ONLINE REQUEST AND APPROVAL MANAGEMENT SYSTEM

A CASE STUDY OF UNIVERSITY OF KIGALI

BY

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Research Proposal submitted in partial fulfillment of the requirement for the award in Bachelor of Science with honors in Computer science (BCS) submitted to the Faculty of IT and Architecture, University of Kigali.

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DECLARATION

This research study is my original work and has not been presented to any other Institution. No part of this research should be reproduced without the authors' consent or that of University of Kigali.

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Declaration by the supervisor(s)

This research has been submitted with our approval as The University of Kigali Supervisor(s).

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DEDICATION

I would have dedicated this to my family and friends but since they won't read any of it but only celebrate on graduation.

I dedicated this

To whoever might find it interesting,

especially you who will use it as a reference.

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ACKNOWLEDGEMENT

Thanking the Almighty God that I'm still breathing and full of energy to conduct this research project.

In this respect therefore, my profound thanks go to my supervisor Mr. NICHOLAS KATENDE to whom I indebted to read all my drafts and making positive contribution and criticism when it was due. He has been great and offered his time for the accomplishment of this project.

I am grateful for all IT &ARCHITECTURE lecturers for they have shaped my knowledge in the field of computer science.

Sincere thanks go to my lovely Dad and Mom, couldn't have done it without your genetic material.

My fellow students, especially you that have 'suffered' along side me everyday the past three years. I am very grateful for sharing this experience with you, for all the meals, the discussions and the laughs we had. Thank you for cheering with me.

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ABSTRACT

This project is about online request and approval management system, a system that enables the management of requisitions of employees throughout an organization. It helps to create requests online, track the process until the request(s) is(are) approved. Employees are able to create/edit or delete requests, follow them up online until they are approved. The approvers too can approve or deny requests and provide comments. The system has information about the database which contains employee's details, requisitions details, and all services offered to the user. This project report covers the explanations about automated methods and approaches used when implementing the new system to reduce the problems raised by the existing system that delays work.

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LIST OF ABBREVIATIONS

CSS : Cascading Style Sheet
HTML : Hyper Text Markup Language
IT : Information Technology
MySQL : My Structured Query Language
PHP : Hypertext Preprocessor
SDLC : Software Development Life Cycle
XAMPP : Extended Apache MySQL, PHP, Perl.
DFD : Data Flow Diagram
ERD : Entity Relationship Diagram
PDM : Physical Data Model
RAM : Random Access Memory
BCS : Bachelor of Computer Science

CHAPTER ONE

GENERAL INTRODUCTION

1.1. BACKGROUND OF THE STUDY

To be successful in the 21st century means being comfortable with using technology on a regular basis; where faster, smarter and more efficient should be distinctive qualities of technologies you should equip your business with. Employees when given necessities to perform their work certainly there is no way they can't be productive.

However, most internal request and approval process may delay work mostly if they are of multiple approval steps; miscommunication and mistakes may arise when everyone's part in approval process is not clear and defined. Approvals delay as emails are forwarded around the company in search of the right person.

University of Kigali philosophy states that UoK has the vision of radiance and excellence with its quality education, research, services to community and utilization of new information and communication technologies. Well to achieve that excellency and quality education with utilization of new information and communication technologies, it must start from the roots, from the employees of the campus, Online request and approval system is an automated way of sending and approving requests employees log into a portal where the can submit approval requests and track their progress while approvers can easily review and approve requests; administrators can designate alternate approvers to cover for vacation, illness or travel, all of this to keep the organization efficient and accountable

1.2. STATEMENT OF THE PROBLEM

As business grow, streamlining process becomes a necessary priority to improve business performance; sometimes delayed process can lead to ineffectiveness and poor performance of employees. If your organization is like most, an approval process means employees and supervisors are spending a lot of time tracking down paperwork, shared documents, sending emails or making calls, etc. your business handles a lot of internal requests and approvals for instance material requisition. That's a lot of people asking for a lot of things, some with multiple approval steps which may delay work and cause administrative headache of request management. Online request and approval management system comes in to automate and keep organization efficient and accountable; employees log into portal where they can submit approval requests and track their progress and approvers can easily review and approve any outstanding requests online. Miscommunication and mistakes are also greatly decreased when everyone's part in approval process is clear and defined. Documents are sent to the right person(s) every time no more approval delays as emails are forwarded around in search for the right person.

1.3 OBJECTIVES OF THE STUDY

1.3.1 General Objectives

The main objective of this study is to develop and implement an online Request and Approval Management system that will help to manage employee's requisitions online thus saving time and maximizing efficiency.

1.3.2 Specific Objectives

i. Create login portal
ii. Creating a database that manages users accounts
iii. Designing a portal that is used to approve requests
iv. Designing an email notification system
v. Generate reports for better insights

1.4 RESEARCH QUESTIONS

The following are the research questions for my project ONLINE REQUEST AND APPROVAL MANAGEMENT SYSTEM

- How to log into the system?
- How will users accounts be managed?
- How is the system used to approve requests?
- How to know if an employee sent a request?

1.5 SCOPE OF THE PROJECT

1.5.1 Content Scope

The proposed System is customized for the use of university of Kigali in handling and managing online requests and approvals of its employees which takes into account the usage of computers. The system helps to create a database that contains employee's information and the office or department the employee belongs to so that is ease up the approval of his/her superior.

1.5.2 Time Scope

The time that will be spent developing the project is roughly 3 months' time. Including the time for planning, developing the prototype and collecting relevant data needed in the development of the project.

1.5.3 Geographical scope

Online Request and Approval system development takes place at University of Kigali located at Kacyiru in Gasabo District, KG 542 St, Kigali Rwanda

1.6 INTEREST OF THE PROJECT

1.6.1 personal interest

The completion and success of this research project will award me a Bachelor's degree in computer science. The development of this project will also enable me to delve and apply different programming languages acquired during my university studies hence providing a hand on experience in software development.

1.6.2 Institutional interest

Online Request and Approval Management System will help the university of Kigali in handling its employees request and approvals online thus saving time and providing a more effective way to perform work. The system will be ready for use.

1.6.3 Public interest

The system will help the employees to send their requests and make them approved fast and without delaying.

1.7 LIMITATIONS OF THE PROJECT

Like any other project or any other work done by a human being, there are ups and downs, therefore I expect to face hindrances in the course of my research but I will try to reduce or overcome the hindrances.

i. Limited internet connection in the course of developing the project; internet access and cost are cascading challenges today and as student this is one of the biggest challenges I face, otherwise I would be more effective.
ii. In the research study, the researcher may face a problem of respondent's reluctance in giving the required information.

1.8 ORGANIZATION OF THE PROJECT

The work is divided into five chapters:

Chapter 1: General introduction. This chapter provides the general description of project, deals with introduction which provides an insight into what the research is all about, the statement
of the problem, purpose of the study, limitations of the study and finally organization of the study.
Chapter 2: Literature review. Deals with the literature review which provides details about what other authors have done that is in relation with the system am working on and hence set a benchmark for the current project as well as to justify the use of specific solution techniques.
Chapter 3: Research design and methodology. Deals with research design and methodology.
Chapter 4: System analysis, design and implementation. Deals with system analysis, design and implementation.
Chapter 5: Discussion, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

“Sometimes we need to go backward before we can move forward” said Jaclyn Mullen. Knowing deeply the existing system is vital to the conception of the new system, that is why in this chapter we will review and make a comparative study of the work done by other researchers in the related area of research. As for understanding the new system, we will provide a brief description about terms that are used during development of this project.

