



Serious Gaming

Research document

This is the research into the development of a brand new piece of software using the concept of serious gaming through gamification.

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Introduction

The following project is for the development of a new piece of software as a part of the IT Carlow 4th year software development course this document is for the research carried out for the creation. The software will be serious game that will use the features of gamification to create a new program that will take time consuming tasks and make them more enjoyable.

The game will be use to register car licence plate that computer cannot register, which is a time consuming process the aim of this project will be to turn this process into a simple and fun game by using gamification.

Objective

The objective of the this document is for the research carried out on the project concept and the different technologies available for creating a new piece of software, the information that is found will then be used to determine the best technologies to use in the proposed project.

The document has been broken down into different sections with each focusing on a different part of the project

- Section one - Focusing on the projects topic of gamification and serious gaming
- Section two - The available platforms for development
- Section three - Checks the different programming languages
- Section four - Looks into different servers and databases options

Serious gaming / Gamification

Serious game

“Serious gaming describes a technology that can educate and train while entertaining users” [1]. Serious Gaming is the combination of an enjoyable game that also can teach valuable lessons such as new languages, skills or allow for the progress of work in an enjoyable way this is why they are considered learning games.

A serious game is a term that can be applied initiative that has at its core an additional agenda these agendas can include training and development of topics. Serious gaming are able to helps highly motivate and develop employee’s skills this is can be necessary as these maybe the skill that can make the difference between a company that succeeds and one that fails. [2]

A serious game helps to teach or reinforce a skill through a game and story, one example of serious gaming is maths blaster this is an educational game used to teach and reinforce the knowledge learned during a maths class by children in primary education by creating a fun way for them to keep learning and improve upon their skills.

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Gamification

Gamification is the use of game elements, design and techniques in non-game contexts to encourage participation and engagement but also to motivate and excite people, but note that it is not a learning game or a simulation.

Gamification is about taking the effect of an existing core experience and making it better by applying the game mechanics and techniques, these are what make so many games engaging and fun to play. [3]

An example of gamification can be seen through websites such as “Chore Wars” where children create Dungeons and Dragons (D&D) based characters where they are given tasks (chores) to complete receiving EXP upon completing the tasks (household chores), this makes tasks children would not normally do but with added rewards are eager to do their chores. [4]

Platform

A Platform is software that allows for the development of other software as well as the testing. There are many mobile application development platforms (MADP) that allow for the development of applications on smart devices.

Some of the biggest platforms which are used to develop an application for mobile devices that available are

- Android
- IOS
- Windows

Native, Web and Hybrid

There are three different ways that an app can be developed when choosing a platform one aiming at multiple platforms and the other aimed a single platform

- Native – An application aimed at a single platform
- Web – An web application that resembles a native app
- Hybrid – An application aimed at multiple platforms using both native and web technologies

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Native

A native application is a program that has been developed for a single platform in particular for example if an application has been design for Android it can only run on Android devices and no other type of device.

Since native app are developed specifically for one platform they are able to take full advantage of all the device features such as the camera, the GPS, running in the background, the user's contacts list and so on (all with the user agreement to do so). Native apps can use the device's notification system and can work offline.

Native apps are installed through an application store such as Google Play or Apple's App Store (depending on the OS being used).

Web

A Web app is not a real applications rather it is a website that acts like a native app in many ways from it look and feel of it, typically the app runs in a browser accessing it like any web page but unlike normal website a special URL and a bookmark to the page is created this is how the app is saved onto the users device.

Web apps are popular with HTML5 because of this popularity and the app having a lack of distinguishing browser features (such as URL bar and buttons) it has become hard to tell the difference between web apps and regular web pages.

There are many features that are available for web app in HTML5 but many of these need an API to access them some of these are access to the phones Camera and GPS location. However some native features still cannot be accessed by the browser these include the notifications system and running in the background. [5]

Hybrid

A hybrid application is a program that has been developed to take advantage of both web apps and native apps, these apps are able to use the features available on the device like native apps but are just like a web app everything is relies on HTML5 and being rendered in a browser, a hybrid app is downloaded and installed from an app store similar to an native apps.

