



**SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY**

Triple Code Generator

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Triple Code Generator

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الآية

(وَمَا تَوْفِيقِي إِلَّا بِاللَّهِ عَلَيْهِ تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ)

صدق الله العظيم

سورة هود الآية (88)

الحمد لله

اللَّهُمَّ لَكَ الْحَمْدُ أَنْتَ نُورُ السَّمَاوَاتِ وَالْأَرْضِ وَمَنْ فِيهِنَّ، وَلَكَ الْحَمْدُ، أَنْتَ قَيِّمُ السَّمَاوَاتِ وَالْأَرْضِ وَمَنْ فِيهِنَّ، وَلَكَ الْحَمْدُ، أَنْتَ مَلِكُ السَّمَاوَاتِ وَالْأَرْضِ وَمَنْ فِيهِنَّ، وَلَكَ الْحَمْدُ أَنْتَ الْحَقُّ، وَوَعْدُكَ حَقٌّ، وَقَوْلُكَ حَقٌّ وَلِقَاؤُكَ حَقٌّ، وَالْجَنَّةُ حَقٌّ، وَالنَّارُ حَقٌّ وَالسَّاعَةُ حَقٌّ، وَالنَّبِيُّونَ حَقٌّ، وَمُحَمَّدٌ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ حَقٌّ.

اللَّهُمَّ لَكَ الْحَمْدُ كُلُّهُ، وَإِلَيْكَ يَرْجِعُ الْأَمْرُ كُلُّهُ، عَلَانِيَتُهُ وَسِرُّهُ. فَحَقٌّ أَنْتَ أَنْ تُعْبَدَ، وَحَقٌّ أَنْتَ أَنْ تُحَمَدَ، وَأَنْتَ عَلَى كُلِّ شَيْءٍ قَدِيرٌ اللَّهُمَّ لَكَ الْحَمْدُ كَالَّذِي تَقُولُ، وَخَيْرًا مِمَّا نَقُولُ اللَّهُمَّ لَكَ الْحَمْدُ بِجَمِيعِ الْمَحَامِدِ كُلِّهَا

اللَّهُمَّ لَكَ الْحَمْدُ كَمَا حَمَدْتَ نَفْسَكَ فِي أُمِّ الْكِتَابِ وَالتَّوْرَةِ وَالْإِنْجِيلِ وَالزَّبُورِ وَالْفُرْقَانِ اللَّهُمَّ لَكَ الْحَمْدُ أَكْمَلُهُ، وَلِكَ التَّنَاءُ أَجْمَلُهُ، وَلِكَ الْقَوْلُ أَبْلَغُهُ، وَلِكَ الْعِلْمُ أَكْثَمُهُ، وَلِكَ السُّلْطَانُ أَقْوَمُهُ، وَلِكَ الْجَلَالُ أَعْظَمُهُ

اللَّهُمَّ لَكَ الْحَمْدُ حَمْدًا يَمْلَأُ الْمِيزَانَ، وَلِكَ الْحَمْدُ عَدَدَ مَا حَطَّه الْقَلَمُ وَأَحْصَاهُ الْكِتَابُ وَوَسِعَتْهُ الرَّحْمَةُ اللَّهُمَّ لَكَ الْحَمْدُ عَلَى مَا أُعْطِيتَ وَمَا مَنَعْتَ، وَمَا قَبَضْتَ وَمَا بَسَطْتَ اللَّهُمَّ لَكَ الْحَمْدُ عَلَى كُلِّ نِعْمَةٍ أَنْعَمْتَ بِهَا عَلَيْنَا فِي قَدِيمٍ أَوْ حَدِيثٍ، أَوْ خَاصَّةٍ أَوْ عَامَّةٍ أَوْ سِرٍّ أَوْ عَلَانِيَةٍ أَوْ حَيٍّ أَوْ مَيِّتٍ أَوْ شَاهِدٍ أَوْ غَائِبٍ

اللَّهُمَّ لَكَ الْحَمْدُ فِي السَّرَّاءِ وَالضَّرَّاءِ وَلِكَ الْحَمْدُ فِي النَّعْمَةِ وَاللَّوَاءِ، وَلِكَ الْحَمْدُ فِي الشَّدَّةِ وَالرَّخَاءِ، وَلِكَ الْحَمْدُ عَلَى جِلْمِكَ بَعْدَ عِلْمِكَ، وَلِكَ الْحَمْدُ عَلَى عَفْوِكَ بَعْدَ قُدْرَتِكَ، وَلِكَ الْحَمْدُ عَلَى كُلِّ حَالٍ الْحَمْدُ لِلَّهِ فِي الْأُولَى وَالْآخِرَةِ، الْحَمْدُ لِلَّهِ الَّذِي لَا يَنْسَى مِنْ ذِكْرِهِ، وَالْحَمْدُ لِلَّهِ الَّذِي لَا يَخِيبُ مَنْ دَعَاهُ، وَلَا يَقْطَعُ رَجَاءَ مَنْ رَجَاهُ

الحمد لله الذي وفقنا ويسر لنا كتابة هذا البحث

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Abstract

Because of the continuous increase in the requirements of users to developers to create applications in different environments, the different operating environments have become very complex, which make the traditional way to create such applications from scratch by the developer's impractical way.

The aim of the study is to help developers of Odoo, Android, and Web applications reduce the time and effort in creations of such applications by creating databases for these applications and restricting all patterns that are common such as (input, delete and other types).

To study the problem and test the proposed solution, the following steps: Develop three applications (Odoo, Android, and web) without the use of Triple Code Generator for a simple student registration system and then create the same application using the Triple Code Generator designed in this study.

The code generator developed in this research helps developers but the developer still needs to write code to complete and specify the applications, so researchers recommend others who will complete the research to find a way in which developer need not to write code such as drag and drop.

المستخلص

بسبب الإزدياد المستمر في متطلبات المستخدمين من المطورين إنشاء تطبيقات لهم في بيئات مختلفة ، أصبحت بيئات التشغيل المختلفة تتسم بدرجة كبيرة من التعقيد مما جعل الطريقة التقليدية لإنشاء مثل هذه التطبيقات من الصفر بواسطة المطور طريقة غير عملية

بتقليل الزمن و الجهد (المبدول في إنشاء web , odoo , android)الهدف من الدراسة هو مساعدة مطوري تطبيقات مثل هذه التطبيقات و ذلك عن طريق إنشاء قواعد البيانات لهذه التطبيقات وحصر كل الأنماط المشتركةمثل (الإدخال، الحذف و غيرها من الأنماط) في إطار عمل واحد.

لدراسة المشكلة و اختبار الحل المقترح تم تطبيق الخطوات التالية : إنشاء ثلاثة تطبيقات وهي (android , odoo web) بشكل منفصل بدون استخدام إطار العمل لنظام تسجيل بسيط و إعادة إنشاء نفس التطبيق باستخدام إطار العمل الذي تم تصميمه في هذه الدراسة.

إطار العمل الذي تم إنشاؤه في هذا البحثيساعد المطورين بصورة كبيرة و لكن ما زال علي المطور أن يكتب بعض الشفرات لإكمال التطبيق و بالتالي يوصي الباحثون الأشخاص الذين سيكملون البحث لإيجاد الوسيلة التي جعلالمطور لا يحتاج لكتابة شفرة مثلالسحبوالادراج.

List of Terms:

#	Abbreviation	Terminology
1	PHP	Hypertext preprocessor
2	HTML	Hypertext Markup Language
3	MySQL	My Structure Query Language
4	CSS	Cascading Style Sheet
5	MVC	Model View Controller
6	UML	Unified Modeling Language
7	SaaS	Software as a service
8	VB	Visual Basic
9	JS	Java Script
10	RAD	Rapid Application development
11	J2EE	Java 2 Enterprise Edition
12	WPF	Windows Presentation Foundation
13	IOC	Inversion of Control
14	JSF	Java Server Faces
15	ASP	Active Server Page
16	XML	Extensible Markup Language
17	T4	Text Template Transformation Toolkit
18	SDK	Software Development Kit
19	MOF	Meta Object Facility
20	XSD	XML Schema Definition
21	OCL	Object Constraint Language
22	EMF	Eclipse Modeling Framework
23	MDE	Model-Driven Engineering

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CHAPTER ONE:

Introduction

1.1 Introduction

In This chapter we will discuss description of software engineering and the software as service, and the related technologies to research project.

Software Engineering is a branch of engineering based on a set of rules designed to design and develop programs in a high quality and meet the needs of users, and focuses on the practical problems faced by workers in the software industry as a theoretical concept from time to time in the late fifties and early sixties of the last century.

The program development process includes new research or development, design of templates, modification or reuse of engineering or maintenance or any other activities that may lead to the production of a software product. The methodology of the software development life cycle aims to ensure the same results, same quality and consumption of the same resources as long as the procedures are followed, as well as enabling employees to better plan their day-to-day work, thanks to the possibility of anticipating the results of the work, as well as increasing the productivity of the software development team.

Software as a Service describes any cloud service where consumers are able to access software applications over the internet. The applications are hosted in “the cloud” and can be used for a wide range of tasks for both individuals and organizations.^[4]

Enterprise users are able to use applications for a range of needs, including accounting and invoicing, tracking sales, planning, performance monitoring and communications.^[4]

SaaS is often referred to as software-on-demand and utilizing it is akin to renting software rather than buying it. With traditional software applications you

would purchase the software upfront as a package and then install it onto your computer.^[4]

The software's license may also limit the number of users and/or devices where the software can be deployed. Software as a Service users, however, subscribe to the software rather than purchase it, usually on a monthly basis. Applications are purchased and used online with files saved in the cloud rather than on individual computers.^[4]

SaaS customers have no hardware or software to buy, install, maintain, or update. Access to applications is easy: You just need an Internet connection.

Why we use? ^[5]

- **High Adoption:** SaaS applications are available on almost all devices anytime anywhere. Since most people are familiar with how to use the Internet.
- **Lower Initial Costs:** Since SaaS applications are subscription based, there is no license fee and hence lower initial costs. Also, as the SaaS provider manages the IT infrastructure, it lowers the IT costs for hardware, software and resources.
- **Seamless Integration:** With true multitenant architectures SaaS can scale indefinitely to meet customer demands, and many SaaS providers also offer customization capabilities to meet specific needs.
- **Data backup and recovery:** Data is stored in multiple data centers to ensure that in the event of a disaster, the other data centers can continue delivering the service. SaaS solutions also eliminate the painstaking task of taking backups every week by triggering automatic backups without user intervention, thus ensuring the integrity of company data.

In addition, new technologies have emerged in the field of software engineering or computer science such as (android, web, Odoo) and may find interdependence and dependence on each other in some cases, working to produce or develop a product that works efficiently and fulfills the needs of the user.

We can summarize how they relate to each other in several ways, for example (Zapier app) is a connection between two apps made of trigger and an action, whenever the trigger event happens, Zapier will automatically make the action event happen for you So, it can connect android with Odoo.

In other case, we find relationship between web and android, PHP and Android are widely used platforms, while PHP is used for dynamic web development, Android is an OS for mobiles, tablets etc. To develop Android applications, we can use the benefits of PHP to communicate it with MySQL database and get required data from there. We can use JSON and HTTP as an intermediate of communication between Android and PHP.

We can also create android app that show information from Odoo, for example new Odoo Mobile app for Android provides access to all Odoo applications directly from your mobile phone. Optimized for interfaces on any Android device, Odoo Mobile provides the next level of flexibility in your business management software.