Definition of key terms.

i. Online

Online is the condition of being connected to a network of computers or other devices. The term is frequently used to describe someone who is currently connected to the internet. (Rouse, 2008)

ii. Requisition

a requisition is a demand or application made usually with authority such as a written request for something authorized but not made available automatically. (Anon, 2018)

iii. System

a system as a network of interrelated procedures that are joined together to perform an activity or accomplish a specific objective. They noted that, a system could be classified as being open or closed. (Rosen, 2012)

Database system concepts

i. Data

Data is a collection of numbers represented as bytes that are in turn composed of bits (binary digits) that can have the value one or zero. Data is processed by the CPU, which uses logical operations to produce new data (output) from source data (input).
(Elmasri& Navathe ,2016)

ii. Database

database is an organized collection of data, stored and accessed electronically. Database designers typically organize the data to model aspects of reality in a way that supports processes requiring information. (Stallings, 2012)

iii. Database Management System

A database management system (DBMS) is system software for creating and managing databases. The DBMS provides users and programmers with a systematic way to create, retrieve, update and manage data.(Monelliah and Arepalli G ,2017)

iv. Data Modelling

Data modeling is the process of documenting a complex software system design as an easily understood diagram, using text and symbols to represent the way data needs to flow.
(Papazoglou& Zahir, 2010)

v. Entity

An entity is an object that exists. In database administration, an entity can be a single thing, person, place, or object. Data can be stored about such entities. (Lerman, 2012)

vi. Table

A table is a set of data elements (values) using a model of vertical columns (identifiable by name) and horizontal rows, the cell being the unit where a row and column intersect. A table has a specified number of columns, but can have any number of rows.
(Davidson R, 2014)

vii. Record

Records are composed of fields, each of which contains one item of information. A set of records constitutes a file. For example, a personnel file might contain records that have three fields: a name field, an address field, and a phone number field. In relational database management systems, records are called tuples. (Michael S - 2012)

viii. Fields

A space allocated for a particular item of information. A tax form, for example, contains a Number of fields: one for your name, one for your social security number, one for your income etc.
In database systems, fields are the smallest units of information you can access. **(**Tim Johnson ,2011**)**

ix. An Attribute

An attribute is a characteristic or property of an entity. The term is used in this text exactly as it is used in everyday English. For entity person, for example, the list of attributes might include such things as eye color and height. For Premiere Products, the attributes of interest for the Entity customer is such things as customer name, street, city, and so on. An attribute is also called a Field or column in many database systems.
(Carles &, Akiba ,2014)

x. A Primary Key

A **primary key**, also called a **primary** keyword, is a **key** in a relational **database** that is unique for each record. It is a unique identifier, such as a driver license number, telephone number (including area code), or vehicle identification number. **(**W. Pink ,2009**)**

xi. Foreign Key

A **foreign key** is a field (or collection of fields) in one table that uniquely identifies a row of another table or the same table. In simpler words, the **foreign key** is defined in a second table, but it refers to the primary **key** or a unique **key** in the first table.
(Lerman& Rowan M, 2012)

xii. A flowchart

A flowchart is a formalized graphic representation of a logic sequence, work or manufacturing process, organization chart, or similar formalized structure. The purpose of a flow chart is to provide people with reference point when dealing with a project or process (Gallagher, 2011)

2.2 REVIEW OF THE PAST STUDIES

The eApproval app by intellect (2016*)* is an electronic application that simplifies approvals hence bringing approval workflows in one place.

It creates requests for approval on just anything-to buy a new laptop, attend a conference, approval on a new sales contract, or get a new marketing brochure approved. It allows uses not to lose sight of approval requests in their email, know what's important and get it done. It provides automatic reminders and can get upgraded to paid plans which provides additional features.

ApprovalMax by xerocon Brisbane (2017) is an innovative cloud approval workflow system ApprovalMax enables spend control and optimization for organizations of all sizes.
Coupled with cloud accounting software, it allows a flexible definition of approval authorization levels and the automation of approval processes for finance and accounting.
ApprovalMax ensures better process control and visibility, and fosters compliance and audit readiness for both in-house and outsourced accounting processes. It is connected with other apps like QuickBooks, it enables the creation of purchase orders without logging into QuickBooks online. It restricts purchase order requests with regard to suppliers, inventory items and tracking categories. Business users need no particular technical expertise for configuring a custom approval workflow and approval matrix.

Approval workflow management software by comidware® (2014) provides an effective way to Collect and route approval requests and task hand-overs; Manage related data and documents effectively; Track approval status and collaborate with a team on-the-fly; Evaluate performance of the approval workflows and optimize them.

Its key features include approval request forms where Request-specific web forms collect all required information to ensure that the proper request information is provided in the proper format and trigger proper approval workflow. Approval tracking and collaboration where Internal and external users are given access to a portal where they can submit requests, track approval status, take any necessary follow-up actions and provide feedback to staff handling their requests and you can work with approval workflow tasks right from MS outlook.

