose that it is simple, efficient and broad-based. The IVU must be collected and forwarded to the Secretary of Hacienda by merchants of retail products. However, at present Hacienda receives only around 52% of the IVU consumers pay. To address that problem, Hacienda created the program of IVU-Lotto, to ensure that merchants deliver the amount collected by the concept of the IVU tax that is charged to the consumers [1, 2].

IVU-Lotto uses the electronic media that is already installed in participating establishments, which operate as fiscal terminals. Not having the technology, Hacienda is responsible for installing a fiscal revenue terminal in the business, which will be connected to Hacienda and report the amount of sales, as well as the IVU that is charged to the consumer. In addition, in the receipt of purchase, a number will be provided that will allow the consumer to participate in the lottery of IVU-Lotto.

IVU-Lotto is a program used to audit tax revenue in the sale of consumer products and services (IVU). In this program, the consumer is the main component for the collection of the IVU tax, since he will require a proof of purchase, which will have a number that will make him eligible to enter a lottery. This will ensure that the IVU is paid, if applicable, and the

sales are reported to Hacienda. The receipt makes eligible consumers participate in the IVU-Lotto lottery.

Figure 2 shows the characteristics of the receipt that is composed by principal line (IVULOTO Number and DRAW information) [4].

<p>Line 1: IVULOTO: XXXXX-XXXXX,</p> <ul style="list-style-type: none"> • Number of the IVU-Lotto which will include letters and numbers. The letters will not be used "O" or the "I", to avoid confusion with the numbers zero and one. <p>Line 2: DRAW999 DD/MMM/YY XX</p> <ul style="list-style-type: none"> • XX - Code that will identify the processor where the transaction was made and IVU-Lotto number generated. • DRAW - Text Characteristics to identify the number of the draw which will be presented in the next field • 999 - Draw number • DD/MMM/YY - Draw date 	<div style="text-align: center;"> <p>Colmadito de Juan 780 Calle Fernandez San Juan, 00907 787-755-5555</p> </div> <table style="width: 100%; font-size: small;"> <tr> <td>DATE</td> <td>TIME</td> <td>HOST</td> </tr> <tr> <td>Aug 22, 2011</td> <td>19:52:00</td> <td>ATH</td> </tr> <tr> <td>BATCH</td> <td>TERMINAL</td> <td>Merchant ID</td> </tr> <tr> <td>000501</td> <td>10492042</td> <td>37628630723</td> </tr> </table> <p style="text-align: center;">SALE</p> <p>VISA *****3421</p> <table style="width: 100%; font-size: x-small;"> <tr> <td>Amount</td> <td style="text-align: right;">\$10.00</td> </tr> <tr> <td>State Tax</td> <td style="text-align: right;">\$0.55</td> </tr> <tr> <td>Mun. Tax</td> <td style="text-align: right;">\$0.15</td> </tr> <tr> <td>Total</td> <td style="text-align: right;">\$10.70</td> </tr> </table> <p style="background-color: yellow; text-align: center; font-weight: bold; font-size: small;">IVULOTO: 5A621-HMJKP</p> <p style="text-align: center; font-size: x-small;">ET DRAW 040 AUG/27/11</p>	DATE	TIME	HOST	Aug 22, 2011	19:52:00	ATH	BATCH	TERMINAL	Merchant ID	000501	10492042	37628630723	Amount	\$10.00	State Tax	\$0.55	Mun. Tax	\$0.15	Total	\$10.70
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Mun. Tax	\$0.15																				
Total	\$10.70																				

Figure 2
IVU Lotto Characteristics

The IVU-Lotto works using electronic media which already exists in retailers with outlets, once these are certified by Hacienda to operate as a fiscal revenue terminal. In other cases, Hacienda installed a fiscal revenue terminal according to the needs of the business. These terminals are connected to Hacienda and report the amount of the sale and the charged IVU. In addition, it issues a sales receipt with a numbering which involves participation in the draw of IVU-Lotto.

Currently within the website of IVU-Lotto by Hacienda there are 228,634 registered users for the draw. The company in charge for the lottery is Scientific Games. They manage and control all purchase transactions that generate the lottery drawing algorithm. Evertec functions as an entity for data gathering from the different stores and serve as a certifying body for those businesses (generally large chains) that emit their own combination of IVU-

Lotto. According to the data of Evertec, there are 62,566 shops that feature the fiscal apparatus of the IVU-Lotto, while 32 large chains as Walgreens, Sears, JCPenney and Home Depot generated their own combinations without having Evertec or Softek - also hired by Hacienda - to intervene. These commercial entities reported trades of a weekly average of 18 million transactions that generate code for the draw of IVU-Lotto, weekend days being of greater incidence in the businesses [9].