Hybrid apps are popular with due to the low development costs and work effort needed for building a cross-platform application, some companies will build hybrid apps as wrappers for an existing web page

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Android

Android is both a development environment for software development and an operating system (OS) that runs on most smart devices such as mobile phones, tablets, car GPS systems and watches.

Android is a system built by Google that is used on many different smart devices, it is similar but different to iOS in that it is a layered system stacked to provide a rich set of frameworks. The OS is based on the Linux kernel just modified to provide management of processes, memory, device-drivers and the device's power.

The Android OS layers are built on top of each other with the user applications at the top of the framework on top.

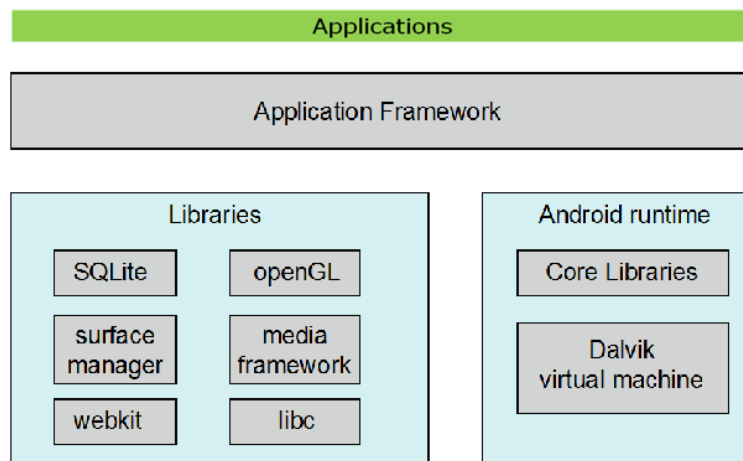


Figure 1

The Android run environment includes a core set of libraries to run applications. Android apps are mainly built in Java, but can also run native which allows for C and C++ development on Android.

The Android Development Kit is used in the creation of applications used on Android devices, giving access to tools and interfaces for the development of Android applications. [6]

Any manufacturer is free to make an Android phone if they want to. Such manufacturers include HTC, Samsung, Alcatel, Asus, Sony, Acer, LG, and OnePlus, among others. [7]

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IOS

The iPhone Operating System (IOS) was created by Apple to manage the applications and hardware of smart devices developed by Apple. Applications are installed physically on a device to always make them available to the user, even if the device is in Airplane mode.

The IOS is created using a layered system which is split into two section hardware and software, communication with the hardware is done only by the core OS itself all other applications and services must first go through the core OS before communicating with the hardware.

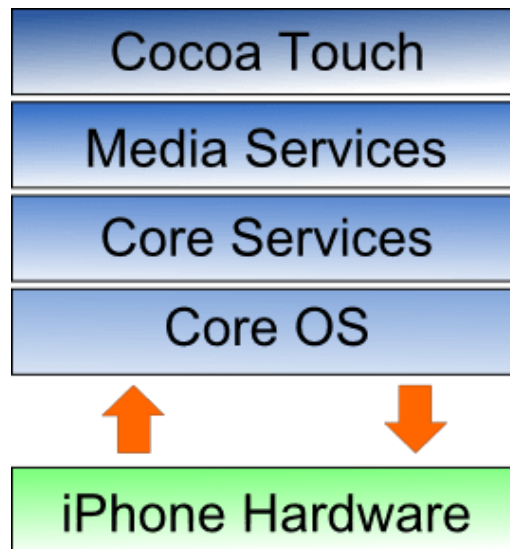


Figure 2

The software is all built upon itself (as seen in figure 2), Cocoa Touch at the top this as it is the user interface which allows applications to run on the IOS, the media services layer is the layer that handles graphics audio and video in any app. The core services layer is the foundation of the framework managing features such as networking, finally there is the core OS layer that every other layer is built on top of this layer deals with communication with the hardware as well as security.

