2. SOFTWARE REQUIREMENT ANALYSIS AND SPECIFICATION

2.1 Related Work

There are many proposed methods for Automatic Attendance Systems on the market. Most of them include Bluetooth technology, fingerprint sensors,and RFID (Radio Frequency Identification and Detection). In this section, I will briefly mention a few of these proposals. This Reference proposes software that has to be installed in the instructor's mobile telephone that enables the instructor to query the student's mobile smartphone via Bluetooth connection and transfers the student's mobile smartphone Media Access Control (MAC) addresses to the instructor's mobile telephone to confirm the student's presence. This Reference is another example of a proposal that employs real-time face detection algorithms integrated into an existing Learning Management System (LMS) that automatically detects and registers students presence during a lecture.

The system represents a supplemental tool for the instructors that combines algorithms of machine learning with many adaptive methods that are used to track facial changes over a longer period of time. This proposal uses a fingerprint verification technique and proposes a system that is based on fingerprint verification, which is done by using the extraction of minutiae technique, and this system automates the whole process of taking attendance. We noticed that many proposals were made by the instructors during class. Hence, if the attendance system requires some effort from the instructor, then the class lecture will be disturbed every time the instructor allows the late students into the class. On the other hand, our proposal does not require the instructor to do anything beyond just present the slides of the course to students. Hence, students may have to register their presence in the classroom at any time during the class.

1. Effective and efficient attendance tracking system using secret code
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Students' attendance taking and tracking are important in order to monitor students' performance in class. More often than not, students' performance is closely related to their attendance. Good attendance usually leads to good performance, and vice versa. Therefore, any problems related to students' attendance should be identified as early as possible so that appropriate measures can be taken to address them. However, tracking students' attendance, especially if done manually, can be tedious and time-consuming, especially for classes with a large number of students. Not to mention issues related to attendance taking such as signature forgery where other students are signing on behalf of their absent friends.

To address this issue, a unique and secure attendance tracking system is proposed. The system automates most of the steps involved in tracking students' attendance. To address the issue of signature forgery, a secret code using the MD5 hashing algorithm is implemented as part of the system so that each student will be given a unique code each day to be used for signing attendance. Implementation of the system shows that the time taken to track students' attendance using this system can be significantly reduced, and the secret code is able to prevent signature forgery amongst students.

2. Patel, R., Patel, N., & Gajjar, M. (2012). Online students' attendance monitoring system in classroom using radio frequency identification technology: a proposed system framework. International Journal of Emerging Technology and Advanced Engineering, 2(2), 61-66.

The attendance of students in classes has grown in importance for all organisations and institutions nowadays. In a school or university setting, keeping track of and recording class attendance can be a time-consuming process. This is partly because attending lectures to learn the essential material takes a lot of time. This study presents the use of RFID technology to manage student attendance in the classroom using ubiquitous computing systems. RFID technology has the potential to be a potent tool for managing

student attendance during the course of a typical school day while also enhancing safety in the classroom.

When it is necessary to automatically record students' movements and positions in a classroom or other school or university setting, RFID technology has been used to find solutions. In a school or university setting, a real-time intelligent system is put into place along with RFID hardware to keep track of students' attendance at lectures and labs. RFID is a technology that enables a tag attached to an ID card to wirelessly communicate with a reader in order to retrieve the tag's identification number.

3. Mothwa, L. Tapamo, J. R., & Mapati, T. (2018, November). Conceptual model of the smart attendance monitoring system using computer vision. In 2018 14th International Conference on SignalImage Technology & Internet-Based Systems (SITIS) (pp. 229-234).

Any educational institution's management of student attendance continues to be an essential and vital component. Although a few automated biometric-based attendance tracking systems have been put forth in the literature, their success has been negatively impacted by incorrect system modelling. As a result, it is important to address the numerous issues related to the creation of an AI-based attendance monitoring system.

In order to track students' attendance during lectures, this study suggests a conceptual model for a smart attendance monitoring system that makes use of face recognition. The front-end and back-end system architectures are described, along with a full-view multi-camera setup designed to efficiently capture and detect faces. We looked into three different feature extraction methods: PCA, LDA, LBP, and a combination of PCA and LDA. The model's recognition accuracy was high, at 90%.

4. Shoewu, O., & Idowu, O. A. (2012). Development of attendance management system using biometrics. The Pacific Journal of Science and Technology, 13(1), 300-307.