Web: Internet networks, including internal and external networks, have a significant impact on trade, industry, banking, financial transactions, leisure and others. And We find a wide range of new applications that can be distributed to the web environment.

[1]

The web provides a general representation of information for support and helps in linking -all types of content and facilitates the process of reaching the end user. It can also create content with easy specifications using all widely available tools. [1]

In most cases, the methodology used in specific Internet-based systems, and these systems have been operating on the Internet through a general stream. The development of web-based systems lacks precision and lacks systematic

methodology, quality control and assurance. As the complexity and development of web-based applications grow, we find a growing and legitimate concern about how long-term application, quality and integrity will emerge.^[1]

The Internet or Internet Engineering in general is the establishment of several scientific principles, including engineering and management methods to succeed in the development and maintenance and production of high quality systems over the Internet and applications.^[1]

Android: android It is a stack or software store for mobile devices that includes operating system, mediator and basic applications.

The architecture of android is that, the various components and elements of the android systems have been designed and constructed as a heap, with the formation of applications and the organization of the top layer of the stack.^[2]

Android is related to a range of basic applications that include email applications, SMS program, browser, calendar, maps, and other features. All applications and programs in android are written using the Java programming language.^[2]

Developers and engineers can access the same APIs used by major applications. A general application architecture is created to facilitate the reuse of the application components. There is also the possibility to deploy or distribute the capabilities of any application and then to be used by any other application. This method or mechanism allows the replacement of components by the user.^[2]

Android contains a collection of special C and C++ libraries that are used by different components of the android system. This efficiency or capability is clear and open to developers through the framework of the application of android.^[2]

Odoo: odoo is a large and open source platform for business applications and commerce. Through the odoo system, a huge range of close-to-close applications was created, covering all areas of business, sales, assets and accounting. odoo has a

dynamic and growing community around it as well as additional business features and applications. ^[3]

Odoo is developed and built using the Python programming language and using PostgreSQL as a database to store all data and information for each system. These components are key requirements for the Odoo host. ^[3]

Odoo can run and run on various different combinations of operating systems, but in the first place odoo is preferred to develop with the Ubuntu platform. It will be easy to get support and help and also get additional resources. ^[3]

Odoo is also considered as a platform for most developers who work on it, and most deployments are deployed and performed. So, developers are expected to have Odoo compatible with that platform., Even if the developer works on Windows will need to have knowledge of this matter. ^[3]

1.2 Problem Statement

The emergence of what is known as the software crisis, which emerged because of the lack of a reliable methodology in the thinking of the process of software development in the construction and creation of software, which led to this the emergence of many errors during the process of building and maintenance of software and thus become in need of time to maintain and develop, A larger financial cost than expected, in addition to delays and budget overruns.

Also, if any company needed to develop a system through odoo, web site and an apps with some features in common the developer will need to build the three systems individually and will write three codes even for the similar features because there is no encapsulation across platforms.

In Admin to user apps and dynamic websites the developer need to implement the app individually and then implement the control panel through web or odoo and that takes a lot of efforts and time.

Proposed solution: Create or develop a tool that works as software as a service, which creates three codes for three techniques that facilitate development and maintenance users.

1.3 Importance of The Research

1-This research helps developer get three codes for three technologies by one service or tool (triple as service) so less coding for develop.

2-Reducing write code as much as possible.

1.4 Research Objectives

1. To design and develop three codes (odoo, web, android) that shares some requirements by one front-end at one time.
2. To reduce code editing operation.
3. To Reduce projects cost.
4. To Reduce time of developing.
5. Reduce probability of cause inerror.
6. To analyse and modelling of requirements to be implemented.
7. To design the database tables for users and defining the relationships among them.
8. To Reduce the number of developers and designers, to develop each program separately.

1.5 Scope of Project

A triple works as software as a service and code generator, it is limited to the design or creating databases for three domains or we can say three different technologies and write code for each technique. The codes they create deal with MySQL database in web, SQLite in android, PostgreSQL in odoo. Each of these techniques has specific properties and different ways to deal with each of the database.

The operations that will be performed on the interfaces or on triple can be limited to: insert (Input process is found in several interfaces, for example when entering the name of the project, the name of the database, the names of tables, the number of tables, act), update, delete, select (For example, choose the relationship between tables, choose the views from tabs, select type of view for every technique (odoo, android, web)).

1.6 Research Methodology

We can describe research methodology as follow:

1. Select a research topic and a suitable title for research.
 2. Develop an appropriate and coordinated plan to write the research and its parts.
 3. The next step is to collect all the project data and gather and analyse the requirements.
 4. Write search results and appropriate recommendations.
- Also, we used cloud computing because it's better than desktop application. It's give you probability to update, edit functions to your project easily.

1.7 Research Structure:

1. Chapter one gives introduction about the project, defining the problems, objectives, and scope.
2. Chapter two contains related studies with our project.
3. Chapter three also contains background about project, tools, domains, and techniques used overall project.
4. Chapter four contains the project analysis, specification, and UML diagrams.
5. Chapter five project implementation.

6. Chapter six is the results and recommendations.

CHAPTER TWO: Background and Related Studies

2.1 Introduction

This chapter contains introduction background about the related technologies to our project which are: Odoo, Cloud Computing, SaaS, Android, Web services.

2.2 Odoo

Open source ERP: Open source software has now moved higher value for small business organization who wanted to do the business systematically. It's a free licensed ERP software package available in both standalone software and web based software.

Open ERP is one of the popular open source ERP in the market for small scale enterprises. Open ERP changed its name as odoo.^[9]

2.2.1 Functional Benefits of Odoo

The company can access their functional departments through odoo open ERP source apps. Supported functional apps in odoo such as:

1. Website builder.
2. Blog.
3. Live chat.
4. Manufacturing.
5. Ecommerce.
6. Project management.
7. Accounting and purchase.
8. Enterprise social network.
9. Timesheet.
10. Business intelligence.

2.2.2 Technical Benefits of Odoo

1. The firm or individual can access all the modules without paying any fee to the odoo company.
2. Accessing the ERP any ware in the world.
3. It supports all the devices to access (desktop, laptop, tablet, smartphone, etc.).
4. Browser compatibility (chrome, fire fox, safari, internet explorer, etc.).

2.3 Cloud Computing

The idea of cloud computing is based on a very fundamental principle of “reusability of IT capability. It’s bring compared to traditional concepts of grid computing, distributed computing, utility computing is to broaden horizons across organizational boundaries.

Forrester defines cloud computing as: “A pool of abstracted, highly scalable, and managed compute infrastructure capable of hosting end-customer applications and billed by consumption.”^[10]

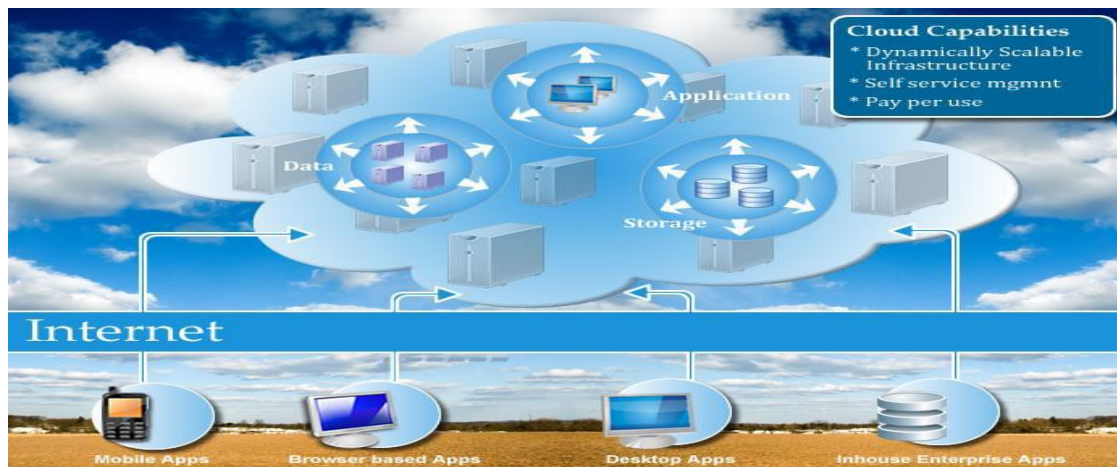


Figure (2.1) Conceptual view of cloudcomputing^[11]

2.3.1 Cloud Computing Models

- **Software as a service(SaaS):**

In this model complete application is offered to the customer, single instance of the service runs on the cloud and multiple end users are serviced, on the customers side no need for software licenses while for the provider the costs are lowered, since only single application need to be hosted and maintained. offered by Microsoft, zoho, etc.

- **Platform as a service(PaaS):**

Layer of software or development environment is encapsulated and offered as a service. The customer has the freedom to build his own application which run on the provider's infrastructure, to meet manageability and scalability requirements of the application. PaaS providers offer a combination of OS and application servers such as LAMP platform (Linux, Apache, MySQL and PHP), etc.

- **Infrastructure as a service(IaaS):**

Provides basic storage and computing capabilities as standardized services over the network. the customer would typically deploy his own software on the Infrastructure. some common examples are; Amazon, 3 Tera, etc.

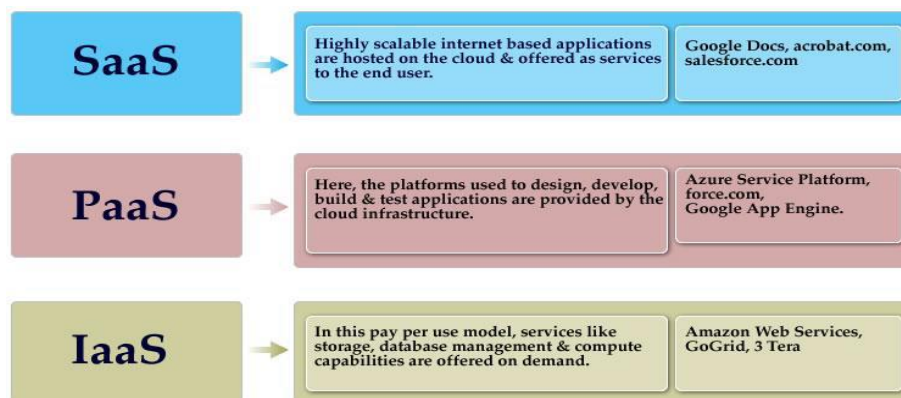


Figure (2.2) cloud models. [11]

2.4 Software as a Service

SaaS describes any cloud services where consumers are able to access software applications over the internet. The applications are hosted in “the cloud” and can be used for a wide range of tasks for both individuals and organization. SaaS is often referred to as software as demand and utilizing it as akin to renting software rather than buying it. With traditional application you would purchase the software upfront as package and then install it on your computer. The software’s license may also limit the number of users and devices where the software can be deployed.

SaaS customers had no hardware or software to buy, install, update or maintain. Access to applications is easy, you just need an internet connection^[12]

2.4.1 Benefits of Using SaaS:^[13]

- **High adoption:**

SaaS applications are available on almost all devices – anytime, anywhere. Since most people are familiar with how to you use internet, the learning curve is lower and adoption rates are high.

- **Lower initial host:**

Since SaaS application are subscribing based, there is no license fee and hence lower initial costs. Also, as the SaaS provider manages the IT infrastructure, it lowers the IT costs for hardware, software and resources.