The iOS Software Development Kit (SDK) gives access to tools and interfaces needed for the development, installation and testing needed to create IOS applications created using the iOS system frameworks and programmed in Objective-C. [8]

Android and iOS have many similar features in design of OS example both are filled with shortcuts to apps allowing users to hide apps they don't use very often, both OS's also have a form of notifications bar which can be dragged down from the top of the screen to display any unread messages and other important notices. [9]

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Windows phone

The Windows Phone OS was created by Microsoft, created to be run on smart based devices manufactured by Microsoft. Windows Phone uses a tile based system similar to Operating system Windows 8 and windows 10, in this document will look in to the windows Phone 8 OS the second generation windows phone OS and the one that is currently being used.

Windows phone 8 architecture shares a common core unlike standard window platform (PC versions), the Windows Phone allows for a shared cored programming model allowing different low level components easy access to the system kernel unlike with IOS and Android where everything is layered.

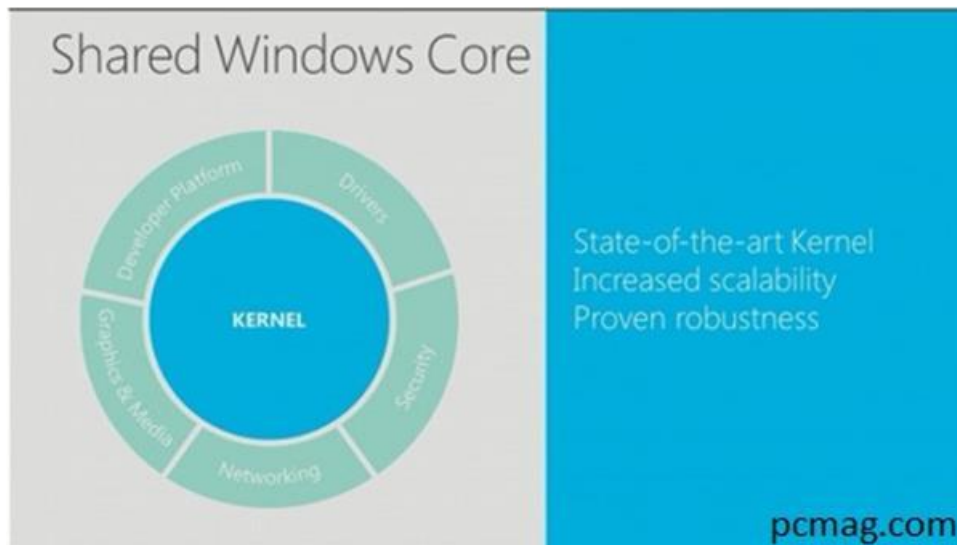


Figure 3

The system was created by a using programming model that sends out controlled pulses when any previous process is done its intended task rather than at regular intervals. This allows for applications to operate faster, cleanly and able to avoid users having to wait for operations to complete and the system freezing up creating a better experience for users. [10]

The Windows Phone SDK 8.0 Software Development Kit provides developers with the tools that are needed for the development application and games on Windows phones 8. When developing an application developers use Visual Studio for the development of applications.

When developing with Windows Phone developers are able to support native and C++ allowing for the porting of Android and IOS apps to Windows Phones, apps can also be ported to Windows 8 and Windows 10. [11]

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Coding language

During the research of this project many suitable programming languages were found below is a list of some of the most used and popular languages to use for the development of a mobile application that will be considered for the creation of the project implantation these can include.

- Android
- IOS
- HTML
- PHP
- Java
- Bootstrap
- Python flask
- Cordova
- Swift
- XML

Native Android

The Android Native Development Kit (NDK) is a set of tools that allows users to code android apps using C and C++, this provides developers with access to platform libraries to manage activates and access to the devices physical components.

By using native it allows developers to import predefined C and C++ code, it also allows them to squeeze in extra performance of the device due to being able to fine tune the memory management, there is also the low level latency used to run computationally intensive applications such as [12].