It is suggested that we create a biometric attendance management system. Controlling student attendance during lecture times has grown to be a challenging task. Because manual calculating involves errors and takes a lot of time, it becomes difficult to calculate the attendance percentage. An effective biometric attendance management system is created for the given rationale. With the aid of a fingerprint reader, this technology electronically registers attendance, which is then saved in a database. Once students have been identified, attendance is recorded.

A biometric (fingerprint) identification system is implemented to identify students. However, this procedure does away with the requirement for stationary supplies and staff members for record-keeping. The technique was tested with 80 candidates, and a 94% success rate was noted. The average execution time for the manual attendance system for 80 students was 17.83 seconds, compared to 3.79 seconds for the biometric-based automatic attendance management system. Results suggested the automated attendance management system performed better. Once students have been identified, attendance is recorded.

5. Wei, X., Manori, A., Devnath, N., Pasi, N., & Kumar, V. (2018). QR Code Based Smart Attendance System.

Smartphones are an important part of daily life in this technological age. Today's cellphones can swiftly and simply resolve the majority of issues. Everybody's life is now simpler and easier because of the various social apps, business apps, problem-solving apps, educational apps, and marketing apps, among others. The study intended a solution to tackle a difficulty with documenting attendance after the technology. The suggested solution consists of two applications: one that creates a QR Code using student information and another that records attendance and outputs it in CSV or XLS format.

To verify a student's attendance, the teacher will need to scan their QR code. The system's verification of student identity to stop bogus registrations is covered in the paper. All students' attendance is managed by the system, which also evaluates it. The lecturer will receive the student's QR code in order to record their attendance. The subject-area professor is in charge of recording everyone's attendance for the group or class. In the database for the specific student row in the table, the attendance will be recorded as 0 and 1, with 0 denoting absence and 1 representing attendance. For further use, the student attendance reports will be created in CSV and XLS files.

6. Chintalapati, S., & Raghunadh, M. V. (2013, December). Automated attendance management system based on face recognition algorithms. In 20 International Conference on Computational Intelligence and Computing Research (pp. 1-5).

We suggest an automated solution for managing attendance. Based on face detection and recognition algorithms, this system automatically recognises the student as soon as he enters the classroom and records his attendance. This document describes the system architecture and algorithms utilised at each stage. To assess the effectiveness of various facial recognition systems, numerous real-world circumstances are taken into account. This essay also suggests some methods for dealing with issues like spoofing. This methodology saves time and aids in monitoring students when compared to the conventional method of recording attendance.

2.2 System Architecture

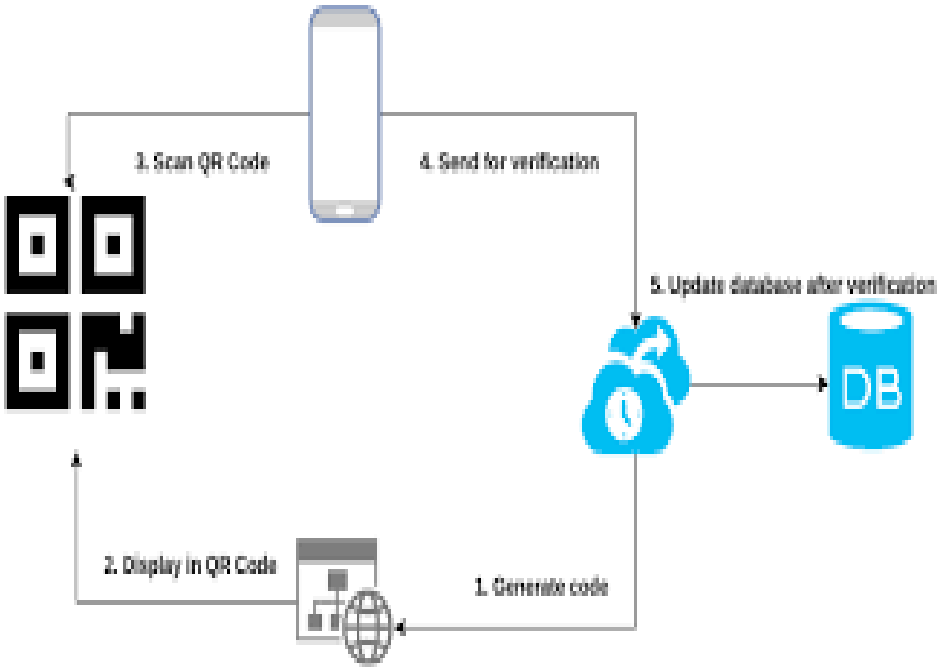

Fig 2.2.1: System Architecture

2.3 Product Function

This project consists following modules

- Student Module
- Faculty Module

Student Module

Student can login to system by using his ID and can view his attendance from start and end date selection. The following are the functionalities of Student.