- **Data backup and recovery:**

Data is stored in multiple data centers to ensure that in the event of disaster, the other data centers can continue delivering the services. This solution eliminates the painstaking task of taking backup every week by triggering automatic backup without user intervention, thus ensuring the integrity of company data.



Figure (2.3) Software as services importance. ^[14]

2.5 Android

Android is a software stack for mobile devices which means a reference to a set of system programs or set of application programs that form a complete system. ^[15]

2.5.1 Main Features of Android

This statement given by Andy Rubin “There should be nothing that users can access on their desktop that can’t access on their cell phone”. Google’s director of mobile platform. Reflect exactly the goal of android mobile stack (a stack includes a mobile operating system, middle ware and applications). ^[16]

2.5.2 Stack of Layers

1. Application layer:

Android software platform will come with a set of basic application like SMS program, maps, browser, calendar and many more. writing using java programming.

2. Application framework:

Software framework that is used to implement a standard structure of an application for specific operating system.

3. Libraries:

The available libraries are all written in C/C++.

4. Runtime:

Consist of two components first a set of core libraries which provides most of the functionality available in the core libraries of the java programming language, second the virtual machine Dalvik which operate as translator between the application side and the operating system.

5. Kernel:

Linux.

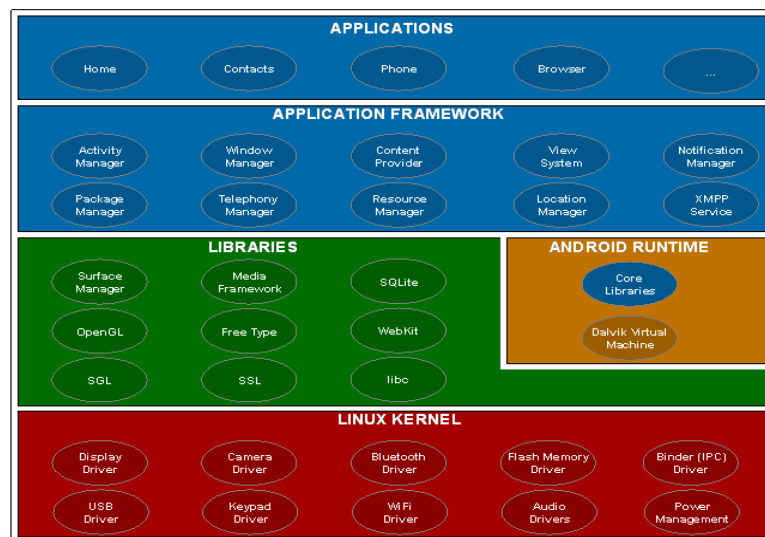


Figure (2.4) Major components of the android operating system ^[15].

2.6 Web Services

The term Web services is used very often nowadays, although not always with the same meaning. Nevertheless, the underlying concepts and technologies are to a large extent independent of how they may be interpreted.

Often, a Web service is seen as an application accessible to other applications over the Web. This is a very open definition, under which just about anything that has a URL is a Web service. It can, for instance, include a CGI script. It can also refer to a program accessible over the Web with a stable API, published with additional descriptive information on some service directory. A more precise

definition is provided by the UDDI consortium, which characterizes Web services as "self-contained, modular business applications that have open, Internet-oriented, standards-based interfaces".

This definition is more detailed, placing the emphasis on the need for being compliant with Internet standards. In addition, it requires the service to be open, which essentially means that it has a published interface that can be invoked across the Internet. In spite of this clarification, the definition is still not precise enough. For instance, it is not clear what it is meant by a modular, self-contained business application. The W3C definition is quite accurate and also hints at how web services should work. The definition stresses that Web services should be capable of being "defined, described, and," thereby clarifying the meaning of "accessible" and making more concrete the notion of "Internet-oriented, standards-based interfaces." It also states that Web services should be "services" similar to those in conventional middleware. Not only they should be "up and running," but they should be described and advertised so that it is possible to write clients that bind and interact with them. In other words, Web services are components that can be integrated into more complex distributed applications.

A step further in refining the definition of Web services is the one provided by the World Wide Web consortium (W3C), and specifically the group involved in the Web Service Activity: "a software application identified by a URI, whose interfaces and bindings are capable of being defined, described, and discovered as XML artifacts. A Web service supports direct intimations with other software agents using XML-based messages exchanged via Internet-based protocols".^[17]

2.7 Related Studies

In this chapter we will talk about studies they work as our project, the following related studies are used to the same purpose. Let's see them.

2.8 Code Smith Generator

Code Smith Generator is a template driven source code generator for different programming languages such as C#, Java or VB. The syntax of the templates is based on ASP.NET. Basically, XSD schemas are used for transforming its instances as XML documents to source code.

2.9 My 2nd Generation Code Generator

My2ndGeneration is a free .Net development tool for generating source code based on templates. The syntax of the templates is based on JScript, VBScript, C# or VB.NET. Databases such as SQL Server, PostgreSQL or Oracle are used as input for code generation.

2.10 Acceleo Generator

Acceleo is an open source implementation of MOFM2T, an EMF 10 M2T code generator framework, included in the Eclipse Modeling release. As an implementation of MOFM2T, Acceleo M2T language is template based. Acceleo uses OCL11 as model querying language. Hence, Acceleo M2T language can be considered a superset of OCL, facilitating its learning to modelers familiarized with MDE standards. Templates support both dynamic and static code and the specification of user code blocks (e.g. protected areas) to avoid overriding code added manually. Acceleo offers a complete M2T framework that includes the Acceleo M2T language, a runtime and SDK development tools. This SDK is included as part of the Eclipse M2T project. These SDK tools include advanced editors for

Acceleo modules (including code completion, validation, quick fixing, pattern management, etc.), wizards to create modules from existing code (bottom-up approach) and support for debugging, profiling and launching Acceleo modules on selected input models. There is a repository of Acceleo modules 12, including the UML 2.1 to Java module.

2.11 T4 Generator

T4 text templates, can be created using Visual C#, used to generate any text file or language. A template may consist of a mixture of text blocks and control logic. As input an XML document can be used. In addition, the diagrams of workflow in a business activity used for generating code. However, if your code generator is based on T4 templates, Visual Studio has to be installed, not only for defining the templates but also for executing the code generation based on the templates.

2.12 Code4Green

The ultimate Code Generation Tool is available to the programmers free. The only commitment needed from you is the commitment to make the Earth greener. tool supports programming languages including C#, VB.Net, SQL, Share point's Snippets, Java, XML, HTML, ASP, and many others.

2.13 Accelerator

The intent of the Accelerator solutions is to provide a rapid application development (RAD) environment , that produces well-designed n-tier code that can run in a client/server, web or mobile deployment. The use of Microsoft's .NET Framework, is recommended for zero-lock in development and optimal deployment

flexibility including both Windows Presentation Foundation (WPF) and Responsive web (and mobile) design (ASP.NET MVC / Bootstrap) clients.^[6]

The Accelerator uses customizable templates, standards and naming conventions to generate code. The generated code is human readable, and standardized to minimize testing, debugging, customization, and future maintenance efforts. The generated code follows object-oriented programming design principles, the inversion of control (IOC) pattern, observer pattern, model–view–view model (MVVM, with OO techniques to avoid redundancy, promote ease of testing and maintenance).Supports ASP.NET MVC3 Framework. Other patterns followed by the architecture, or are adapted depending on the case; flexibility promoted by the typical use of abstraction

patterns when practical. Abstraction is promoted through the use of Windows Presentation Foundation and Windows Communication Foundation.^[7]

2.14 Generjee

Generjee is a free online tool that generates source code of data-oriented applications according to an entity-relationship-model and a user-defined application design. The created code is intended as scaffolding to efficiently start new development projects from a prepared working code base. The produced output is technologically based on Java EE, JSF, Prime Faces, and JPA (e.g. Hibernate) and is ready to run on a Java EE application server or a micro services platform.^[8]

2.15 Summary

Table 2.1 show summary of related studies.

Product	Implementation language	Typical input	Other input	Typical output
My 2nd Generation Code Generator	JavaScript, HTML 5, CSS	Android, iPhone; BlackBerry, Tizen, mobile web	-	-
T4	-	T4 Template/Text File	-	Any text format such as XML, XAML, C# files or just plain text files.
Acceleo	Java	User-defined EMF based models (UML, E core, user defined metamodels)	Any EMF based input (X text DSLs, GMF graphical models, etc.)	Any textual language.
Accelerator	C#	Database schema	XML Schema, Templates and configuration tables	C#, WPF, ASP.NET, MVC, ASP.NET, WCF, Webservices (complete application)
Code4Green	C#, VB.net, ASP.net, SharePoint, SQL, JAVA, classical ASP, HTML, XML	Code4Green - an online ultimate code generation tool with a green cause of plantation of trees on each 10,000 LOC	Code in C#, VB.net, ASP.net, SharePoint, SQL, JAVA, classical ASP, HTML, XML	Output determined by the selected language type. It is a plain text.
Code Smith Generator	ASP.NET	C#, VB.net, js.net	Templates	Any ASCII-based (text based) language
Genexee	Java	Online-editor, user-defined models	-	Full Java EE Application

CHAPTER THREE:
Analysis & Tools and Techniques

3.1 Introduction

The analysis phase is where the project lifecycle begins, also it is the part of the project where you identify the overall direction that the project will take through the creation of the project strategy documents. Gathering requirements is the main attraction of this phase. The design phase is important phase in project lifecycle, it show the overall picture of the system's requirements and operation's hierarchy.

3.2 System Requirement

3.2.1 Functional Requirement

- **Insert Data Function**

System must provide insert component that allow the developer to insert his project information and what he needs in project.

- **Select Data Function**

System must provide selection component that allow the developer to select which view he want to display his project.

- **Execution data function**

System must provide execution component that allow the developer to Execute last phase in implementation and generate specified code.

3.2.2 Non- Functional Requirement

- **Portability**

The users shall be able to use the triple code generator from anywhere.

- **Usability**

Users should have no trouble using the tool with maximum ease of use as possible also a very fast learning curve.

3.3 System Analysis

3.3.1 System Analysis Using UML

3.3.1.1 Use Case Diagram

The Following diagram describes the main functionality of the project.

After User do registration then user can login to create new project.

