

Chapter 3

Selection of Technology

3.1 Introduction

The main focus in this chapter is to discuss the technologies available for design and development of the proposed software product. It will also elaborate why the selected techniques are appropriate to the proposed software process. In doing this project the selected technologies can be categorized into four major areas as follows

- I. Software process models
- II. Domain analysis and design methodology
- III. Modeling language
- IV. Development Environment

3.2 Software Process Models

As per Professor Ian Somerville; “Software process model is an abstract representation of a software process.” [16]

The importance of a software process model is to explain the approach taken to develop the software. Three generic software process models are

1. The waterfall method
2. Evolutionary development model
3. Component based software Engineering model.

3.2.1 Waterfall Model

In this approach, fundamental process activities of Specification, Development, Validation and Evaluation are taken as discrete phases.

The advantage of the waterfall model approach is the documentation it produces at phase and that it fits with other engineering process models [16]

The major disadvantage of the waterfall model is the difficulty in accommodating the requirement change at a later stage since the commitments have already been made at the early stage in the process. Therefore, the waterfall model is more suitable for the systems where the requirements are well understood and rarely change during the system development.

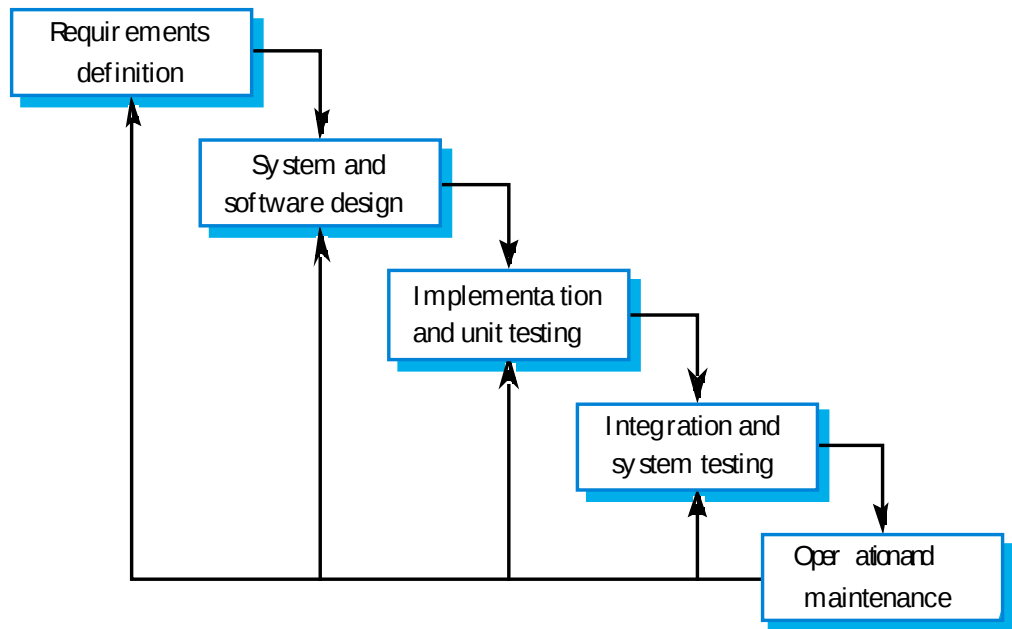


Figure 3.1 – Waterfall Model[16]

01. Requirement definition

During this stage, the functional and non functional requirements of the system, goals and objectives are defined in consultation with users

02. System & software design

Architectural design of the software and hardware requirements are decided at this stage

03. Implementation and unit testing

Compliance of each unit against the specification is verified at this stage

04. Integration & System testing

All the units of the system are integrated and whole system is tested in order to verify that the software meets the requirements specification . At this stage the software product is delivered to the client

05. Operation & maintenance

At this stage the system is installed and used. Correcting errors that were not observed in the early stages of the lifecycle and improving the system by incorporating new requirements, are also done at this stage.

3.2.2 Evolutionary Development Model

In the Evolutionary approach an initial version is developed and made use of the client and then refined it through many versions incorporating various user needs and commence until robust system is emerged.