- ❖ Login
- ❖ Check Attendance
- ❖ Logout

Faculty Module

Faculty can login to application by using username and password as ‘faculty’ and then add new student details application will generate QR code. Faculty can view all Student details and then can view Student attendance by using start and end date. The following are the functionalities of Faculty.

- Login
- Create student data
- View student data
- View student attendance
- Logout

2.4 User Constraints

A constraint in project management is any restriction that limits a project's desired outcome. Project constraint is one of the important factors that would influence the way you manage the project, and in some cases, it would be a determinant factor in deciding whether to continue the project or not. Project limitations can fall into different categories, and it is critical to identify and understand each of them as they affect your project. This way, you can focus your analysis on those limitations and substantially increase your preparedness to deal with them.

It is a common misconception that the project management constraints are internal, i.e., limitations due to internal factors associated with that particular project. Though internal limitations such as project scope or cost play a major role in defining project constraints, some external factors, such as the environment and external stakeholders, can also impose restrictions or limitations that would result in project constraints.

The Triple Constraints of Project Management

Anyone with even rudimentary knowledge of project management concepts has probably heard about the well-known 'Triple Constraint," also known as the Project Management Triangle.

Fig 2.4.1: Triple Constraints of Project Management

As shown in the picture, all projects are executed under these constraints: cost, time, and Scope. If you look at each of these constraints in isolation, every project manager's aim is to deliver the project.

- within the allocated or budgeted cost
- Within the stipulated time frame
- As per the agreed scope

Quality

Quality would be the central theme of any project, and it should meet the client requirements that are set at the beginning of the project. Cost, time, and scope are linked to one another, and any change or compromise on one constraint would affect one or all other project constraints.

Cost

Every project has a fixed budget that the sponsors are ready to spend in order to get goods or services. If the sponsors cut the budget, you will have to either extend the timeline for project delivery or reduce the project scope. This is an estimation of the amount of money required to produce the final deliverable. Monitoring components of various aspects of the project need to be estimated in advance, which will be added up to the overall cost of the given project.

Time

The schedule or time frame of a project is normally fixed based on various factors such as customer requirements, project feasibility, resource availability, etc. Hence, every project has a deadline, which is predetermined at the beginning of the project. When a project's time gets reduced, either the project cost needs to be increased or the scope of the project should be cut down in order to accommodate a shorter deadline. Basically, the amount of time required to finish the project is directly related to the number of requirements that need to be part of the end product (Scope) and the number of resources assigned to the project.

Scope

It is common across many projects that the scope is fully refined, communicated, or understood by the stakeholders at the beginning of the project in order to give the project the best chance of success. However, the scope can potentially be changed by the customer during the project life cycle (known as Scope Creep). The scope is the functional elements of the project that define the end deliverable's capability. If the scope of the project is increased at a later stage, either the cost or the time need to be increased accordingly.

Project Constraints List

Scope: Project outcome as defined in the contract

Timeline: Important milestones and client-imposed completion dates; budget funding limits imposed by project sponsors

Quality: Agreed quality metrics with the customer or conformance with internal quality standards

Resources: Availability of skilled human resources or materials Risks: Uncertainties associated with the project.

2.5 Hardware Requirements

- Processor with Speed : i3 with 2.4GHZ
- RAM : 4 GB
- Hard Disk : 1TB

2.6 Software Requirements

- Operating system : Windows8 or Above
- Coding Language : Python
- Front end : HTML, CSS, JAVA SCRIPT
- Back end : MYSQL

2.7 Non-Functional Requirements

Non-functional requirements describe user-visible aspects of the system that are not directly related to the functionality of the system. Non-functional requirements are Constraints on the services or functions offered by the system.