2.3. CONCEPTUAL FRAMEWORK OF THE CURRENT PROJECT

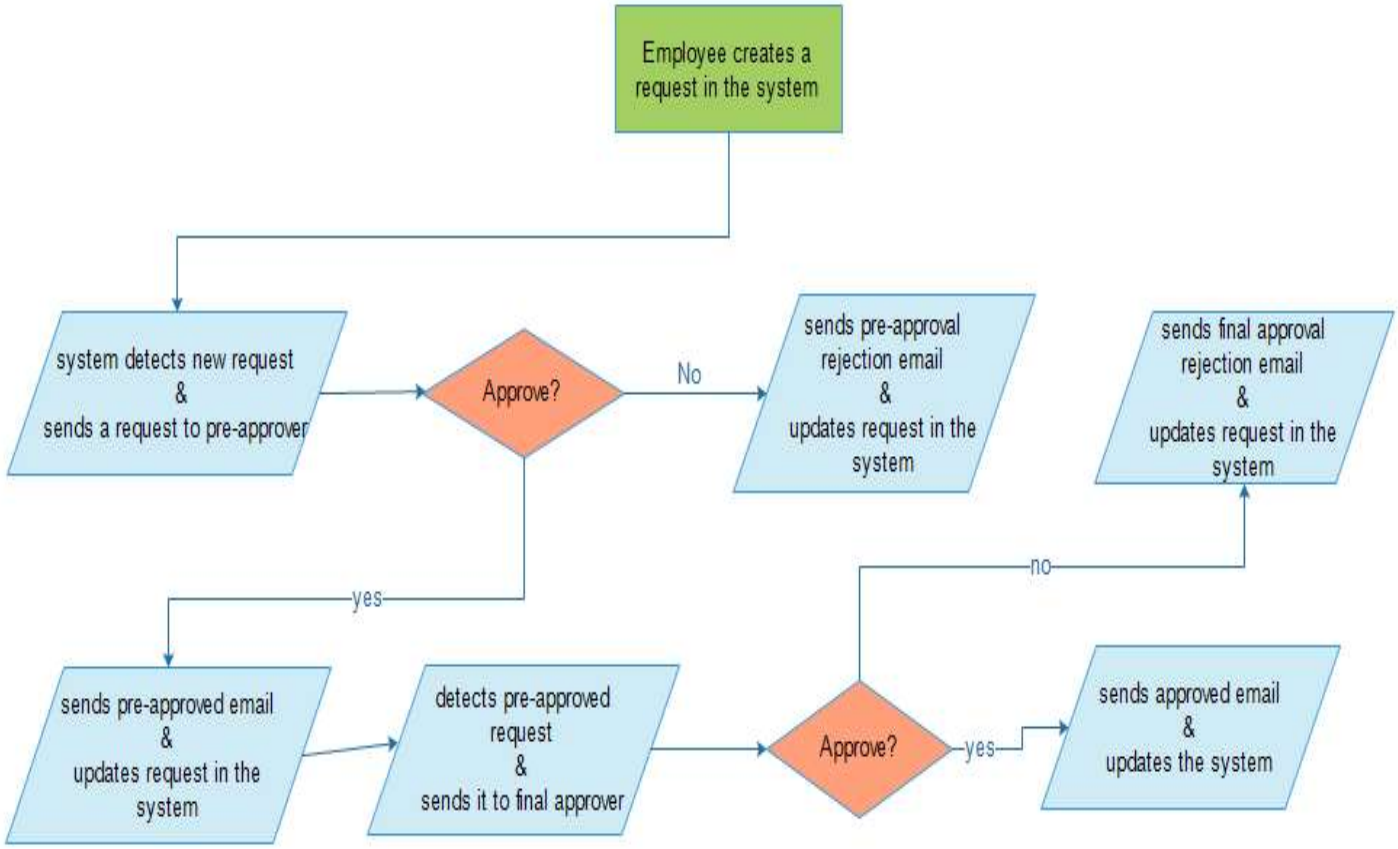


Figure 1 : Conceptual framework

Source: *my own design (using E-draw UML diagram application)*

2.4 CRITICAL REVIEW

There are a number of research or studies that were conducted on projects similar to mine, which were good and problem solving, however they are some gaps in their Softwares that I'm going to highlight in the paragraphs proceeding.

The eApproval app simplifies approvals and provides great features but those features are limited depending on the amount of money you pay for the app, which limits some people or companies. Prices should be standard to make sure all the people benefit from the app.

ApprovalMax put a lot of focus in the finance and accounting areas and less attention to other departments which would make its other users not relating.

Approval workflow management software has features that allow clients to design their workflows online which would open a window to hackers to corrupt client's system or steal some information about their work.

All of these reviews are related to the scope of the study but still suffer from a few limitations which my system is going to tackle.

2.5 SUMMARY

My contribution is to improve the online request and approval system by providing a software that simplifies day to day work.

It will be customizable depending on your area of work so that it well handles the work and the process clear and well defined. Clients will also receive new upgrades as we will keep working on them. The system will be friendly user, easy to adapt and a necessity to integrate in day to day work.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Research methodology refers to a set of methods and principles that are used when studying a particular kind of work. This Chapter consists primarily to highlight both method and techniques that are used in data collection as well as technology and tools to carry out this project.

3.2 DATA COLLECTION TECHNIQUES

These are the methods or techniques that are going to be used in the course of collecting data throughout my research. They can be categorized as follows:

a. Interviews
b. Observation and inspection of records and documents.
c. Internet Research.
d. Documentation.

3.2.1 Documentation

This technique helps in defining technical terms which are specific that will be used throughout the course of this project. It is a process of searching in books or other publications from various institutions to find data that are supposed to be useful for subject under the study. (Anon,2018)

3.2.2 internet Research

This is the practice of using the internet such as world wide web(www) to collect information that is relevant to the research or the project. Internet research was the most used data collection technique/method through the course of my research project.

3.2.3 Interview

This is also another technique of collecting data. It involves verbal communication between the interviewer and the interviewee. It allowed me to communicate with UoK employees and gain data and news that helped me to develop requirements for the system.

3.2.4 Observation

This technique also allowed me to observe for myself how the current program is operating and identifying all the issues it has in order to propose an efficient and accountable system.

3.3 SOFTWARE ENGINEERING METHODS

In software engineering, a **software development methodology** (also known as a **system development methodology**, **software development life cycle**, **software development process**, **software process**) is a splitting of software development work into distinct phases (or stages) containing activities with the intent of better planning and management. It is often considered a subset of the systems development life cycle. The methodology may include the pre-definition of specific deliverables and artifacts that are created and completed by a project team to develop or maintain an application. Common methodologies include waterfall, prototyping, iterative and incremental development, spiral development, rapid application development, extreme programming and various types of agile methodology. Below I'm explaining some of the methodologies.

I. Waterfall Model

The waterfall model was the first process model to be introduced.it is also referred as **a linear-sequential life cycle model**. It is very simple to understand and use. In a waterfall model, each phase must be completed before the next phase can begin and there is no overlapping in the phases.

The waterfall model is the earliest SDLC approach that was used for software development.

The waterfall model illustrates the software development process in a linear sequential flow. This means that any phase in the development process begins only if the previous phase is complete.in this waterfall model the phases do not overlap.

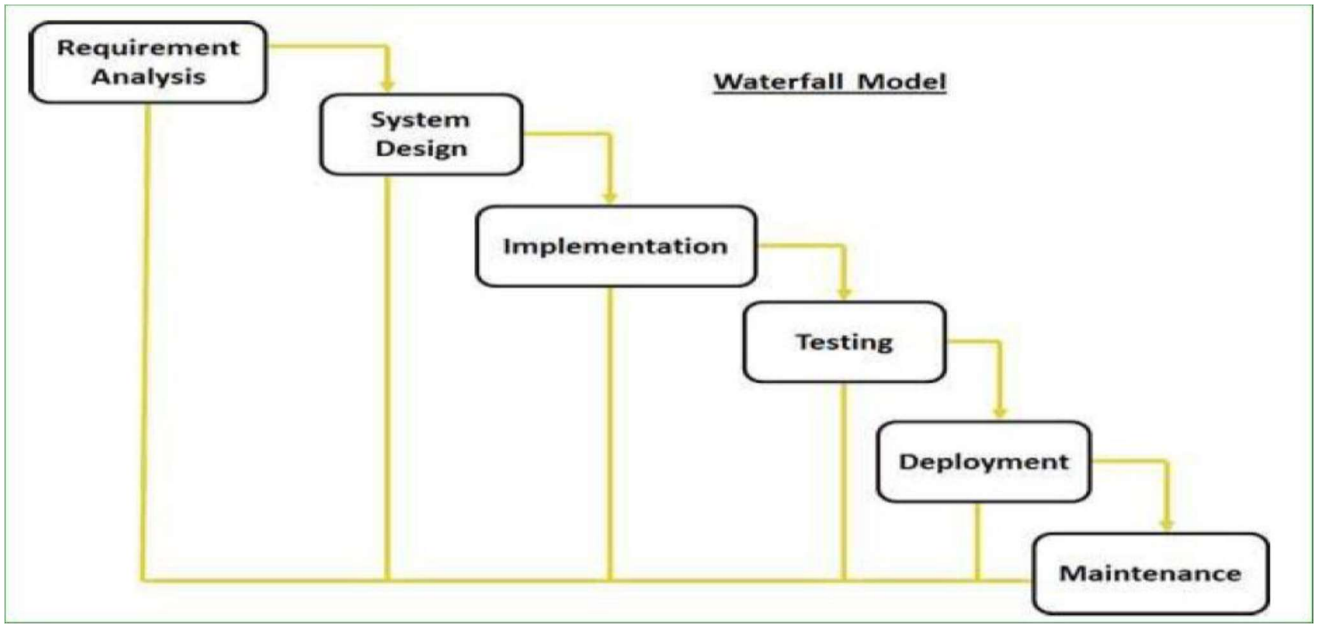


Figure 2: Waterfall model design

Source: United States*, Navy Mathematical Computing Advisory Panel (29 June 1956),*

Sequential Phases in Waterfall Model

- **Requirements:** The first phase involves understanding what need to be design and what is its function, purpose etc. Here, the specifications of the input and output or the final product are studied and marked.
- **System Design:** The requirement specifications from first phase are studied in this phase and system design is prepared. System Design helps in specifying hardware and system requirements and also helps in defining overall system architecture. The software code to be written in the next stage is created now.
- **Implementation:** With inputs from system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality which is referred to as Unit Testing.
- **Integration and Testing:** All the units developed in the implementation phase are integrated into a system after testing of each unit. The software designed, needs to go through constant software testing to find out if there are any flaw or errors. Testing is done so that the client does not face any problem during the installation of the software.