As part of the progress of IVU-Lotto in Puerto Rico, the Secretary of Hacienda presented the new selective options of the website of this program. Among these stand out that consumers can now verify their receipts online and the list of businesses that are already participating in IVU-Lotto, which are divided by municipality.

ANALYSIS OF RESEARCH METHODS

Currently the problem is that the citizens of Puerto Rico need an application that offers a simple way for the corroboration of the winning numbers in the draw of the IVU-Lotto.

The impact is the citizens are not participating in the draws and are not claiming the prizes. The people of Puerto Rico are not giving it the importance it deserves. The main purpose is to report those tax evaders. The benefits of solving this problem are that the people begin to participate in the raffle to win prizes and to monitor that tax evaders. The government of Puerto Rico tried without success to make a good publicity about the price of the draw, but for now it doesn't work. If the problem is not corrected, the people stop demanding the prizes and the draw stop participating therefore not report the trade tax evaders and not report the sales and use tax to Hacienda. The consequences are many, but usually without funds or contributions are collected, have a huge economic impact in the country's economy.

As the goals of the study are addressed in the research and we have as goals the use of knowledge gained mastery in order to achieve the objectives and goals. The research adds to it based on my knowledge, because in order to meet the goals will be

implementing technology based mobile applications platform. Where internally interacts with a database designed to store images and data also follow a number of patterns of object-oriented design.

The project would continue with the use of the existing island wide infrastructure electronic machines, in a more agile manner, such that the transaction can be simultaneous and the consumer will obtain a single receipt. The big difference is that we are taking into account the sales amount and tax collection at the same time when the consumer makes the payment.

Today the Government of Puerto Rico is going through a period of economic crisis; therefore you have to oversee the budget of the Government with greater wisdom. The Government of Puerto Rico and Hacienda know that this country is a country that loves the game of chance and offers an opportunity for the people to earn a few extra dollars while observing and reporting those businesses that are taxes evaders this is why the idea of the IVU-Lotto was implemented for business our island. The ideas that are being suggested are effective and ideal, but to be able to implement these ideas, there is an impact on the architecture and design of the electronics of the system. The system will suffer an economic impact in times of economic crisis. Hacienda should not complicate matters for the merchants by revising the system, since their main function is to control those businesses that are tax evaders.

The project in the short term solution will minimize or not impact the structure and design of the system and therefore has not impacted the economy of Puerto Rico. The development of a mobile application is proposed where its main function is to record the numbers of the IVU-Lotto acquired from the receipts of purchase in the most easy, simple and effective way. The application will have the option to register the user directly with Hacienda by recording the number of the ticket generated by the receipt of the draw into the database of Hacienda with a simple picture of the receipt. This number will be stored in a database of the application to verify if the number is a winner for the draw date. The application will advise you through e-mail, text message or alert on

the cell phone if your number is the winner, either at the time of registering the ticket or in future draws.

DESIGN

The project uses the systems development life cycle (SDLC) methodology, also referred to as the application development life-cycle. This is a term used in systems engineering, information systems and software engineering to describe a process for planning, creating, testing, and deploying an information system. The SDLC concept applies to a range of hardware and software configurations, which are composed of a number of clearly defined and distinct work phases which are used by systems engineers and systems developers to plan, design, build, test, and deliver information systems [3].

Figure 3 presents the five phases of our SDLC (Requirement Analysis, Design, Implementation, Testing and Evolution).



Figure 3
Software Development Life Cycle

In our first phase of the SDLC we create our analysis that contains the requirement of the application. Those requirements are divided into functional and no functional requirement, development, testing, documentation, and technical support requirement.

In our second phase of the SDLC we designed our system according to our analysis. We divide our design into Design Consideration, Architecture, Database, Communication and Diagrams. In our Implementation we used ADT tools and Java to

develop our design and once we finished our development we moved to the testing stage to correct our program. When we finish the testing phase we have to maintain our system just like the evolution of the system.