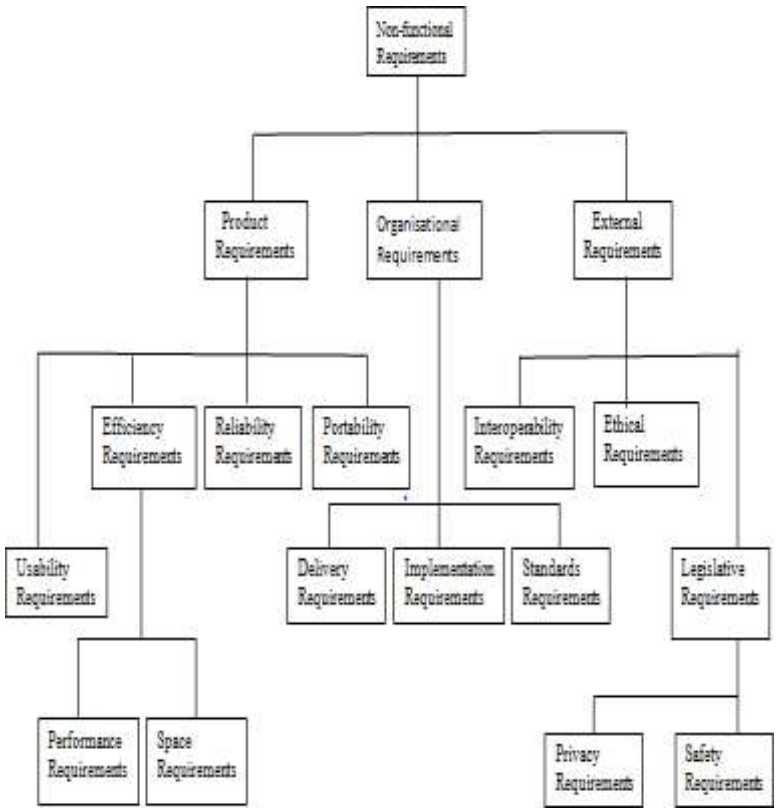

Fig 2.7.1: Non-Functional Requirements

Non-functional requirements are often called qualitys of a system. Other terms for non-functional requirements are "constraints", "quality attributes", "quality goals", "quality of service requirements" and "non-behavioural requirements". Qualities that are non-functional requirements It can be divided into two main categories:

- ❖ Execution qualities, such as security and usability, which are observable at runtime.
- ❖ Evolutionary qualities, such as testability, maintainability, extensibility, and scalability, are embodied in the static structure of the software system.

Usability

As it is an Internet Application, it must have some usability Features. End users of this System are Unlimited and from Various skill groups, so we can't restrict them. By providing some facilities, we have to make them comfortable.

- The colours we use in this Web Portal design must be attractive.
- Easy navigation is Preferable for any task.
- Home page There should be a centralised system (screen or window) to go to any feature and get any result.
- The facility to return to the home page from any page should be available.
- The labels of all Objects in the entire system Must be understandable.

Performance

No external factor influences performance as the application is standalone. Higher memory is recommended for faster execution. However, when executed from the intranet or internet, good bandwidth, less congestion, and the shortest route to reach the server would enhance the performance.

Compatibility

(As it is an Internet Application, it has to support various Hardware configurations, software, and Network communications.) It should support all types of Hardware versions, Operating systems, and Browsers.

Security

The web server and database server should be protected from hacking, viruses, etc.

Scalability

It has to support up to 2,000 Concurrent users.

Portability

The application will be developed using standard open source software (Except Oracle) like Java, Tomcat Web Server, Internet Explorer Browser, etc. This software will work on Windows and Linux.

Software Development Life Cycle (SDLC)

SDLC is nothing but Software Development Life Cycle. It is a standard which is used by software industry to develop good software.

Stages in SDLC

- Requirement Gathering
- Analysis
- Designing
- Coding
- Testing
- Maintenance

Requirements Gathering Stage

The requirements gathering process takes as its input the goals identified in the high-level requirements section of the project plan. Each goal will be refined into a set of one or more requirements. These requirements define the

major functions of the intended application, define operational data areas and reference data areas, and define the initial data entities. Major functions include critical processes to be managed as well as mission-critical inputs, outputs, and reports. A user class hierarchy is developed and associated with these major functions, data areas, and data entities. Each of these definitions is termed a requirement." Requirements are identified by unique requirement identifiers and, at a minimum, contain a requirement title and textual description.