- **Deployment of System:** Once the functional and non-functional testing is done, the product is deployed in the customer environment or released into the market.
- **Maintenance:** This step occurs after installation, and involves making modifications to the system or an individual component to alter attributes or improve performance.These modifications arise either due to change requests initiated by the customer, or defects uncovered during live use of the system. Client is provided with regular maintenance and support for the developed software.

Waterfall Advantages and Disadvantages

Advantages	**Disadvantages**
a. Conceptually simple to understand and use, cleanly divides the problem into distinct phases that can be performed independently b. Natural approach for problem solving c. Easy to administer in a contractual setup, each phase is a milestone.	▪ Assumes that requirements can be specified and frozen early. ▪ May fix hardware and other technologies too early. ▪ Lack of user involvement once specification is written. ▪ Follows the "big bang" approach – all or nothing delivery; too risky. ▪ Very document oriented, requiring docs at the end of each phase. ▪ Risk mitigation postponed ▪ Operational problems discovered too late

Table 1: Advantages and disadvantages of waterfall model

The main drawback of the waterfall model is the difficulty of accommodating change after the process is underway. One phase has to be complete before moving onto the next phase.

Waterfall model is appropriate when:

- The requirements are well-understood, clear and fixed.
- Product definition is stable.
- Technology is understood.
- The project is short.

II. Prototyping Model

The Prototyping Model is a systems development method (SDM) in which a prototype (an early approximation of a final system or product) is built, tested, and then reworked as necessary until an acceptable prototype is finally achieved from which the complete system or product can now be developed. This model works best in scenarios where not all of the project requirements are known in detail ahead of time. It is an iterative, trial-and-error process that takes place between the developers and the users. To meet this project's purpose, I choose to use this model (prototyping model).

Following is a diagrammatic representation of different phases of prototyping model.

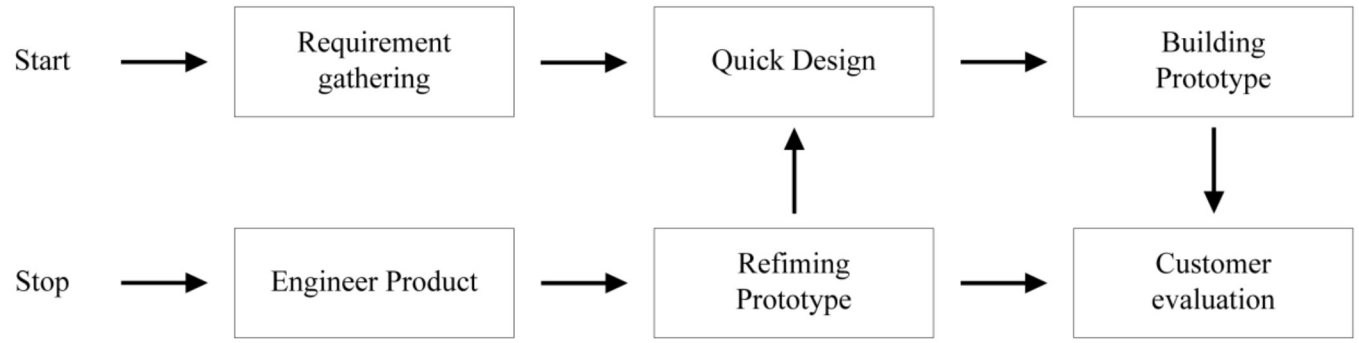


Figure 3: Prototyping model

Source: sommerville, 2016

There are many steps within the Prototyping Model:

1. New system requirements or expectations of the system output are outlined in as much detail as possible. This requires interviewing variety of users, representing all the segments or stakeholders of the prevailing system.
2. A preliminary layout specification is formed for the new system.
3. A first output model of the new system is made from the preliminary layouts. This is often a scaled-down system which tentatively gives an approximation of the desired output required.
4. The users check the primary output, noting its strengths and weaknesses, the things which need to be carried ahead in the next steps and the things which need to be discarded. The developer collects and examines the remarks from the all the stakeholders.

5. The first paradigm is changed, supported by the comments provided by the users, and is shaped to a second output of the new system.
6. The second output is evaluated in the same manner as was the primary output.
7. These steps are reiterated persistently, till the users are satisfied with the output.
8. The final system is hence constructed, supported by the ultimate output. The final system is completely evaluated and tested. Routine maintenance is administered on a seamless basis to forecast large-scale failures and to reduce the time period.

When to use Prototype model:

- Prototype model should be used when the desired system needs to have a lot of interaction with the end users.
- Typically, online systems, web interfaces have a very high amount of interaction with end users, are best suited for Prototype model. It might take a while for a system to be built that allows ease of use and needs minimal training for the end user.
- Prototyping ensures that the end users constantly work with the system and provide a feedback which is incorporated in the prototype to result in a useable system. They are excellent for designing good human computer interface systems.

Prototyping Advantages and Disadvantages

Advantages	**Disadvantages**
d. Users are actively involved in the development. e. Errors can be detected much earlier. f. Quicker user feedback is available leading to better solutions. g. Missing functionality can be identified easily h. Confusing or difficult functions can be identified.	a. Prototyping is usually done at the cost of the developer so, it is should be done using minimal resources otherwise organization's development cost stretches too much b. Practically, this methodology may increase the complexity of the system as scope of the system may expand beyond original plans. c. May use inappropriate Operating Systems, Programming languages and inefficient algorithms.

Table 2: Advantages and Disadvantages of prototyping model

III. Iterative Model

An iterative life cycle model does not attempt to start with a full specification of requirements. Instead, development begins by specifying and implementing just part of the software, which can then be reviewed in order to identify further requirements. It combines benefit of prototyping and waterfall models and is used to develop and deliver software in increments where each increment is complete in itself.

Consider an iterative life cycle model which consists of repeating the following four phases in sequence:

A Requirements phase, in which the requirements for the software are gathered and analysed. Iteration should eventually result in a requirements phase that produces a complete and final specification of requirements.

A Design phase, in which a software solution to meet the requirements is designed. This may be a new design, or an extension of an earlier design.

An Implementation and Test phase, when the software is coded, integrated and tested.

A Review phase, in which the software is evaluated, the current requirements are reviewed, and changes and additions to requirements proposed.
For each cycle of the model, a decision has to be made as to whether the software produced by the cycle will be discarded, or kept as a starting point for the next cycle (sometimes referred to as **incremental prototyping**). Eventually a point will be reached where the requirements are complete and the software can be delivered, or it becomes impossible to enhance the software as required, and a fresh start has to be made.