Design Consideration

The design considerations and is divided as categories, which we focus on the general limitations which are:

Software Environment

- **Android Development Tools:** The project use (ADT) Android Development Tools, which is a plugin for Eclipse IDE to build Android projects.
- Use **SQLite**, which are a data repository and database. This will hold all system data.
- Use **Tesseract**, which are an OCR Library open source.
- Use **KitKat 4.4 Android OS**, which is the Operating system.

Hardware environment

- **Mobile Environment:** The project uses an Android 4.4 KitKat. This operating system has been designed to run fast, smooth, and responsively not only on high-end devices, but also on entry-level ones that have as low as 512MB of RAM.
- **PC Environment:** ADT System requirements: Operating systems Windows Me, Windows 98, Windows 95, Windows 2000, Windows Vista, Windows XP, and Windows NT. In additional requirements Eclipse 3.3+, File size 3.09MB.
- **Availability:** The System will be available 24/7.
- **Data repository and distribution requirements:** SQLite Is a Database that will hold all system data.
- **Performance Requirements:** The system will be designed for use by a lot of user to request an OCR and use the Hacienda API.

Architecture

The system has an Android Architecture Framework for main programming language. This

was chosen due to the development experience and expertise in this product to be able to generate a product as quickly as possible. Figure 4 shows a conceptual diagram of the android architecture that is divided into Application, Application Framework, Libraries, Android Runtime, and Linux Kernel Layer.

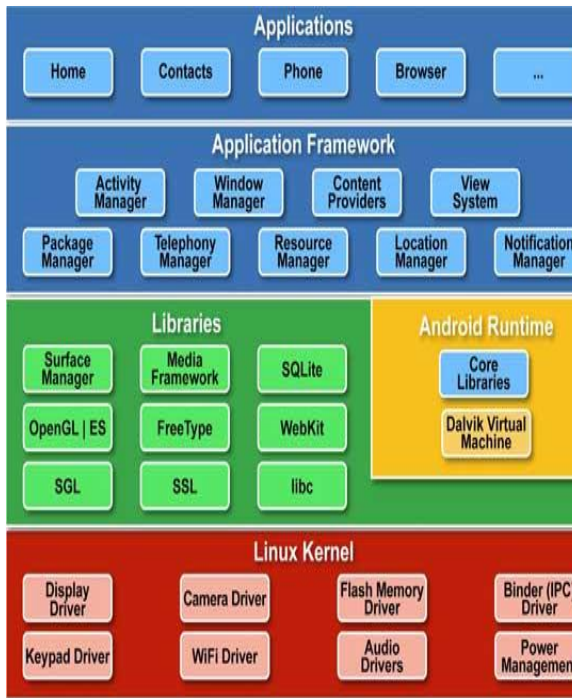


Figure 4
Android Architecture

Database

The development of the database is in SQLite Database. This database was chosen because it is an Open Source; it can reduce the cost of the project. The ERD of the database was designed in order to understand the relationship between each of the tables (Figure 5).

The database is composed of five tables:

1. **User:** This table will contain the information to authenticate the application user.
2. **Receipt:** This table will contain all information about the receipt.
3. **MyNumber:** This table contains all stored IVU-Lotto number entered by the app.
4. **Photo:** This table contains all the image information captured by the app.

5. **Store:** This table contains the information about the shop where the sales receipt is generated.

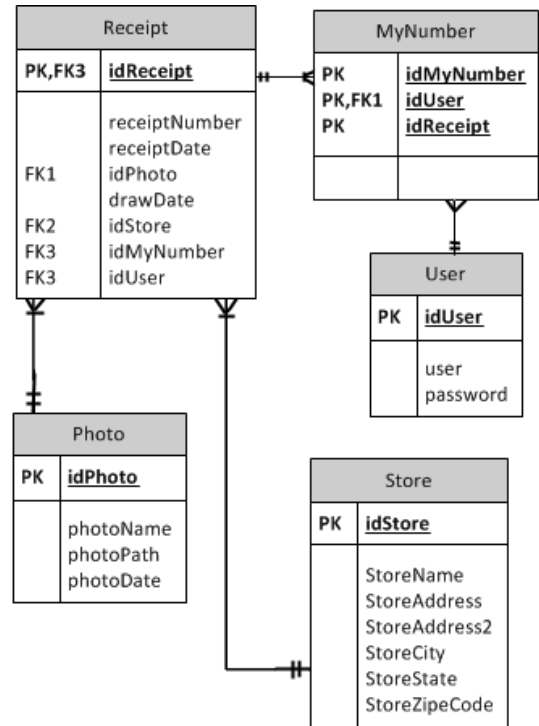


Figure 5
Database ERD

Communication

Communication mechanisms -The system will use the internet to communicate with Hacienda's server and use the internet to connect an email service.