These requirements are fully described in the primary deliverables for this stage: the Requirements Document and the Requirements Traceability Matrix (RTM). The requirements document contains complete descriptions of each requirement, including diagrams and references to external documents as necessary. Note that detailed listings of database tables and fields are not included in the requirements document.

The title of each requirement is also placed in the first version of the RTM, along with the title of each goal from the project plan. The purpose of the RTM is to show that the product components developed during each stage of the software development lifecycle are formally connected to the components developed in prior stages. In the requirements stage, the RTM consists of a list of high-level requirements, or goals, by title, with a listing of associated requirements for each goal, listed by requirement title. In this hierarchical listing, the RTM shows that each requirement developed during this stage is formally linked to a specific product goal. In this format, each requirement can be traced to a specific product goal, hence the term requirements traceability.

The outputs of the requirements definition stage include the requirements document, the RTM, and an updated project plan.

- A feasibility study is all about identifying problems in a project.

- The number of staff required to handle a project is represented as team formation. In this case, only modules with individual tasks will be assigned to employees who are working on that project.
- Project Specifications are all about representing various possible inputs submitted to the server and corresponding outputs, along with reports maintained by the administrator.

Analysis Stage

The planning stage establishes a bird's-eye view of the intended software product and uses this to establish the basic project structure, evaluate the feasibility and risks associated with the project, and describe appropriate management and technical approaches.

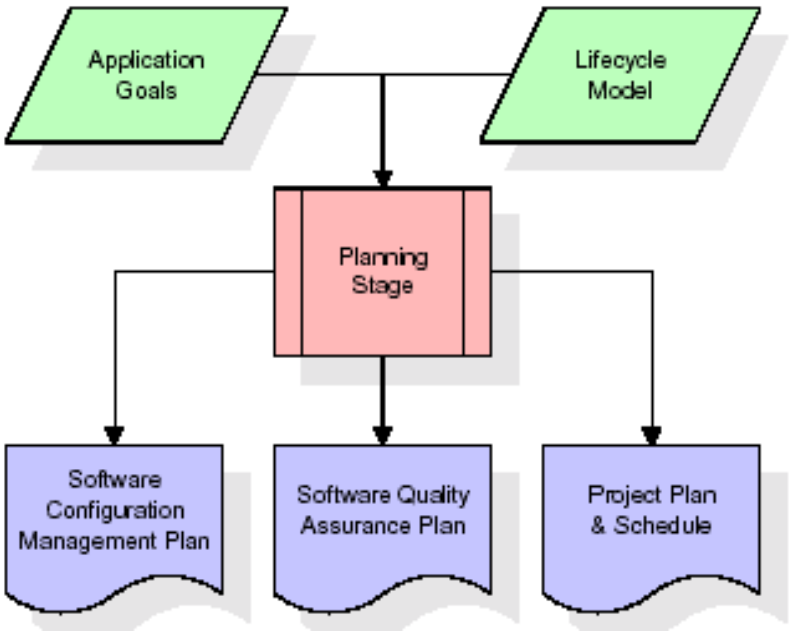

Fig 2.7.2: Analysis Model

The most critical section of the project plan is a listing of high-level product requirements, also referred to as goals. All of the software product requirements to be developed during the requirements definition stage flow from one or more of these goals. The minimum information for each goal consists of a title and textual description, although additional information and references to external documents may be included. The outputs of the

project planning stage are the configuration management plan, the quality assurance plan, and the project plan and schedule, with a detailed listing of scheduled activities for the upcoming Requirements stage and high-level estimates of effort for the outgoing stages.

Designing Stage

The design stage takes as its initial input the requirements identified in the approved requirements document. For each requirement, a set of one or more design elements will be produced as a result of interviews, workshops, and/or prototype efforts. Design elements describe the desired software features in detail and generally include functional hierarchy diagrams, screen layout diagrams, tables of business rules, business process diagrams, pseudocode, and a complete entity-relationship diagram with a full data dictionary.