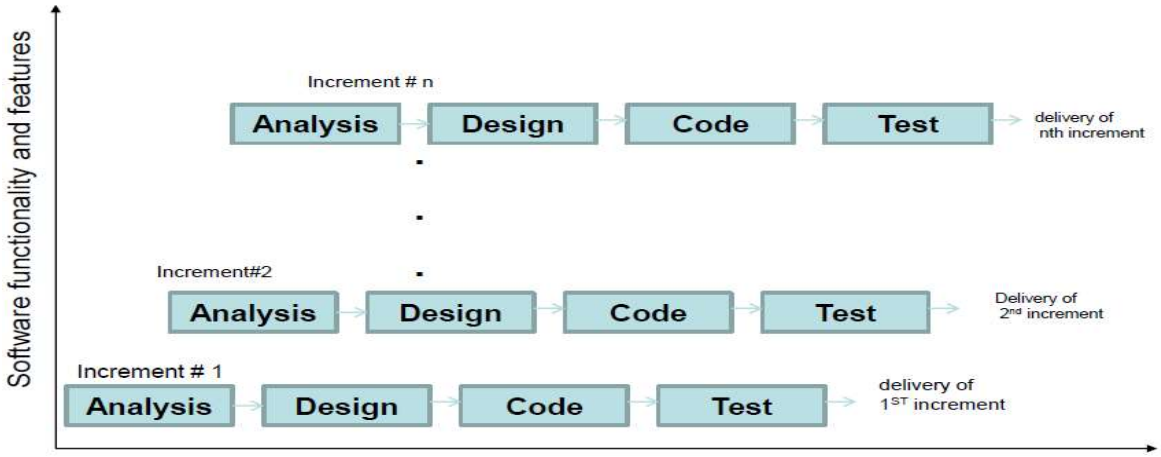


Figure 4: Iterative model design

Source: *Nishant,2018*

3.4 SYSTEM SPECIFICATION

A System Requirements Specification (SRS) (also known as a Software Requirements Specification) is a document or set of documentation that describes the features and behavior of a system or software application. It includes a variety of elements (see below) that attempts to define the intended functionality required by the customer to satisfy their different users. In addition to specifying how the system should behave, the specification also defines at a high-level the main business processes that will be supported, what simplifying assumptions have been made and what key performance parameters will need to be met by the system.
by Inflectra, October 13, 2016

3.4.1 Hardware Specification

I. Internet connection, wired or wireless
II. Desktop and 1 Laptop computers
III. At least 1.8Ghz Intel Duo Processor speed and at least 1 GB RAM for each computer plus 100+ GB Disk space on the different computers
IV. To access the system, any modern-day smartphone, tablet, laptop or desktop computer with internet connection can be used.
V. Secure Hosting Server that will host the information database

3.4.2 Software specification

I. Operating systems: - Windows 10 on Windows PC and mac OS Seirra on MacBook Laptops
II. Antivirus
III. Browser. (Internet Explorer, Opera Mini, Google Chrome, Firefox and others)
IV. Front End Softwares: HTML, CSS and some Javascript
V. Back end Softwares: PHP, MySQL

3.5 FUNCTIONAL REQUIREMENTS

In software engineering and systems engineering, a functional requirement defines a function of a system or its components. A function is described as a set of inputs, the behavior, and outputs.

Functional requirements may be calculations, technical details, data manipulation and processing and other specific functionality that define what a system is supposed to accomplish.

3.5.1 Examples of Functional Requirements for my project

R1: Registration

DESCRIPTION: To enter into this site user has to register himself/herself first. Requirement for registration are First name, Last name, Username, Email Id, Password, Confirm Password.

INPUT: User details.

OUTPUT: Filled registration details.

PROCESSING: User details are checked with database. Password constraint is checked as per validation.

R2: Employee LOGIN

DESCRIPTION: The system provides facility to login into the system.

INPUT: Enter username and password

OUTPUT: User profile page.

PROCESSING: The system will check the input of user and if valid then login is done. Otherwise user will be asked to re-enter username and password.

R3: Forgot Password

DESCRIPTION: The user can send reset link to the mail id to reset password.

INPUT: Email id of the user.

OUTPUT: The reset link is sent to the Email id.

PROCESSING: By reset link we can easily change the password and update store in database.

R4: Add Request

DESCRIPTION: The employee will create a requisition to be approved by his/her superior.

INPUT: User creates and edit the request.

OUTPUT: Display created requisition.

PROCESSING: Request is sent to the appropriate approver.

R5: Admin Panel

DESCRIPTION: The admin can add a replacement of the approver if this one is not available or on holidays.

INPUT: Approver's details.

OUTPUT: Added successfully in the database.

PROCESSING: The system will add selected data in the database.

R7: Logout

DESCRIPTION: The system will provide the facility to logout of the site.

INPUT: Select logout option on the system.

OUTPUT: Logout from the system.

PROCESSING: The user will be logout of the system.

3.5.2 Non-functional Requirements

The software was designed to fulfill the following non-functional requirements.

i. **Performance Requirements:**
ii. **Portability:** the system will run without modification. The system will run on windows 7,8,10.
iii. **Security:** a strong password will be required before entering the system and use it.

iv. **Usability:** the system will be user friendly, novice users can learn to operate major use cases without outside assistance.
v. **Adaptability:** the finished software will support new employee types without needing to be written or recompiled.
vi. **Reliability:** the system will be available to use if the user has internet the lower, the internet the lower the response time.

3.6 CONTEXT (LEVEL 0) DIAGRAM

A data flow diagram (DFD) illustrates how data is processed by a system in terms of inputs and outputs. As its name indicates its focus is on the flow of information, where data comes from, where it goes and how it gets stored.

Context diagram also known as Level 0, is a top-level data flow diagram. It only contains one process node (“Process 0”) that generalizes the function of the entire system in relationship to external entities.