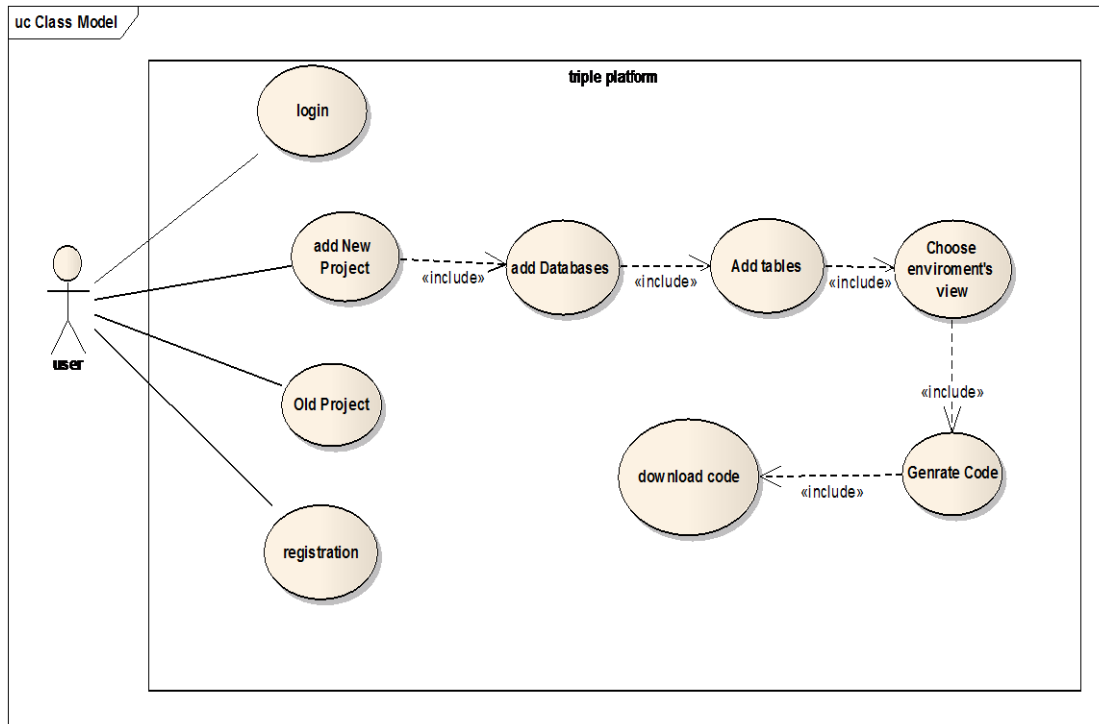


Figure 3.1: Use Case Diagram for System's Operations.

3.3.1.2 Sequence Diagram

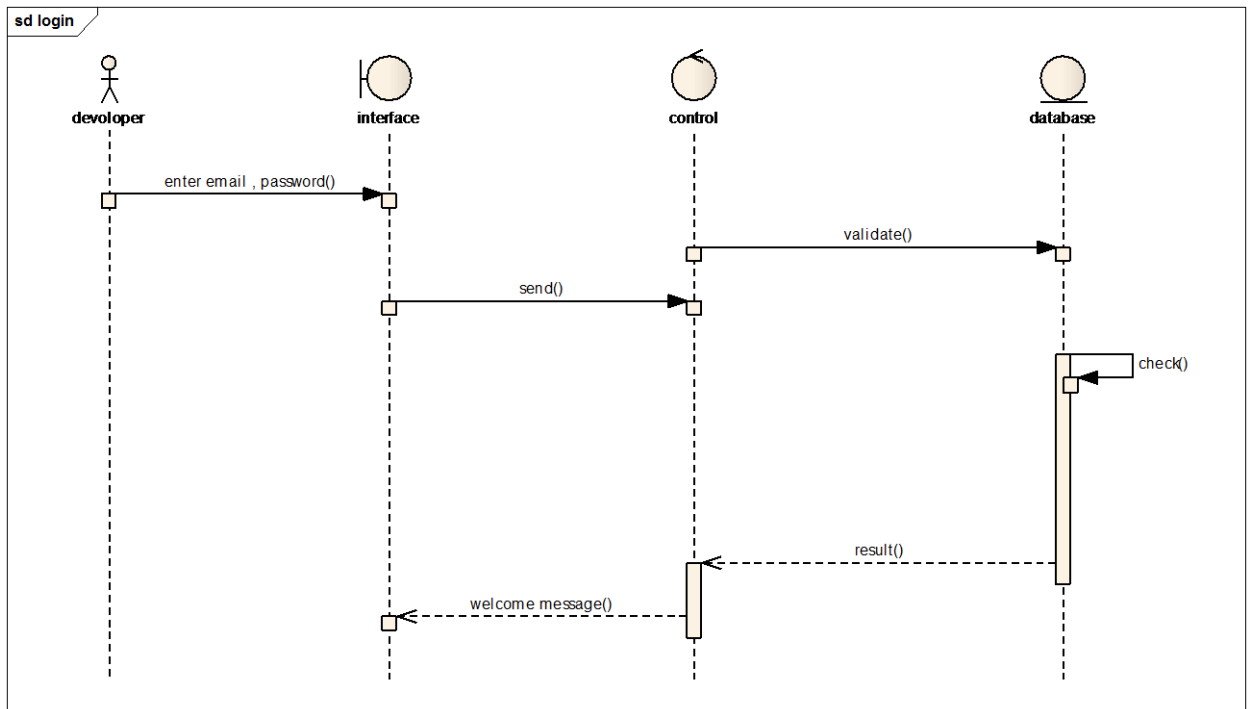


Figure 3.2: sequence Diagram of loginuse case.

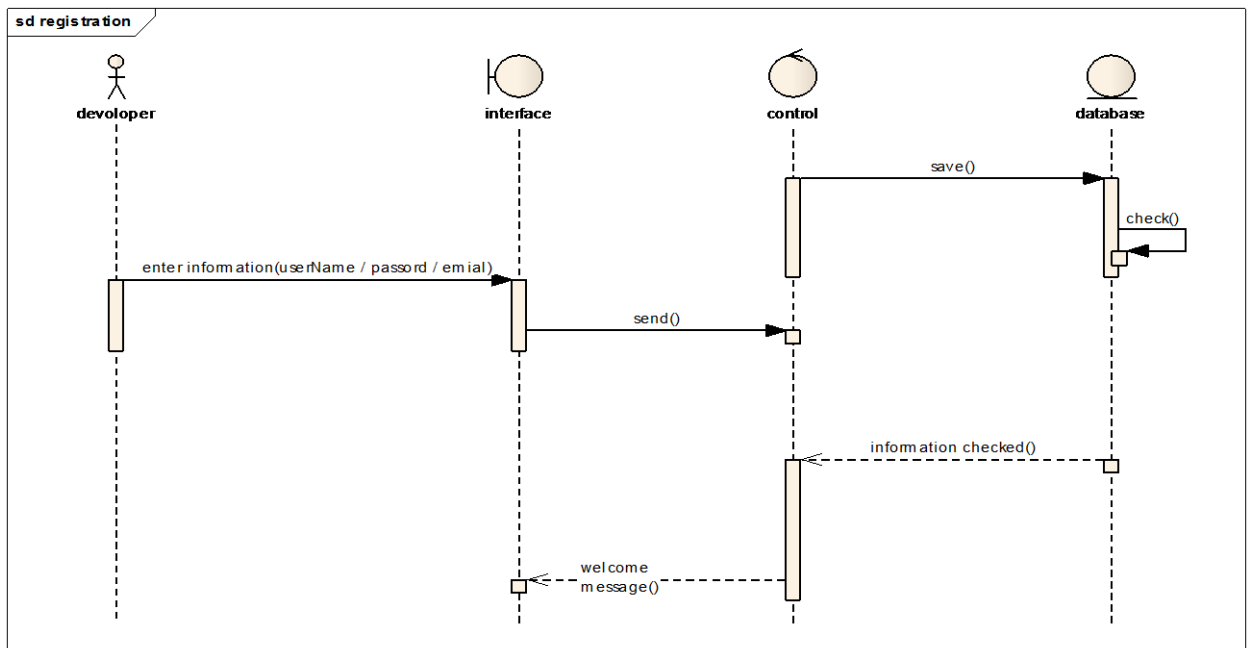


Figure 3.3: sequence Diagram for registrationuse case.

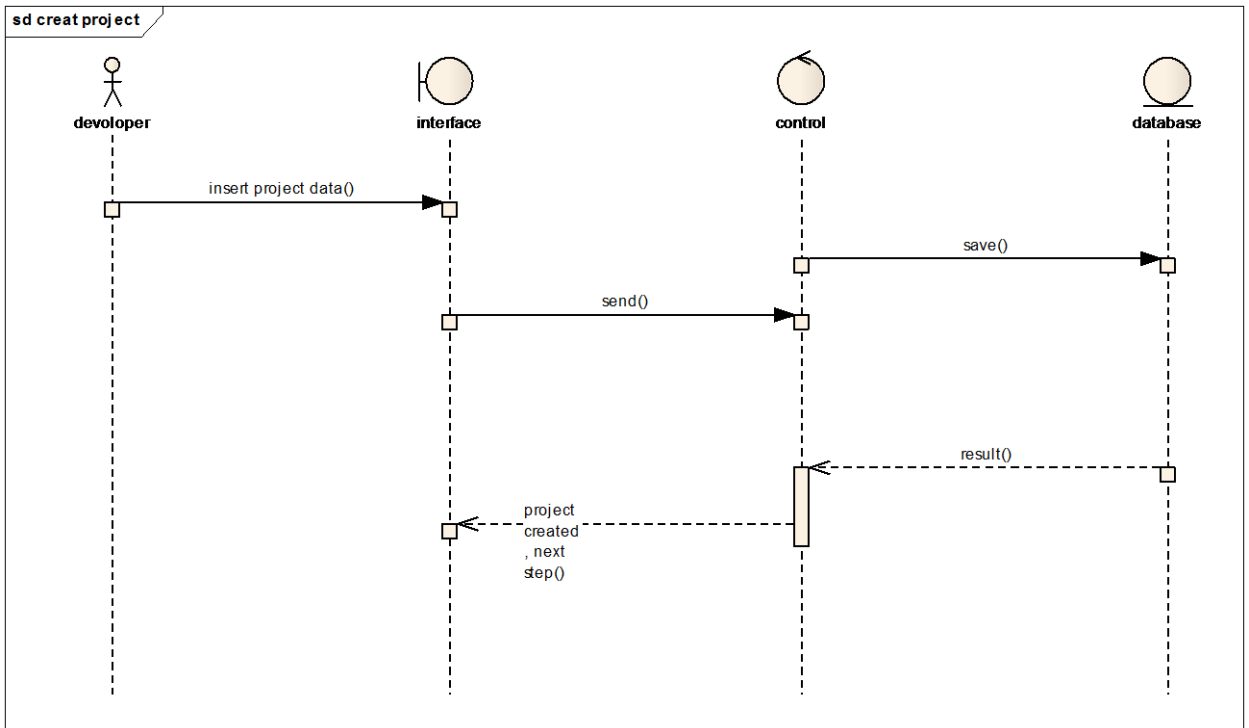


Figure 3.4: sequence Diagram for add projectuse case.