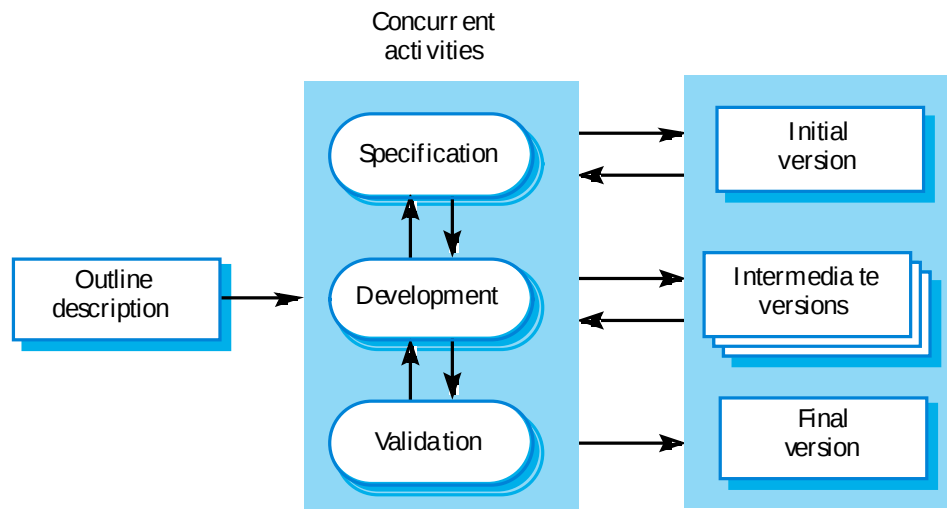


Figure 3.2 - Evolutionary Development Model[16]

Two fundamental types of Evolutionary development are.

3.2.2.1 Exploratory development

Requirements are identified through participation with system users and the final system is delivered.

3.2.2.2 Throw-away prototyping

In a situation where customer requirements are not clear, an initial prototype would be ideal in exploring the customer requirements.

Disadvantages

- Lack of process visibility since it is not cost effective to produce documents at every version
- Systems are often poorly structured as continual changes are often incorporated.
- Special skills (e.g. in languages for rapid prototyping) may be required.

3.2.3 Component Based Software Engineering

The component based approach is best suited in situation where software components are reused to a certain extent. However, this happens when developers identify similar situation that they experienced in some other projects previously.

The major advantages are, reducing the amount of development work, reduced cost and risk .Also the delivery time can be minimized [16].

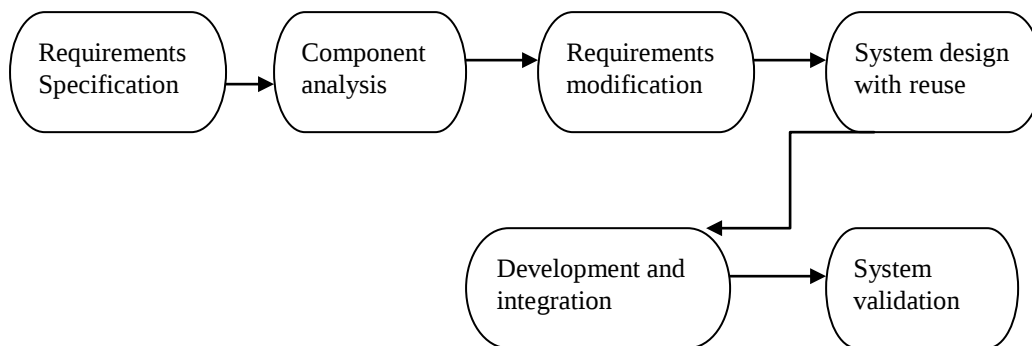


Figure 3.3 – Component based software Engineering [16]

Comparison of three generic Software process Models,

Features	Waterfall model	Evolutionary development model	Component based software engineering
Partitioning of the project	Can be done	Cannot be done	Cannot be done
System design with re-use	Can be done	Cannot be done	Can be done
Special skills	required	Not required	Not required
Process Visibility	High	low	Medium
Requirement modification	Cannot be done	Can be done	Can be done

Table 3.1 – Comparison of generic Software Process Models

3.3 System Analysis and Design Methodology

3.3.1 Object Oriented Analysis & Design

The object oriented approach combines data and methods into single entities called objects. These objects represent real things an information system deals with [11]

3.3.1.1 Object Oriented Analysis

The OOA is an effort taken to interpret the application domain in to an object oriented model or a set of interacting objects

3.3.1.2 Object Oriented Design (OOD)

Object oriented model of the software system is developed in order to implement the identified requirements.

3.3.2 Structured System Analysis and Design Methodology (SSADM)

Structured Systems Analysis and Design Method (SSADM) is a systematic approach for producing models of an existing system or a system that is to be built

The 3 most important techniques that are used in SSADM are [5]:

- **Logical Data Modeling:** This is the process of identifying, modeling and documenting the data requirements of the system being designed. The data are separated into entities (things about which a business needs to record information) and relationships (the associations between the entities).
- **Data Flow Modeling:** This is the process of identifying, modeling and documenting how data moves around an information system. Data Flow Modeling examines processes (activities that transform data from one form to another), data stores (the holding areas for data), external entities (what sends data into a system or receives data from a system), and data flows (routes by which data can flow).
- **Entity Behavior Modeling:** This is the process of identifying, modeling and documenting the events that affect each entity and the sequence in which these events occur.