3.6.1 Example of context diagram for my project

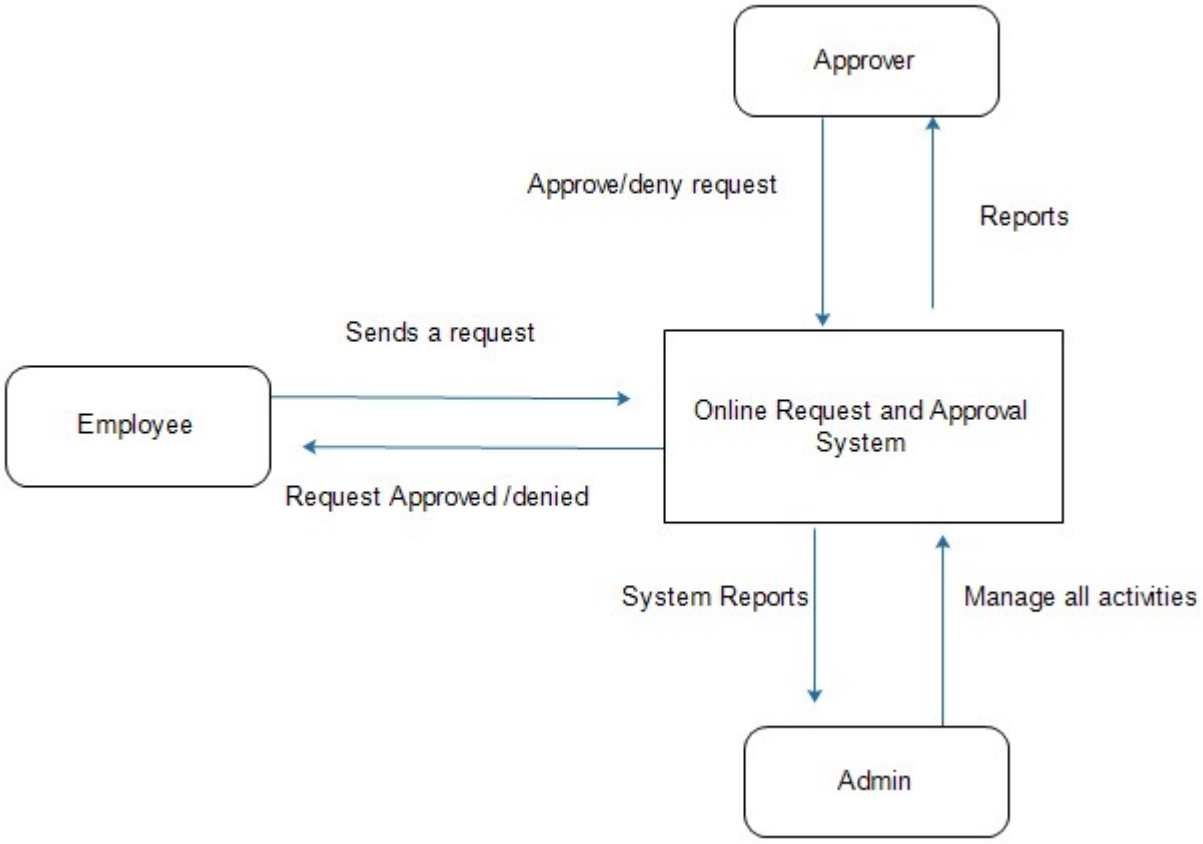


Figure 5: Context diagram level 0

Source: *my own design (using E-draw UML diagram application)*

3.7 DATA FLOW DIAGRAM LEVEL 1

The data flow diagram level 1 is a diagram that shows some of the detail of the system being modeled. The level 1 DFD shows how the system is divided into sub-systems, each of which deals with one or more of the data flows to or from an external agent, and which together provide all of the functionality of the system as a whole. It also identifies internal data stores that must be present so that the system performs it's job, and shows the flow of data between the various parts of the system.

3.7.1 Example of Data Flow Diagram of My Project

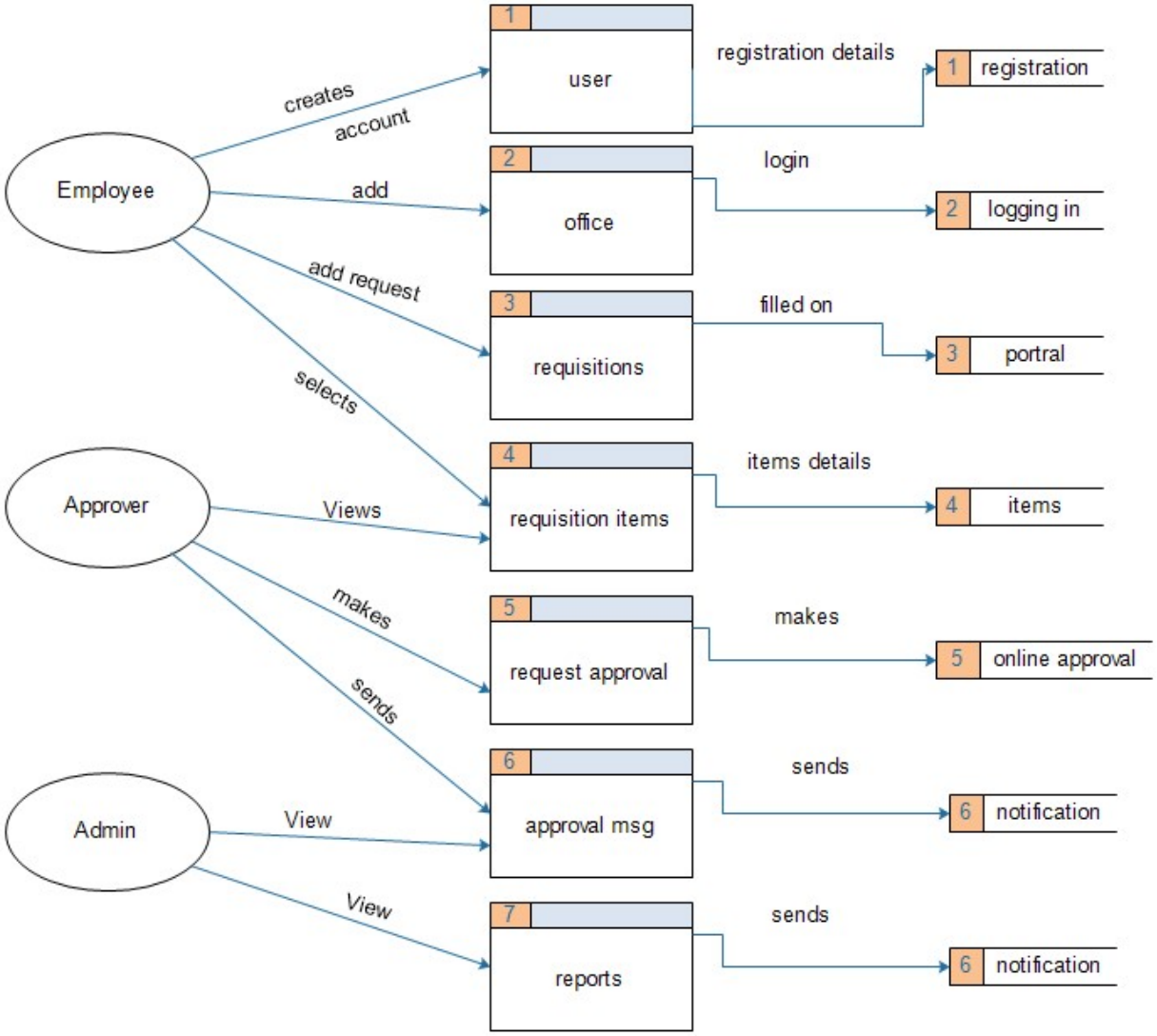


Figure 6: ***Data Flow Diagram(DFD) level 1***

Source: *my own design (using E-draw UML diagram application)*

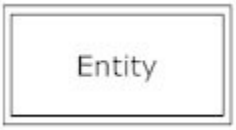
3.8 ENTITY RELATIONSHIP DIAGRAM

An Entity relationship diagram(ERD) also known as entity relationship model, is a graphical representation of an information system that depicts the relationships among people, objects, places, concepts or events within a system. (Aberle-Biscobing whatls.com). It provides a visual starting point for database design that can also be used to determine information system requirements throughout an organization.

The components of ERD and Symbols

- **Entities**, which are represented by rectangles. An entity is an object or concept about which you want to store information.

- A weak entity is an entity that must defined by a foreign key relationship with another entity as it cannot be uniquely identified by its own attributes alone.



- **Actions**, which are represented by diamond shapes, show how two entities share information in the database. In some cases, entities can be self-linked. For example, employees can supervise other employees.

- **Attributes**, which are represented by ovals. A key attribute is the unique, distinguishing characteristic of the entity. For example, an employee's social security number might be the employee's key attribute.