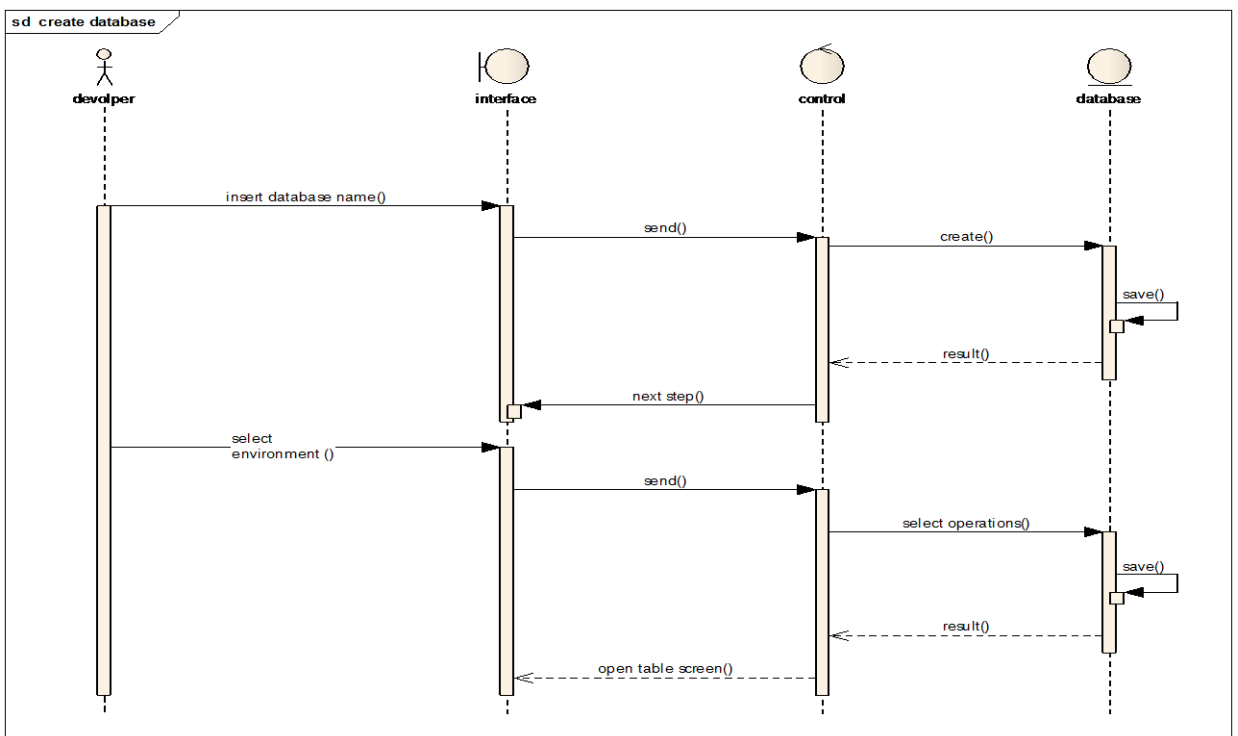


Figure 3.5: sequence Diagram for add database use case.

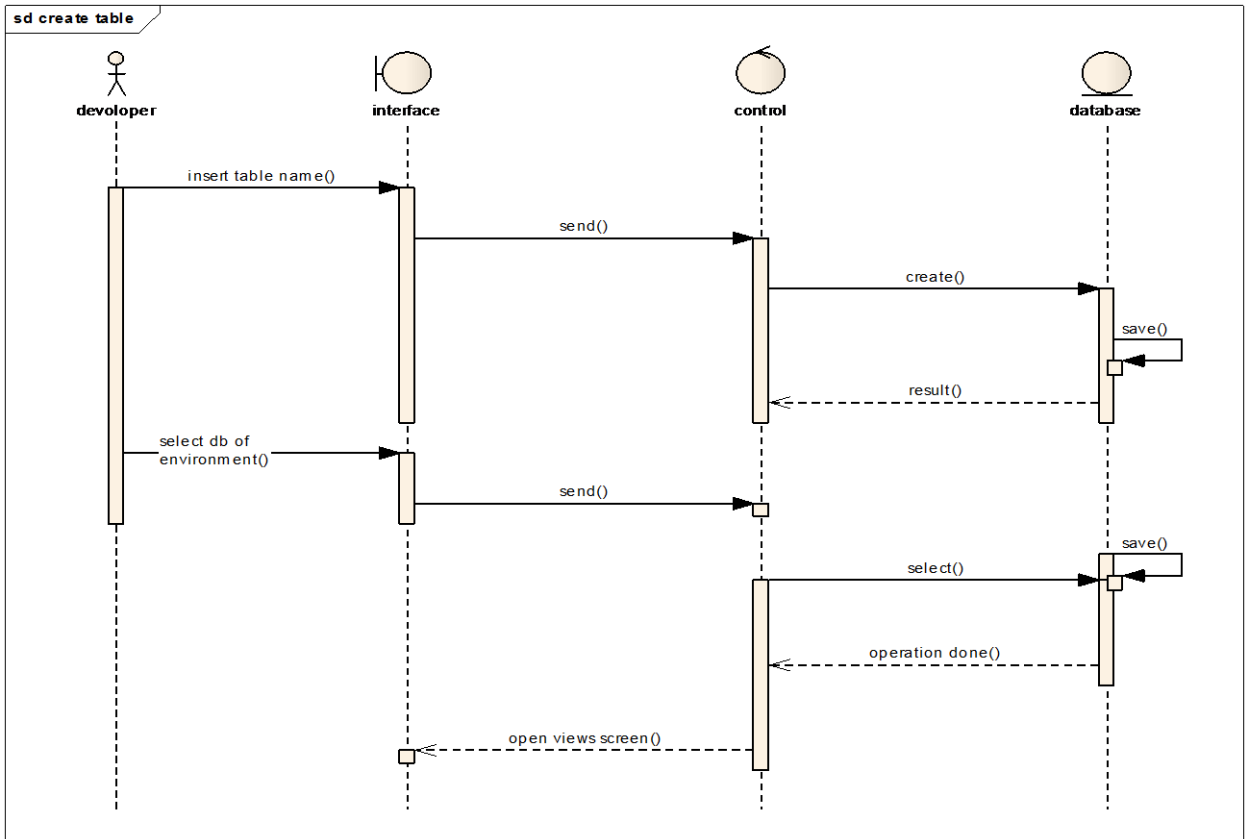


Figure 3.6: sequence Diagram for add tables use case.

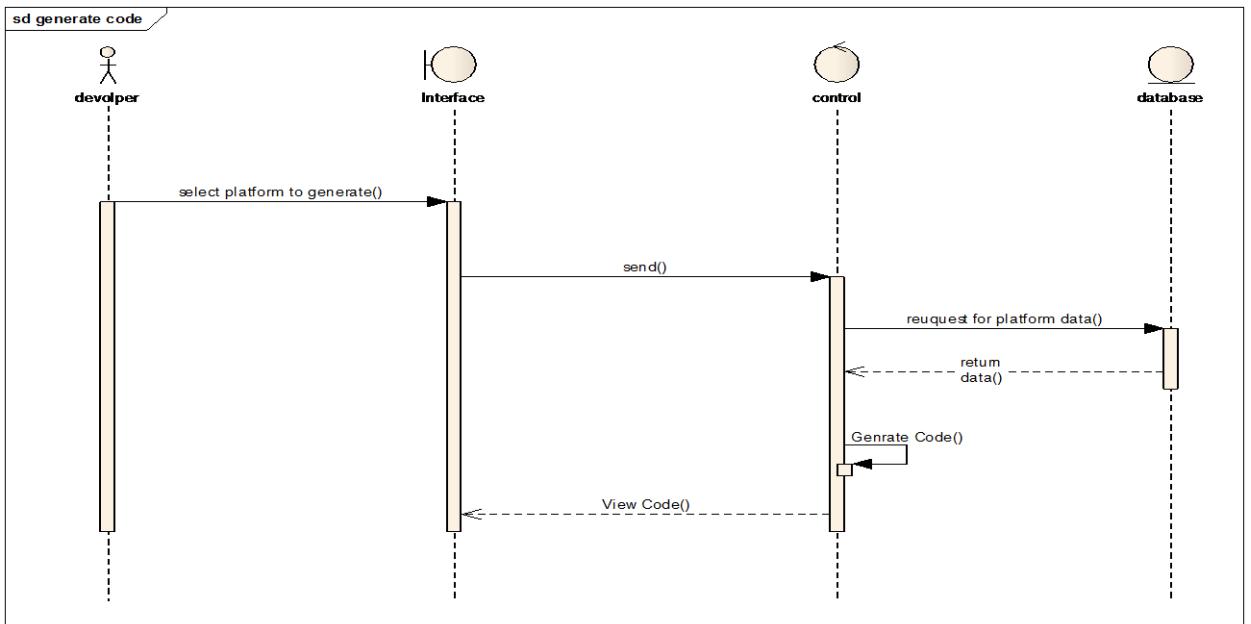


Figure 3.7: sequence Diagram for generate code use case.

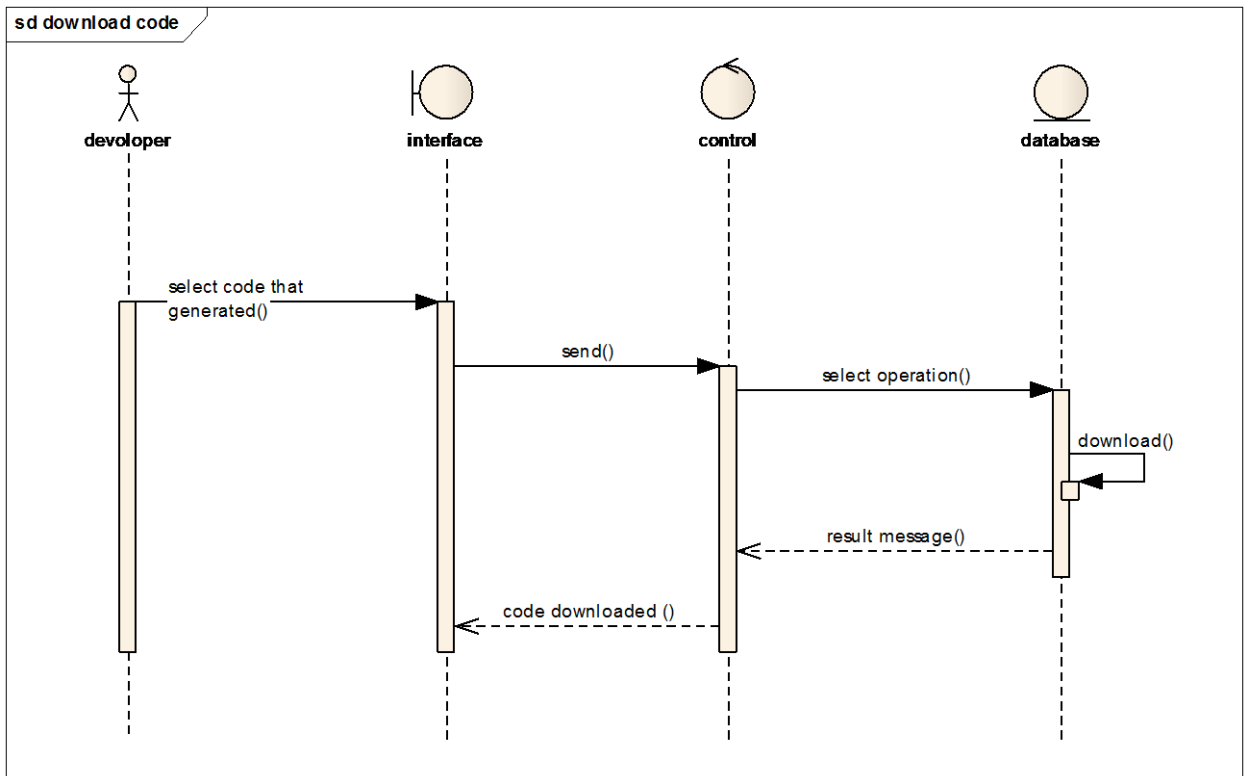


Figure 3.8: sequence Diagram for download code use case.