Diagram

Figure 6 shows our conceptual architecture diagram:

1. **Presentation:** This layer contains all the android activity of the project (mobile page screen), and is the user interface for user interaction.
2. **Business Logic:** This layer contains all the business logic to perform the process of the system, like security, API, and other services.
3. **Data Logic:** This layer contains the database logic where the data is stored and is a very important aspect of this system.

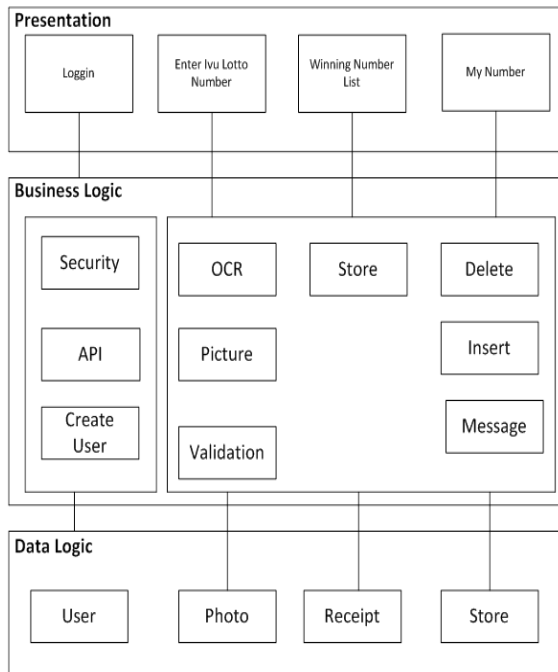


Figure 6:
Ivu-Lotto Architecture

TOOLS

This project uses an Android Development Tools (ADT), which is a plugin for the Eclipse IDE that is designed to provide a powerful, integrated environment in which to build Android applications [8].

ADT extends the capabilities of Eclipse to quickly set up new Android projects, create an application UI, add packages based on the Android Framework API, debug your applications using the Android SDK tools, and even export signed (or unsigned) .apk files in order to distribute your application.

We use SDK Tools component for the Android SDK. It includes a complete set of development and debugging tools. We use Build Tools which is a component of the Android SDK required for building Android application code. The latest version of these tools is included in the SDK starter package and installed in the <sdk>/build-tools/ directory [8].

Build Tools component should be updated by downloading the latest version using the Android SDK Manager. If your projects depend on older versions of the Build Tools, the SDK Manager allows

you to download and maintain separate versions of the tools for use with those projects

- Using Eclipse
- Using Android Studio

SCREENSHOT

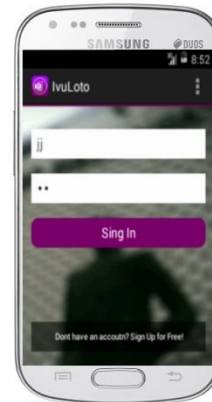


Figure 7 (a)
Logging View

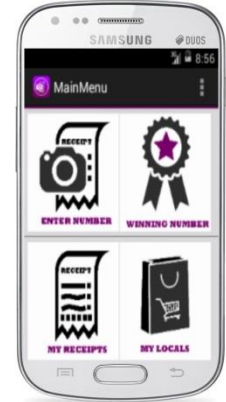


Figure 7 (b)
Main Menu View

Figure 7 (a) shows the User and Password page. It is a login which refers to the credentials required to obtain access to a system and restricted area.

Figure 7 (b) shows the Main Menu view, represented by the icon: enter the number of the IVU-Lotto, the winning number lists, personal number list and more. The consumers can check their own IVU-Lotto number in the IVU-lotto number lists options.