A derived attribute is based on another attribute. For example, an employee's monthly salary is based on the employee's annual salary.

Connecting lines, solid lines that connect attributes to show the relationships of entities in the diagram. *(Smartdraw.com, 2018)*

3.8.1 Example Entity Relationship Diagram of my project

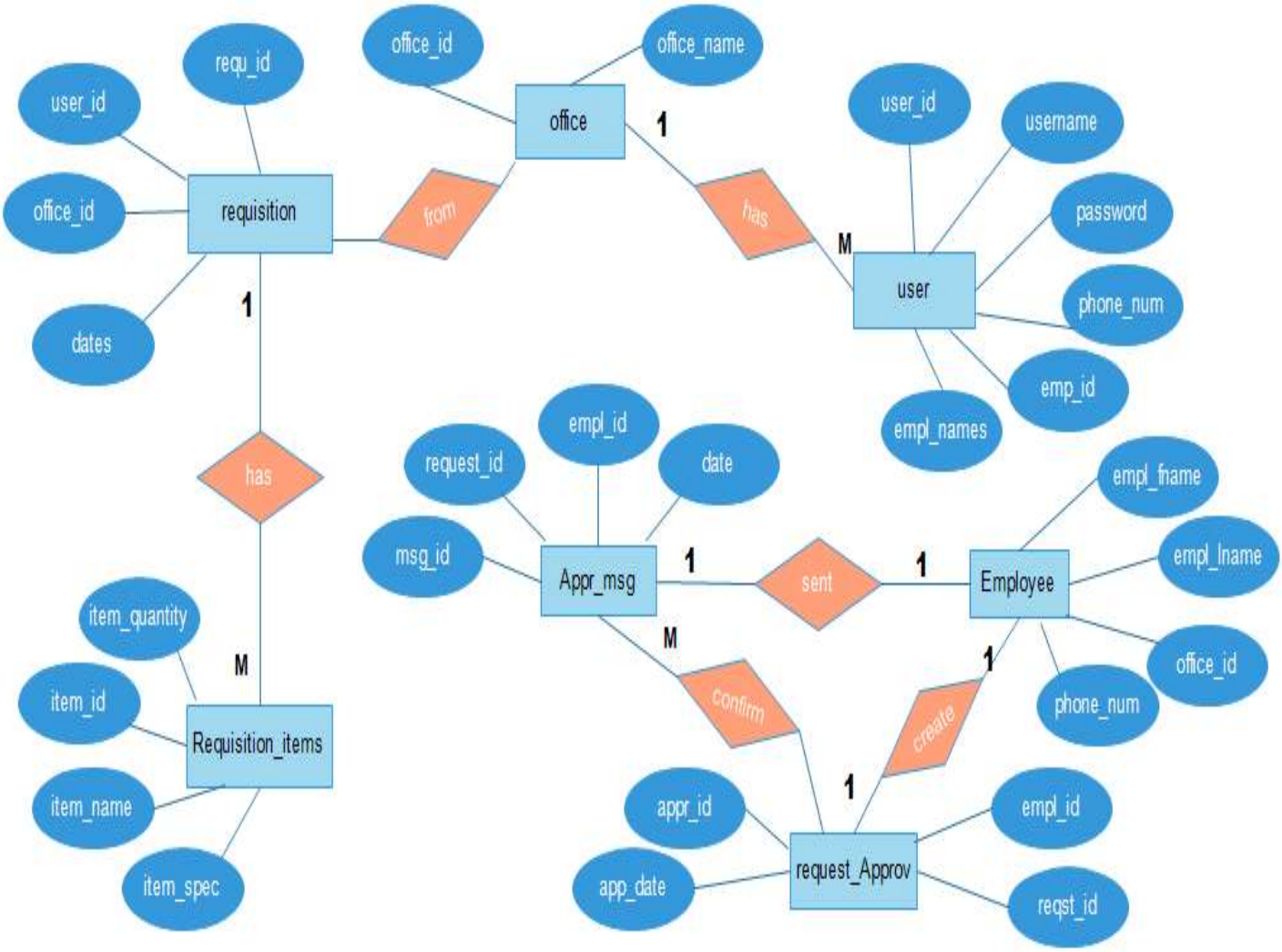


Figure 7: ER Diagram

Source: *my own design*

3.9 PHYSICAL DATA MODEL (PDM)

The PDM is used to design the internal schema of a database, depicting the data tables (derived from the logical data entries), the data columns of those tables (derived from the entity attributes), and the relationships between the tables (derived from the entity relationships).

The features of the physical model of data include:

- Specification of all the tables and columns.
- Foreign keys are used to identify relationship between tables.
- Physical considerations may cause the physical model of data to be quite different from the logical model of data.