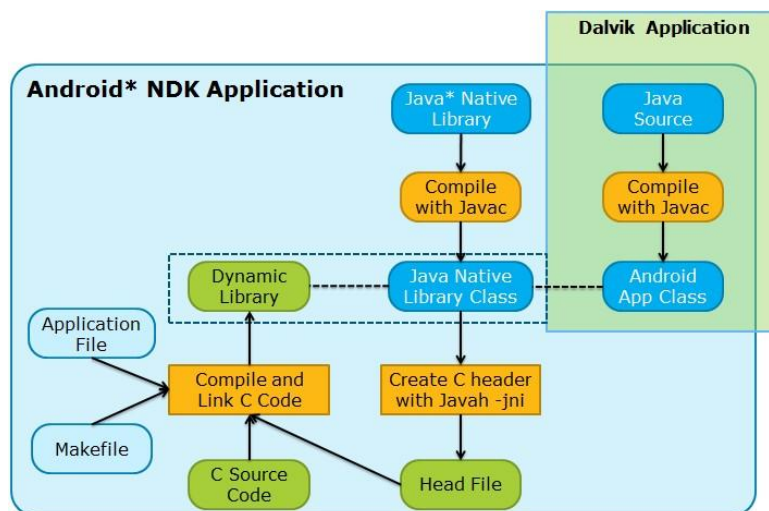


Figure 4

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Native is also good for the games development on Android as C and C++ are widely used in the games industry due to it being fast flexible and well-supported allowing developers to use assembly language at the lowest levels to communicate with the hardware.

By also using native it will give access to a large repository of game assets (this project will only use free and open source assets available in case of copy right) available to C++ game programmers from graphics to sound and much more.

HTML

Hyper Text Markup Language (HTML) is used mainly for the creation of web pages but due to HTML5 developers can develop web applications for smart devices using HTML. HTML pages are created using a series of tags. The tags are interpreted by the web browser which creates the page based on the tag in a HTML file. [13]

PHP

Hypertext Processing (PHP) language is an open source general scripting language that suited for web development and can be embedded into HTML easily giving the webpage functionality it normally would not be able to do. PHP is a server side scripting language PHP is not run on a web browser but instead runs on the server it is used to add functionality to HTML websites

Java

Java is both programming language and computing platform with many applications and websites using it to be developed in java as it fast, secure, and reliable. Java is used in many different systems which included computers, game consoles, smart devices, and data centres that handle big amounts of data for processing. [14]

Bootstrap

Bootstrap is a CSS (Cascading Style Sheets) framework that allows websites and applications to be stylized for devices allow it work on many different devices of varying size (phone to tables) without effecting the position of components or functionality to the application.

Bootstrap allows developers to implement design themes for quicker development of an applications user interface (UI) allowing the interface to be created without weeks of testing and debugging. [15]

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Python

Python is an open source programming language that uses object-orientation with high-level programming with dynamic semantics, python is compiled like other languages but is interpreted like a scripting languages. [16]

Java contains an array of different types of external code called a plug-in one of the plug-ins available is an open source library for

Kivy

Kivy allow for users to use python modules instead of the Application Programmable Interfaces (API), kivy is a cross platform tool that uses most input, protocols

Django framework

The Django framework is a free and open source python written web application framework it a reliable, powerful and flexible toolkit for building Web APIs. Django is helpful to developers avoiding many common mistakes that can occur like as SQL injection, cross-site scripting, cross-site request forgery and more.

Cordova

Cordova is a platform for the building Native Mobile Applications then using a container to running web applications written in HTML, CSS, JavaScript to create a complex hybrid application [17]

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Databases and Server side

Databases

Databases are a large part of any app being developed as large amounts of information relating to the app will need to be stored for that reason any data in a database will need to be sent and receive by the application. To have any app properly communicate with a database a querying language needs to be chosen.