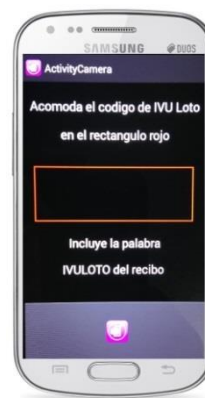


Figure 8 (a)
Enter Number View



Figure 8 (b)
My Number List View

Figure 8 (a) shows the Enter Number View. This view captures the number of the IVU-Lotto, natively by your Android device and stores it in our database

and then process the image using the tesseract OCR libraries. After acquiring the image of the receipt and being processed by OCR, we can capture the word IVULOTO. Within this processing we can acquire information of the draw date and number of the IVU-Lotto. With the link that we have with Hacienda database and with the number of the IVU-Lotto, we can obtain the date and location where that ticket was purchased.

Figure 8 (b) shows MyNumber View. In this view you can check all the number entered in the application. It will be provide all information about the receipts.



Figure 9
Winning Number View

Figure 9 shows the Winning Number View. This view contains all information about the IVU-Lotto draw. You can check the winning number by the day draw.

TESTING

The Iteration Test Plan is to gather all of the information necessary to plan and control the test for a given iteration. The approach to testing the software is the top-level plan generated and the steps used by the tester to direct the test to:

1. Test for the IVU Lotto App identifies the items that should be targeted by the tests.
2. Identify the motivation for and ideas behind the test areas to be covered.
3. Outline the testing approach that will be used.

4. Identify the required resources and provides an estimate of the test efforts.
5. Define test tools to be use and the appropriate environment.
6. Lists the deliverable elements of the project.
7. Detail the activities in relation to each test.
8. Test the application delivered by the developer.
9. Identify and test about security issues.
10. Identify the minimum resource for the test about operating system and hardware architecture.

TESTING RESULTS

Figure 10 shows the results of the test composed of the login, create user, add number and scanning number. The login test results, in February, show how the error was resolved. The test results for the create user was resolved in March and add number function result in April. For the scanning number, the result shows that the OCR has some recognition issues when trying to identify each letter. The OCR (Tesseract) can be trained to recognize the character by language and the result of this test shows how it has been partially resolved. The system is meant to run on an Android Motorola Moto G smartphone.

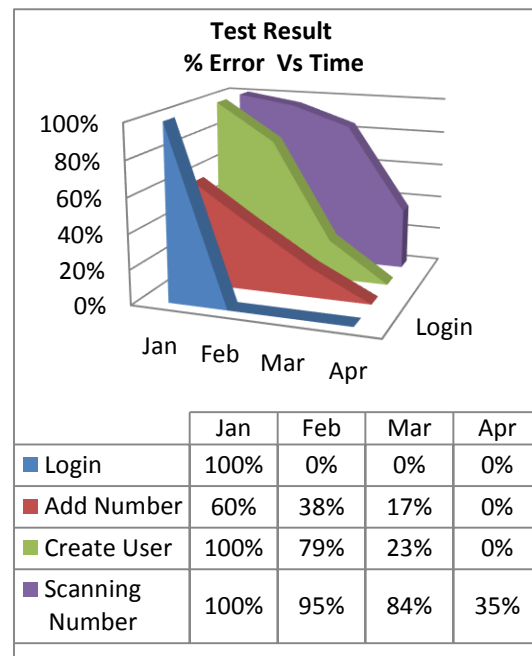


Figure 10
Testing Result of the IVU-Lotto App

CONCLUSION

In this project we focus on finding a solution to the problems of Hacienda in the collection of IVU, in a quick, efficient manner and more cost effective given the state of economic crisis facing in Puerto Rico and the world today. The analysis of our research determined that the most cost effective solution is the development of a mobile application which will facilitate users to search their winning number in the draw. The main function of this application is the collection of the number of draws IVULOTO by a photo of the receipt of purchase acquired. The number of IVULOTO is recreated by an OCR, which will acquire and process the contents in text format from the photo. This number is compared to a list of winning numbers obtained from Hacienda.

The objective of this project was to acquire the number of IVULOTO in an efficient technological manner using resources within the curriculum learned from software engineering. Within these objectives include the use of an OCR to recognize text in an image, using peripherals of mobile technology, such as internal camera phone, GPS and internet service.

This application would have a huge impact on facilitating the IVU-Lotto by tax collection and for the search of the winning number, because the creation of the IVU-Lotto was to motivate the consumer to claim the receipt with the number of draw and report those businesses that are being tax evaders.

Technology would also be impacted, because we can use the advance mints that have been achieved with the OCR technology and image scanning area, which can be used for other areas such as banks, readings of documents, etc.

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