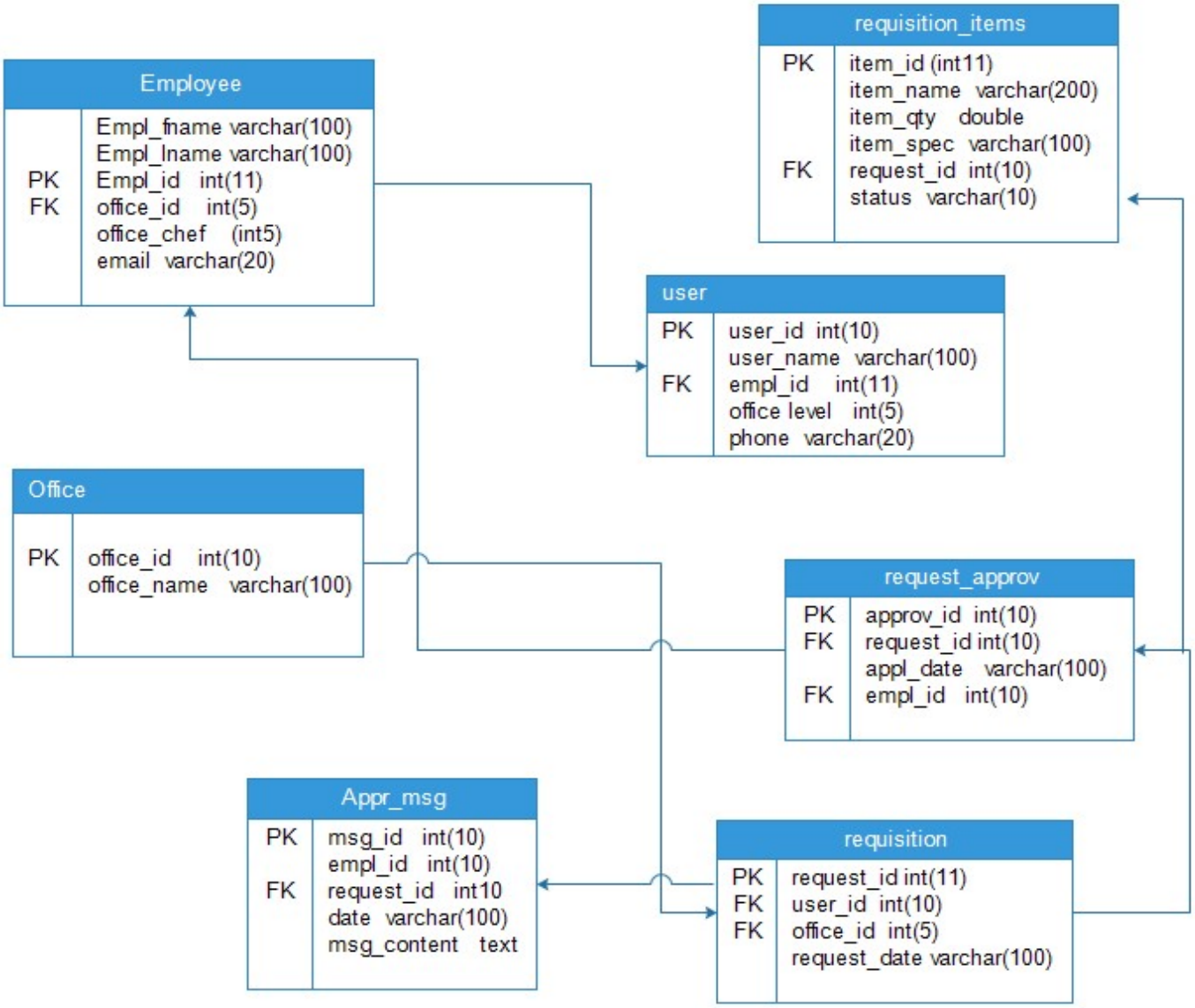


Figure 8: Physical data Model
Source: *My own design*

3.10 DATA DICTIONARY

Logical Database design

Employee Table

Table Name	Column	Type	Constraints	Description
Employee	Empl_fname	varchar (100)	Not null	First name of employee
	Empl_lname	varchar (100)	Not null	Last name of employee
	Empl_phone	varchar (20)	Not null	Employee phone number
	Empl_id	Int (11)	Primary key	Employee identification
	Office_id	int (5)	Foreign key	Office identification
	Office chef	int (5)	Not null	Chef of the office
	Email	Varchar (30)	Not null	Email address

Table 3: employee Table

Approval_message Table

Table Name	Column	Type	Constraints	Description
Appr_msg	Msg_id	int (10)	Primary Key	Identifier of the msg
	Empl_id	int (10)	Foreign key	Employee id
	Request_id	int (10)	Foreign Key	Request identifier
	Date	varchar (100)	Not null	Date
	Msg_content	Text	Not null	Content

Table 4: **Approval message Table**

Offices Table

Table Name	Column	Type	Constraints	Description

Office	Office_id	int (10)	Primary Key	Office identification
	Office_name	varchar(100)	Not null	Name of the Office

Table 5: **Office Table**

user Table

Table Name	Column	Type	Constraints	Description
User	User_id	int (10)	Primary Key	Identification of user table
	Username	varchar(100)	Not null	Username
	Password	Varchar (20)	Not null	Password
	Empl_id	int (11)	Foreign Key	Employee identification
	Office level	Int (5)	Not null	Level of the office
	Phone	Varchar (20)	Not null	Phone number

Table 6: **user Table**

Request Approval table

Table Name	Column	Type	Constraints	Description
Request_Apprv	Approv_Id	Int (10)	Primary Key	Approval identification
	Request_id	int (10)	Foreign Key	Request identification
	App_date	varchar (100)	Not null	Application date
	Empl_id	int (10)	Foreign Key	Employee identification

Table 7: **Approval table**

Items Requisition table

Table name	Column	Type	Constraints	Description
Requisition_items	Item_id	int (11)	Primary Key	Identifier of the item
	Item_name	Varchar(200)	Not null	Item name
	Item_qty	Double	Not null	Quantity of the item
	Item_spec	varchar(100)	null	Item specification
	Request_id	int (10)	Foreign Key	Request identification
	Status	varchar (10)	Not null	Status

Table 8: **requisition items table**

Requisition table

Table name	Column	Type	Constraints	Description
Requisition	Request_id	int (11)	Primary Key	Identifier of the request
	User_id	int (10)	Foreign Key	User identification
	Office_id	Int (5)	Foreign Key	Office identification
	Request_Date	varchar(200)	Not null	Requisition date
	Status	varchar (10)	Not null	Status

Table 9: **requisition table**

3.11 TOOLS AND LANGUAGES TO BE USED IN SOFTWARE DEVELOPMENT

3.11.1 Tools

I. **XAMPP**.

XAMPP is a free open source application and a web server like apache HTTP Server, MySQL, FileZilla, Mercury, and Tomcat servers and written in PHP and Perl programming languages. (Lambert M., Miriam T., Susan F, 2010)

XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes. Everything needed to set up a web server – server application (Apache), database (MariaDB), and scripting language (PHP) – is included in an extractable file. XAMPP is also cross-platform, which means it works equally well on Linux, Mac and Windows. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server extremely easy as well. It is the most popular PHP development environment.

II. Brackets Text Editor

Brackets is an open-source editor written in HTML, CSS, and JavaScript with a primary focus on web development. It was created by Adobe Systems, licensed under the MIT License, and is currently maintained on GitHub. Brackets is available for cross-platform download on Mac, Windows, and Linux. (Bharti, 2017)

III. Web Browser

A web browser (commonly referred to as a browser) is a software application for retrieving, presenting, and traversing information resources on the World Wide Web. An information resource is identified by a Uniform Resource Identifier (URI/URL) and may be a web page, image, video or other piece of content. Hyperlinks present in resources enable users easily to navigate their browsers to related resources.
(Fitzpatrick, Jason, 2009)

3.11.2 Languages

I. PHP

PHP is an acronym meaning Hypertext Pre-processor. It is a scripting language whose syntax is Perl and C language and consists of script embedded in an HTML script. Because PHP generates HTML pages, it works with any browser. PHP is platform independent and versions are available for most operating system (windows, Linux, etc.) and web server (Apache, etc.). This project has been chosen to be developed under PHP version 5.3.0 due to the following features this version of PHP. (Lerdorf, R, Tatroe, K., &MacIntyre, P.et al (2006).

- flexibility, small learning curve, small development time and relatively few hardware resources demand.
- PHP is supported in almost all platforms and popular web servers such as Apache.
- PHP's popularity and increase usability within businesses ensure us that the maintenance and further development of this application will easy and cheap, support and further development.

II. CSS

Cascading Style Sheets is a style sheets language used to describe the presentation semantics (that is, the look and formatting) of a document written in a markup language. It's most common use is to style web pages written in HTML and XHTML. (Hanselman, 2010)

III. HTML

Hypertext Markup Language (HTML) is the authoring language used to create documents on the World Wide Web.HTML is similar to SGML, although is not a strict subnet.HTML defines the structure and layout of a Web document by using a variety of tags and attributes. All the information you would like to include in your Web pages fits in between the tags.

They are hundreds of tags used to format and layout the information in a web page. Tags are also used to specify hypertext links. These allow Web developers to direct users to other web pages with only a click of the mouse on either an image or word. (Lerdorf, R., Tatroe, K., &MacIntyre, P.et al (2006).

IV. MySQL.

MySQL is a relational database management system. It sores data in separate tables rather than putting all the data in one big storeroom. This adds speed flexibility. The MySQL database server is very fast, reliable cheaper and easy to use and learn. MySQL today offers a rich and useful set of functions. Its connectivity, speed and Security make it highly suited for accessing databases on the internet, it also supports clustering technology. (Rouse M, 2012.)

V. JAVA SCRIPT

JavaScript is most commonly used as a client-side scripting language. This means that JavaScript code is written into an HTML page. When a user requests an HTML page with JavaScript in it,

the script is sent to the browser and it's up to the browser to do something with it. (Javascriptissexy.com, 2018).

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