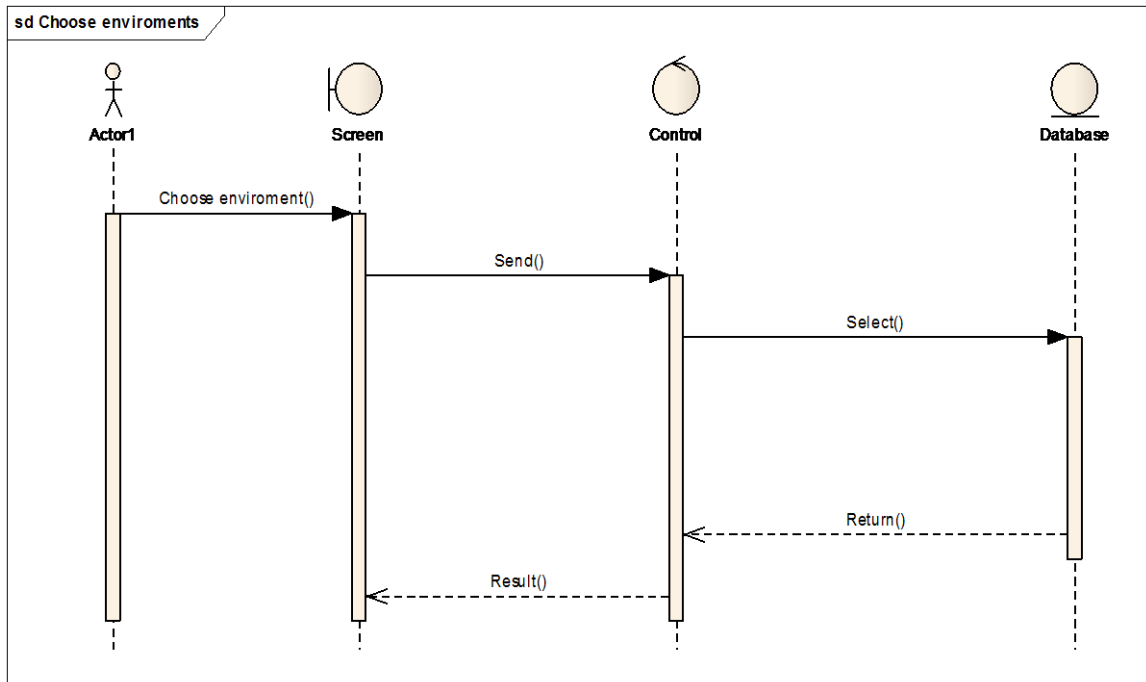


Figure 3.9: sequence Diagram for choose environment use case.

4.3.1.3 Activity Diagram

Activity diagram describes how system works.

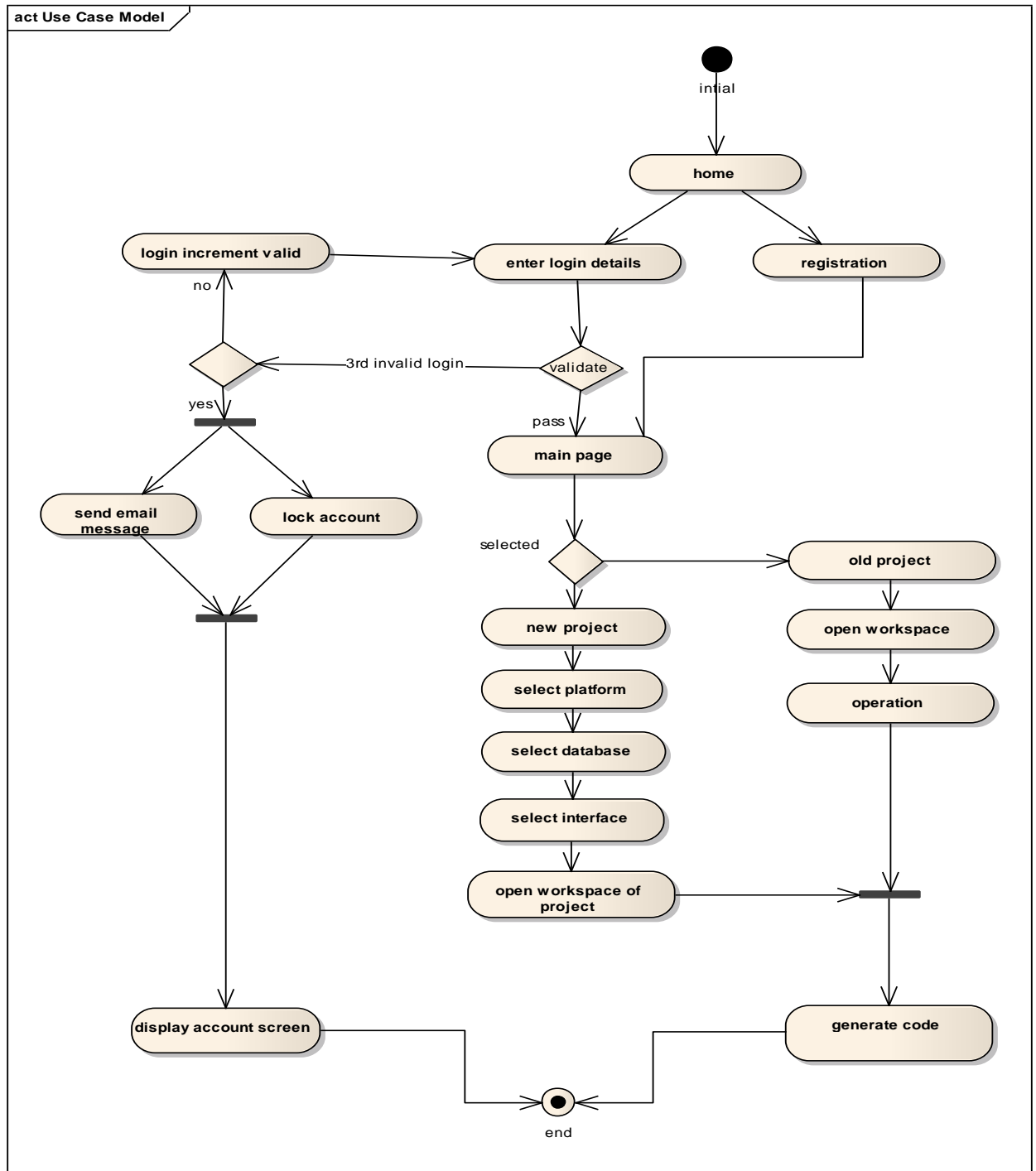


Figure 3.10: Activity Diagram for System.

4.3.1.4 State Diagram

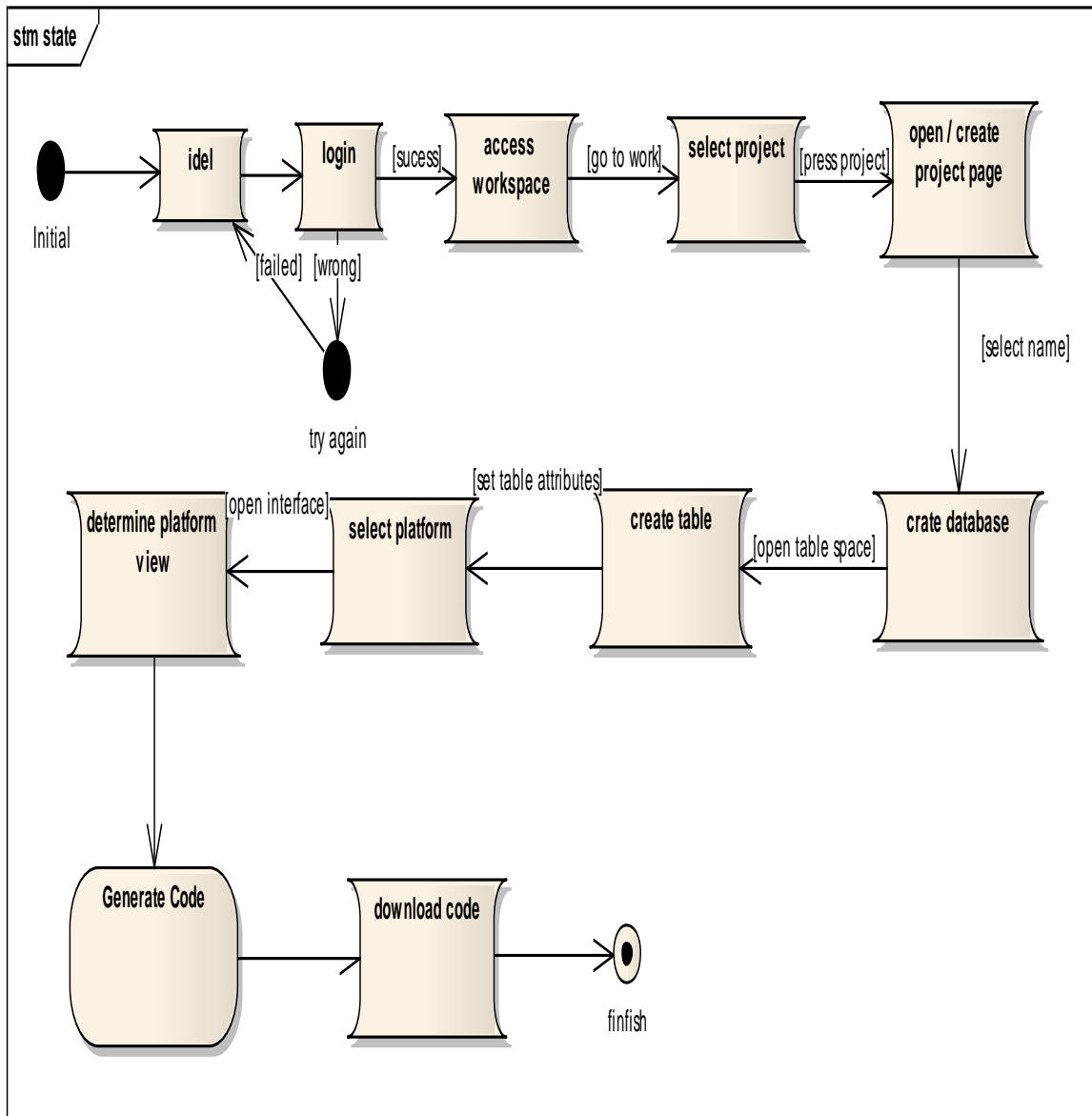


Figure 3.11: State Diagram for System.