- noSQL
- mySQL
- MariaDB
- Amazon Aurora

mySQL

MySQL (Sequence Querying Language) is a popular open source database management system that is used for web based applications to query for data in a database. MySQL runs virtually on different a platform that allows multiple users to create and manage many different databases using a tables to create a structured format some of the different options when using SQL include mySQL, PostgreSQL and SQLite. [18]

NoSQL

NoSQL is a non SQL that is another option for querying and managing databases other then mySQL, similar to mySQL noSQL using tables to create a structured storage format used for large sets of distributed data. NoSQL is able to store graphs and other documents noSQL databases can add data anywhere without the need to specify the document design or collection. [19]

MariaDB

Maria DB is a relation database management system that can be used as a virtual private server (VPS) used to manage data from different programs as well as being able to handle SQL queries although unlike standard SQL MariaDB is an unstructured. [20]

Amazon Aurora

Amazon Aurora is a cloud Relational Database Service (RDS) management system which is compatible with mySQL developed by Amazon Web Services, Aurora provides many services from patching, backup, recovery and other services. [21]

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Server side

The server side of any project refers to the hosting of information, this is the process in which information can be accessed and retrieved from a server by an end user, there are many options available to developers in which it is handle the hosting of a website, the hosting process can be broken down in two to main categories these are:

- Cloud
- Local hosting

Cloud

This is a series of servers connected together known as the cloud, these servers are owned by different organizations with the purpose of storing web application and databases

When a developer uses cloud hosting they rent virtual server space this is a cost effective way in which to host information as it cuts down of the purchasing physical cost of servers. Cloud computing has two main options the first is “shared hosting” and second is “dedicated hosting”. [22]

Shared hosting

Shared hosting is when a client will rent a server from a hosting company but will share the physical device, one server too many clients this is a cheaper option due to the server being used by multiple clients.

Dedicated hosting

Dedicated hosting allows for full control over hosting this is where clients will purchase a physical servers from a company for their own personal use with no other client being allowed to use it, some clients buy purchase and use multiple servers which are all dedicated to them do to large amounts of data being collected.

Some key advantages of cloud hosting weather it is shared or dedicated are

- **Flexibility:** Resources can be accessed when needed as well
- **Scalability:** The site being hosted be increased in size with the demand of users easily (i.e. go from a 20GB storage space to 80GB) with no set on the clients side
- **Cost-effectiveness:** Clients only pay for what they are using at a particular time
- **Ease of set up:** Cloud servers do not require much initial setup
- **Reliability:** When an error occurs on the server the client information can be move so that clients are unaffected by it.

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Local hosting

Local hosting refers to hosting a web application using a physical machine, unlike cloud though local hosting is more expensive as the host must pay for and maintain a physical machine. Local hosting is the traditional way of hosting, but things have moved to a more cloud based environment.

There are many options when it comes to locally hosting a website some options available are:

- WAMP
- XAMPP

WAMP

A WAMP (Windows Apache MySQL and PHP) server used for internal web development and testing, WAMP servers comes pre-installed with MySQL and PHP allowing developers to build more dynamic website before publishing it as a public web server that clients can visit. [23]

XAMPP

XAMPP (Cross-Platform (X) Apache MySQL PHP and Perl) is a lightweight sever used for web development, testing and distribution for local web hosting. Unlike other local hosting server software XAMPP is cross platform allowing it to work on multiple OS systems. [24]