Table 3.2 shows a comparison of OOAD and SSADM approaches,

Main Features	OOAD	SSADM
Main motivation	Object driven	Data driven
Dependability	Objects are independent	Data are interdependent
Usability	Objects can be reused	Data can be reused
Understandability	High	Medium
Maintainability	High	Medium

Table 3.2 – Comparison of OOAD and SSADM

3.4 Unified Modeling Language (UML)

A better understanding of the system can be obtained through modeling system we are developing[2]. As a result, the benefits we receive are as follows,

- Easy to visualize the system as it is or as we want it to be
- Allow us to specify the structure or behavior of a system
- Serves as a template that guides us in constructing the system
- Documents the decisions made through out analysis and design stages

It is very important to distinguish between the UML model and the set of diagrams of a system. A diagram is a partial graphical representation of a system's model.

UML diagrams represent three different views of a system model:

3.4.1 Functional requirements view

Represents the functional requirements of the system from the user's point of view.

Ex. use case diagrams

3.4.2 Static structural view

Emphasizes the static structure of the system using objects, attributes, operations and relationships.

Ex. class diagram

3.4.3 Dynamic behavior view

Emphasizes the dynamic behavior of the system by showing collaborations among objects and changes to the internal states of objects.

Ex. sequence diagrams, activity diagrams

3.5 Development Environment

3.5.1 LAMP

The acronym LAMP refers to a solution stack of software, usually free and open source software, used to run dynamic Web sites or servers[4]. The original expansion is as follows:

- Linux, referring to the operating system;
- Apache, the Web server;
- MySQL, the database management system (or database server);
- PHP or others, i.e. Perl, Python, the programming languages.

The combination of these technologies is used primarily to define a web server infrastructure, define a programming paradigm of developing software, and establish a software distribution package.

3.5.2 WAMP

"WAMP" is an acronym formed from the initials of the operating system (Windows) and the package's principal components: Apache, MySQL and PHP (or Perl or Python)[6].

Apache is a web server and its major function is to parse any file requested by a browser and display results according to the code within that file [1]. The features of Apache version 2.0.50 are , password protected pages for multitude of users, Customized error pages, Display of code in numerous levels of HTML and the capability to determine at what level the browser can accept the content, Usage and error logs in multiple and customizable formats, virtual hosting for different IP addresses mapped to same server. According to a recent survey Apache is the most used web server worldwide compared to other products. Flexibility, open source

nature, power and ability to test web pages before they are uploaded to a secure server on another machine have made the apache as a most used web server everywhere.

PHP is a server side scripting that makes web site truly dynamic. It has made it place as one of the most popular scripting language due to its flexibility and relatively small learning curve for those who have a fair background in other programming languages like JAVA[1].

Running PHP as sever side Script has many benefits. Retrieval of data from a database table, it's processing and formatting as HTML before delivering them to the client browser, PHP script is always invisible to client browser as the web sever sends only the output of the PHP script , not the script it self. Therefore, PHP scripts are browser neutral and do not depend on browser to run successfully. Also it supports many database management systems like MySQL,Oracle,PostgreSQL and runs on different platforms like Widows,Linux,Unix. PHP is compatible with almost all web servers like Apache, IIS. Also PHP is an open source software [10].

MySQL is an open source DBMS , and has the following features[15]

- Scalability: MySQL can handle large databases. This is evident by implantation in organization like Yahoo, Google, and Cisco. It is reported even the NASA institution also has used MySQL reliably for some of their activities
- Portability: MySQL can run on operating systems like, Unix, Linux, windows. It can also run on different architectures ranging from normal PC to high-end mainframes
- Connectivity: MySQL is fully networked and supports TCP/IP sockets and can be accessed from anywhere on the internet. Also multiple users can gain access simultaneously
- Security: MySQL uses a host and user based structure that controls the access
- Speed: speed of MySQL is in par with other commercially available DBMS
- Ease of use: MySQL is simple to install and implement

3.5.3 Client side Scripting

As an object-based scripting language, JavaScript has a strong support from many popular web browsers and is available free in most web browsers [3]

3.6 Summary

In this chapter, it has been discussed and compared the possible technologies that can be selected for analysis, design and development purposes of a software solution in terms of Software Process Models, System Analysis and Design Methodologies, Unified Modeling Language (UML), and Development Environment.

Next chapter describes my approach to develop the proposed software solution.



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