3.4 System Design

3.4.1 class diagram

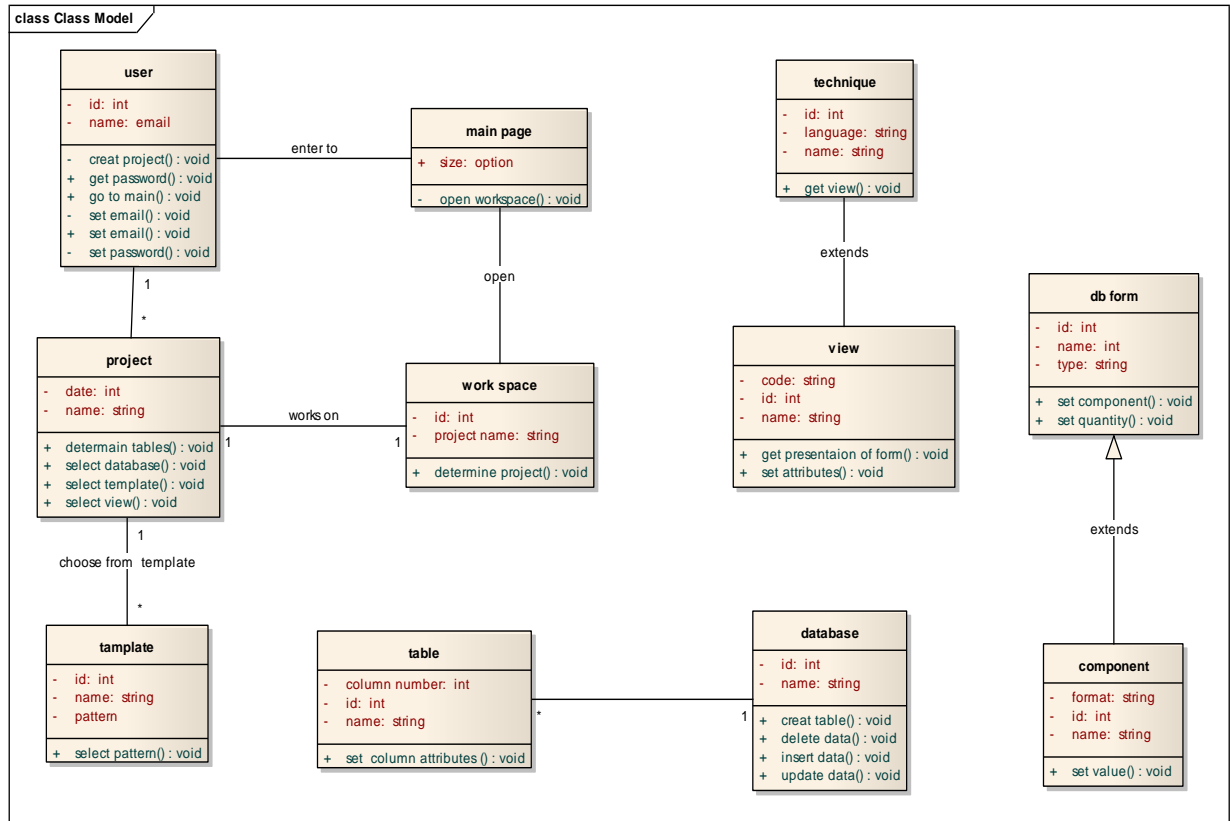


Figure 3.12: class Diagram for System.

3.5 Tools and Techniques

This section contains tools and the related technologies to our project twhich are: HTML, CSS, JavaScript, PHP, UML, MySQL,PostgreSQL, Wamp server,Bootstrap,Python and Django framework.

3.5.1 HTML

Hypertext markup language it’s a markup language we used it for designing, structuring and, presenting the content on the world wide web. website is made up of web pages which can be described by using html tags.^[18]

3.5.2 CSS

cascading style sheet CSS is style sheet language we use it for describing and identifying the presentation of document written in html language. CSS is used by most websites to create and styling user interface and made page separate for web applications, and mobile applications. we can add styling information to html document or by make or having external style sheet.^[18]

3.5.3 JavaScript

JavaScript is a programming language of html and web pages, used for make and generate actions and execute operations, more simply JavaScript make your page or application more dynamic. JavaScript is one that adds behavior to your app, and it's a programming language was made to be understood by web browser only.

JavaScript widely used as programming language for servers, game programming, and mobile applications, also for database. The syntax of JavaScript is actually obtaining from C language, and JS support many type languages. Almost web applications depend on JS to provide and make functionality.^[1]

3.5.4 PHP

PHP is same high-level language such as C, Java, Pascal, and so.

PHP is repetitive acronym and scripting language that usually combined with HTML and has many excellent libraries that provide fast access to DBMSs. PHP is tool designed for developing application logic in the middle of a three-tire app.

PHP script is collection of statements, each end with semicolon, and execute certain function.^[19]

3.5.5 UML

Unified Modeling Language, or UML, provides an overview of the most important diagrams used in the visual modeling of computing programs. The article is ideal for those who have little knowledge of UML concepts, including managers as well as novice practitioners.

Behavior diagrams:

1. Use case diagram.
2. Sequence diagram.
3. Activity diagram.
4. Class diagram.
5. State diagram.

3.5.6 My SQL

The most popular Open Source SQL database, is developed and provided by MySQL, a commercial company that builds its business providing services around the MySQL database. ^[20]

Features:

1. Written in C and C++. Tested with a broad range of different compilers.
2. Works on many different platforms.
3. Fully multi-threaded using kernel threads. This means it can easily use multiple CPUs if available.
4. Very fast B-tree disk tables with index compression
5. A very fast thread-based memory allocation system.
6. In-memory hash tables which are used as temporary tables.

3.5.7 PostgreSQL

(Pronounced "post-gress-Q-L") is an open source relational database management system (DBMS) developed by a worldwide team of volunteers. PostgreSQL is not controlled by any corporation or other private entity and the source code is available free of charge.

3.5.8 Wamp Server

Is a Windows web development environment It allows the programmer to create web applications with Apache, PHP and the MySQL database, it also comes with PHP My Admin to easily manage your database. ^[23]

3.5.9 Bootstrap

Bootstrap is a powerful front-end framework for faster and easier web development. It includes HTML and CSS based design templates for common user interface components like Typography, Forms, Buttons, Tables and many other as well as optional JavaScript extensions.

we used Bootstrap:

Bootstrap also gives your ability to create responsive layout with less efforts.

3.5.10 Python

Python programming language, from high-level languages, characterized simply written and read, easy to learn, use the object-oriented programming style (OOP), open source, and scalable. Python is the language of explanatory language, multi-purpose and are widely used in many fields, such as building independent software using the graphical interfaces known in the work of Web programs.^[21]

we use python:

1. Is very flexible language.
2. Increasing popularity in the scientific community.

3.5.11 Django

Django is a full-stack Python “web framework that encourages rapid development and clean, pragmatic design”. Developed in a fast-paced onlinenews environment in Lawrence, Kansas, it claimsto be “the web framework for perfectionists with deadlines.” Django was developed in 2003, but wasn’treleased as open source until July 2005, the formalrelease 1.0 was in September 2008, and the current version is 1.1 (June 2009). “Django focuses onautomating as much as possible and adhering to theDRY (don’t repeat yourself) principle”. Djan- gosites.org serves as a showcase of Django powered sites; there are 2383 websites listed, including news and entertainment sites such as Lawrence ([http:// lawrence.com](http://lawrence.com)), Washington Post

(<http://washingtonpost.com>) LJWorld.com (<http://LJWorld.com>), social networking and photo sharing sites such as Tabblo (<http://tabblo.com>), Grono (<http://grono.net>), as well as business, educational, ecommerce, and other sites. There are several CMS built in Django, such as Ellington, a CMS specifically built for newspapers, magazines, and entertainment websites, Django-CMS, and Django Page CMS. Django is based on Python, which is a very popular programming language. Often compared to Perl, Ruby, and Java, it is a dynamic object-oriented language. Python offers strong support for integration with other languages and tools and comes with extensive standard libraries. Large firms such as NASA, Google, YouTube, Yahoo!, and Apple use Python for their applications. The language is easy to learn and follows the principles of simplicity, readability, expressiveness, and modularity. Python is an open source language and has a large number of libraries and modules available. Django has a lot in common with Python. Python is overseen by the Python Software Foundation (PSF). Similarly, Django has started its own organization called the Django Software Foundation (DSF). In December 2008 a new version (3.0) of Python was released. In version3 Python underwent a thorough clean up that gives it the opportunity to grow and develop going forward. This version is not backward compatible, and consequently it will take a long time until large projects transition to the new version.^[22]

Django Architecture:

Although Django calls its architecture model-view-template (MVT), it is very similar to MVC. In MVC, an application's data model, user interface, and control logic are separated into three components. The model manages the data of the application and the business rules; the view is responsible for displaying data to the user through an interface; and the controller interprets user inputs and communicates with the model to make the appropriate changes.

features and attributes:

1. Streamline development process by automating some of the parts.
2. Add structure to the code and make code more readable.
3. Reuse components, to speed up the development process.
4. Support concurrent creation, update of content and development.

we use Django:

The main advantages of Django are automatically generated administrative interface and simple templates which can be used by non-programming web designers. Django provide more powerful underling architecture and system will support rapid application development.

3.6 Summary

This chapter addressed analysis and diagrams of project and the main tools and techniques that have been used to achieve the goals of this project.

CHAPTER Four: Implementation

4.1 Introduction

This chapter shows the implementation steps and some of system screens which illustrate the functionality of the system.

4.2 System implementation Steps

Main page include: about us ,work space, services and help



Figure 4.1: Home Page .

- **Login or registration**

1. User can login or register new account.
2. In login enter his registered email and password.
3. In register enter username and email to be registered with and password then confirm password.

The image displays two side-by-side forms. The left form is for login, featuring an 'Email' input field with the placeholder text 'Your Email', a 'Password' input field, and a teal button labeled 'login'. The right form is for registration, featuring a 'Name' input field with the placeholder text 'Your Name', an 'Email' input field with the placeholder text 'Your Email', a 'Password' input field, a 'Confirm Password' input field, and a teal button labeled 'Registrar'.

Figure 4.2: Registration and login Screen.

- **Add project**

Here the user enters the new project name then save into database Project table.

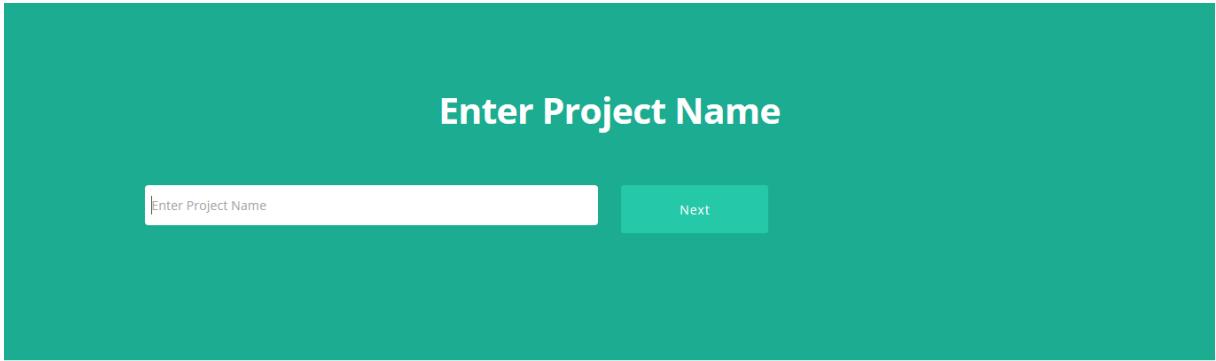


Figure 4.3: adding project Screen.

- **Add database**

Here the user enter the database of his project name then choose the environments to create it on (Android:SQLite, Web:MySQL, Odo:POSTGRE) System insert it into the databases table.

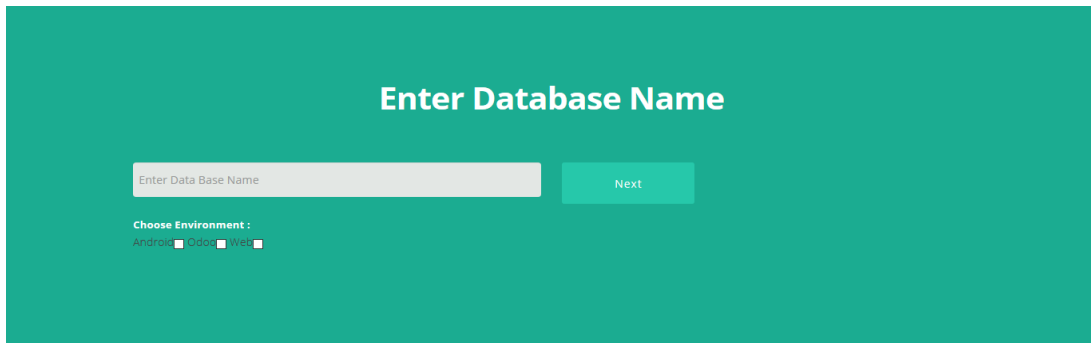


Figure 4.4: adding database Screen.