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Bibliography

- [1] F. R. a. L. T. D. Paolis, "Technology, International Journal of Computer Games - A Comprehensive Review of Serious Games in Health Professions," 2014. [Online]. Available: <http://https://www.hindawi.com/journals/ijcgt/2014/787968>. [Accessed 11th October 2016].
- [2] D. Denny, "What are Serious Games?," [Online]. Available: <http://www.growthengineering.co.uk/what-are-serious-games>. [Accessed 10th October 2016].
- [3] "What is Gamification? How Does Gamification Work?," [Online]. Available: <http://www.bunchball.com/gamification>. [Accessed 17th October 2016].
- [4] R. Stanley, "Top 25 Best Examples of Gamification in Business," 2014. [Online]. Available: <http://www.clicksoftware.com/blog/top-25-best-examples-of-gamification-in-business/>. [Accessed 15 October 2016].
- [5] R. Budiu, "Mobile: Native Apps, Web Apps, and Hybrid Apps," 2013. [Online]. Available: <https://www.nngroup.com/articles/mobile-native-apps/>. [Accessed 15 12 2016].
- [6] "Getting started with the NDK," [Online]. Available: <http://www.https://developer.android.com/ndk/guides/index.html>. [Accessed 17 October 2016].
- [7] Alex Todd, Chris Barraclough, "recombu.com," 2016. [Online]. Available: https://recombu.com/mobile/article/what-is-android-and-what-is-an-android-phone_M12615.html#. [Accessed 23 10 2016].
- [8] "2014," [Online]. Available: <https://developer.apple.com/library/content/documentation/Miscellaneous/Conceptual/iPhoneOSTechOverview/Introduction/Introduction.html>. [Accessed 24 October 2016].
- [9] C. Barraclough, "recombu," 2016. [Online]. Available: <https://recombu.com/mobile/article/what-is-ios-and-what-does-ios-stand-for>. [Accessed 24 10 2016].
- [10] Mr.Anh, "Windows Phone 8 Architecture Hardware and Software," 2015. [Online]. Available: designthing.net/windows-phone-8-architecture-hardware-and-software/. [Accessed 2016 11 13].
- [11] P. Viswanathan, "The Microsoft Windows Phone 8 OS," 2016. [Online]. Available: <https://www.lifewire.com/ways-to-achieve-success-in-the-mobile-app-marketplace-2373468>. [Accessed 15 11 2016].
- [12] M. Dawson, Beginning C++ through game programming, 4th ed., Boston, MA, United States:

Research Document

CENGAGE Learning Custom Publishing, 2014.

- [13] R. Shannon, "What is HTML?," 2012. [Online]. Available: <http://www.yourhtmlsource.com/starthere/whatishtml.html>. [Accessed 24 10 2016].
- [14] Oracle, "What is Java technology and why do I need it?," [Online]. Available: https://java.com/en/download/faq/whatis_java.xml. [Accessed 14 11 2016].
- [15] S. F. Rahman, "Understanding Bootstrap's Grid System," 2014. [Online]. Available: <https://www.sitepoint.com/understanding-bootstrap-grid-system/>. [Accessed 20th October 2016].
- [16] python, "python," 2014. [Online]. Available: <https://pypi.python.org/pypi/pytest-benchmark>. [Accessed 15 11 2016].
- [17] V. P, "what is cordova and how does it work," 2014. [Online]. Available: <https://blogs.sap.com/2014/07/27/what-is-cordova-and-how-does-it-work/>. [Accessed 10 01 2017].
- [18] "What is: MySQL," [Online]. Available: <http://www.wpbeginner.com/glossary/mysql/>. [Accessed 18 10 2016].
- [19] M. Rouse, "NoSQL (Not Only SQL database)," 01 10 2011. [Online]. Available: <http://searchdatamanagement.techtarget.com/definition/NoSQL-Not-Only-SQL>. [Accessed 20 10 2016].
- [20] J. Ellingwood, "How to create and manage databases in mysql and mariadb on a cloud server," 29 07 2012. [Online]. Available: <https://www.digitalocean.com/community/tutorials/how-to-create-and-manage-databases-in-mysql-and-mariadb-on-a-cloud-server>. [Accessed 21 10 2016].
- [21] M. Rouse, "Amazon Aurora," 26 01 2016. [Online]. Available: <http://searchaws.techtarget.com/definition/Amazon-Aurora>. [Accessed 23 10 2016].
- [22] Interoute, "what are cloud servers," 2016. [Online]. Available: <http://www.interoute.com/what-are-cloud-servers>. [Accessed 04 01 2017].
- [23] "Wamp," 2013. [Online]. Available: <https://techterms.com/definition/wamp>. [Accessed 13 11 2016].
- [24] K. Mikoluk, "XAMPP Tutorial: How to Use XAMPP to Run Your Own Web Server," 18 19 2013. [Online]. Available: <https://blog.udemy.com/xampp-tutorial/>. [Accessed 2016 10 19].
- [25] S. Balkhi, "What is: WAMP," [Online]. Available: <http://www.wpbeginner.com/glossary/wamp/>. [Accessed 25 10 2016].

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