- **Add tables**

Here the user enters the number of tables to be created in the database choose on the previous step.

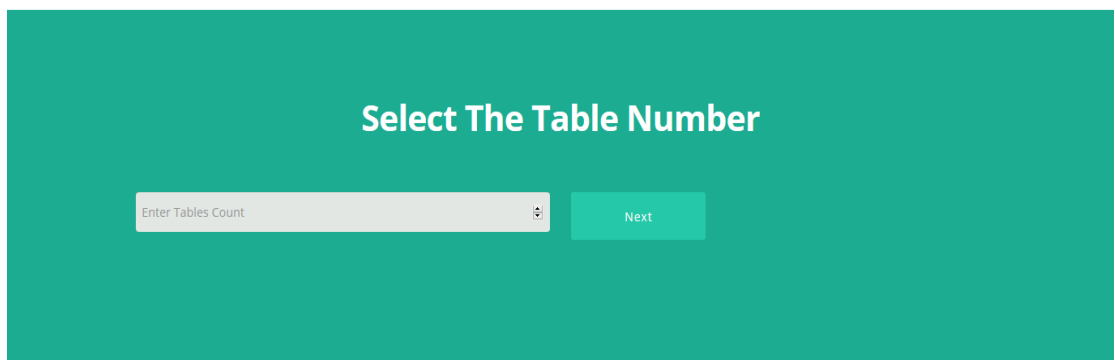


Figure 4.5: adding tables Screen.

- **Add attributes**

- 1.This screen will appear x times depends on the number of tables the user entered on the previous step.
- 2.User must enter the table name and the columns' (name, type, length/values, Default, Collations, Attributes, Null, Index, AI, Comments and Virtuality) if user wants to add another column click on the + button.
- 3.Then user choose the environment to create table in it.

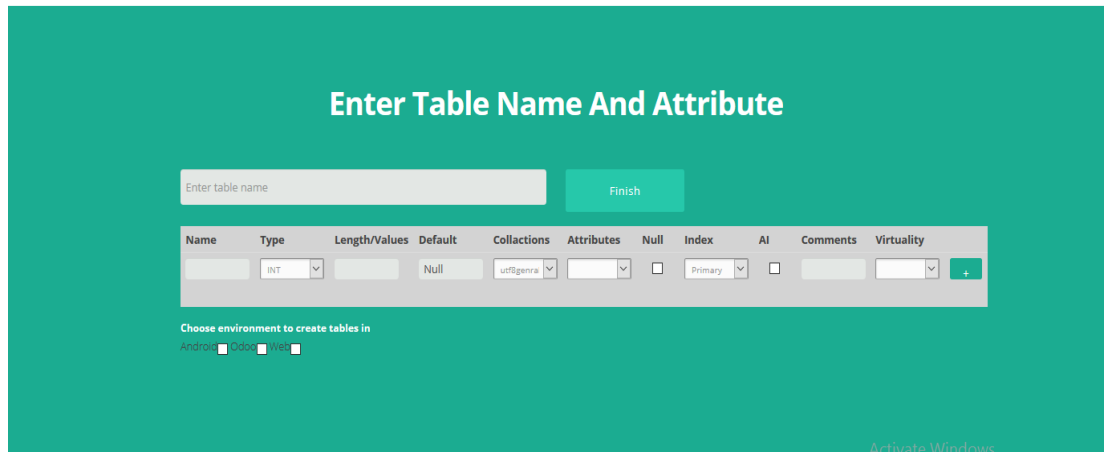


Figure 4.6: adding attributes Screen.

- **Select odoo view**

User choose the view type to be displayed on the Odoo table control screen for each table.

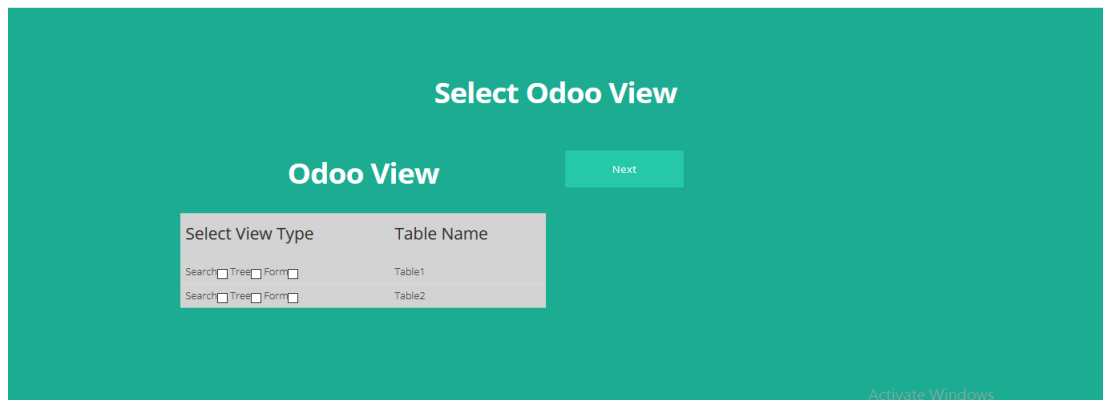


Figure 4.7: select odoo view Screen.

- **Select web view**

User choose the view type to be displayed on the Web table control screen for each table.

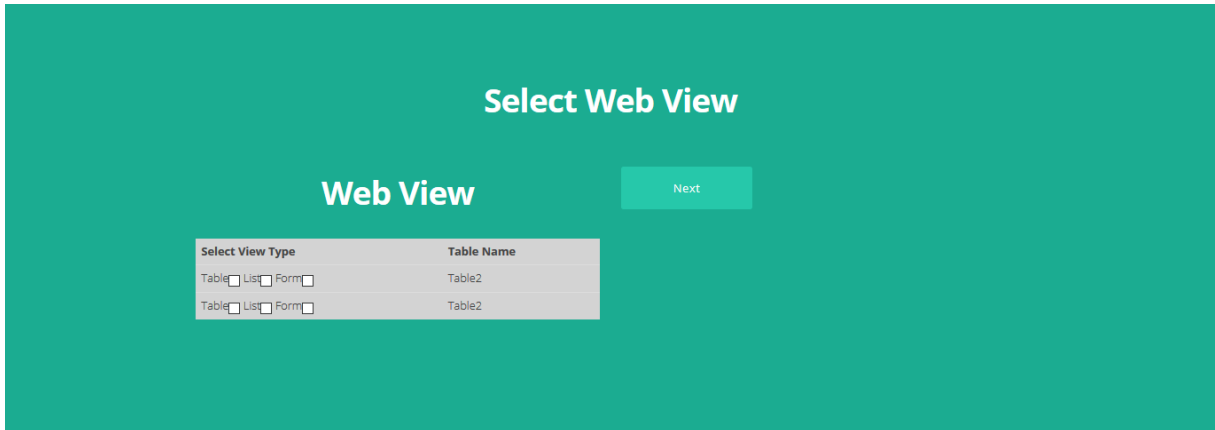


Figure 4.8: select web view Screen.

- **Select android view**

User choose the view type to be displayed on the Android table control screen for each table.

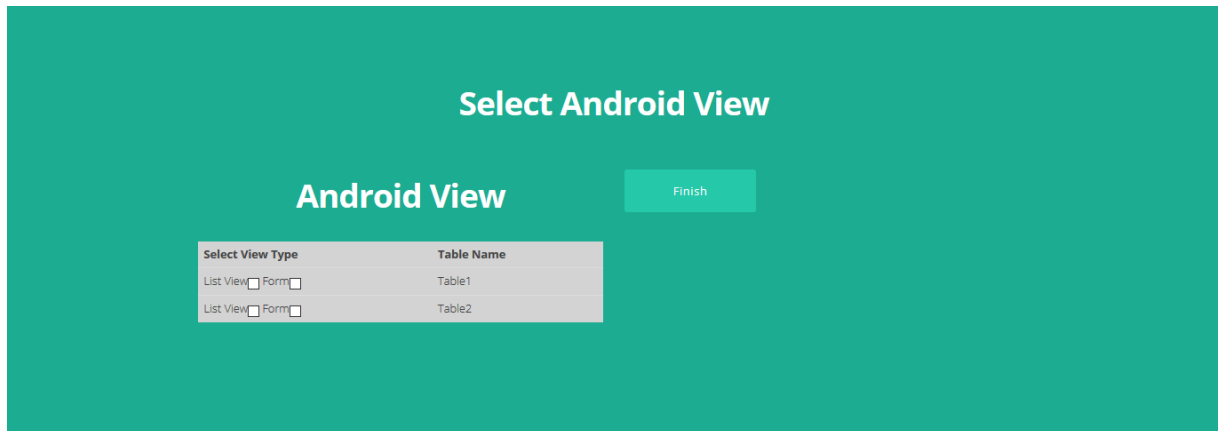


Figure 4.9: select android view Screen.

4.3 Summary

In this chapter we showed system screens and how the system works, and in the next chapter we will present the result of our system and the recommendations that we wish from the next developers to continue on it.

CHAPTER FIVE:

Results and Recommendations

5.1 Introduction

At the earliest chapters of this research, we showed the main contribution of our system and the services provided by it according to the goals that we determine at the first chapter. We came out with a result that fulfils our goals.

In this chapter we will discuss the result of the system, recommendations for this project.

5.2 Results

- Dealing with system is online.
- In few steps three codes for three different platforms was produced.
- A full function Odoo module, Android classes, web pages were automatically generated.
- Database and tables were created with different views in a simple single step.
- All Basic View and UI created.
- Triple code generator lowers the costs for software and resources.
- Provided features are regularity of work and invest a lot of time and efforts.
- Triple code generator is available on almost, anytime, anywhere.

5.3 Recommendations

The research has delivered the requirements that were defined at the beginning, but the tool still need to be developed, so for those who will continue the research they must take into their account the following recommendations:

- the developer must use the tool without need to write any code just insert the basic input and select the components using “drag and drop” .

5.4 Conclusion

- We cannot say that our Triple code generator looks like Code4Green generator or other code generator tools because it's still need to be developed to cover and satisfy large projects needs, We did our best to provide all the features that is required in a software of small scale, but still there are huge work must to be done to get such a brilliant tool to production.
- By using the research's Triple code generation tool, the process of creation database and view become easier, faster and more efficient. The reason behind the research was to achieve developers dream which is zero lines of code.
- We designed the system and analysed it using UML (unified modelling language), and implemented it using python, java, JavaScript, CSS, HTML5, PHP, My SQL, Xml.
- We hope that those who will use our Triple code generator tool get the best benefits from it, other code generator tools perform good and sure they are better than our tool in their requirements coverage domain but triple tool is better in platforms coverage domain because it cover odoo technology which is not covered in any other tool, so we highly recommend other researchers to complete our project to make it the best in multi-platform code generators tools.

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