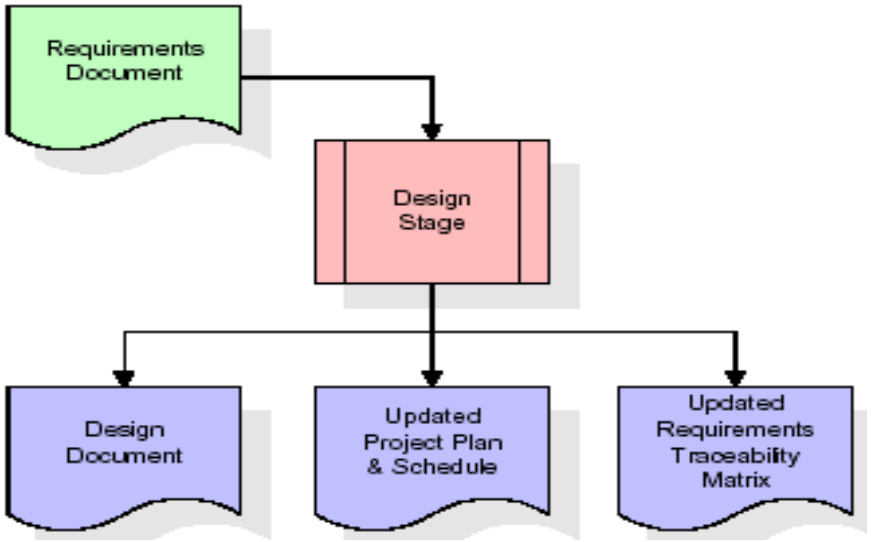

Fig 2.7.3: Designing Stage

When the design document is finalised and accepted, the RTM is updated to show that each design element is formally associated with a specific requirement. The outputs of the design stage are the design document, an updated RTM, and an updated project plan.

Development (Coding) Stage

The development stage takes as its primary input the design elements described in the approved design document. For each design element, a set of one or more software artefacts will be produced. Software artefacts include, but are not limited to, menus, dialogues, data management forms, data reporting formats, and specialised procedures and functions. Appropriate test cases will be developed for each set of functionally related software artefacts, and an online help system will be developed to guide users in their interactions with the software.

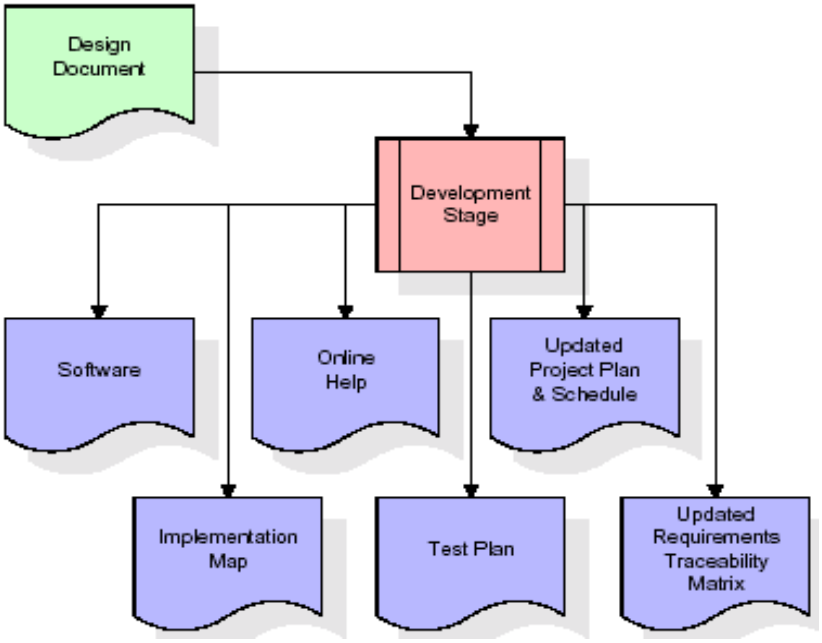

Fig 2.7.4: Development Stage

The RTM will be updated to show that each developed artefact is linked to a specific design element and that each developed artefact has one or more corresponding test case items. At this point, the RTM is in its final configuration. The outputs of the development stage include a fully functional set of software that satisfies the requirements and design elements previously documented, an online help system that describes the operation of the software, an implementation map that identifies the primary code entry points for all major system functions, a test plan that describes the test cases

to be used to validate the correctness and completeness of the software, an updated RTM, and an updated project plan.

Integration and Test Stage

During the integration and test stages, the software artefacts, online help, and test data are migrated from the development environment to a separate test environment. At this point, all test cases are run to verify the correctness and completeness of the software. Successful execution of the test suite confirms a robust and complete migration capability Initiation Plan.

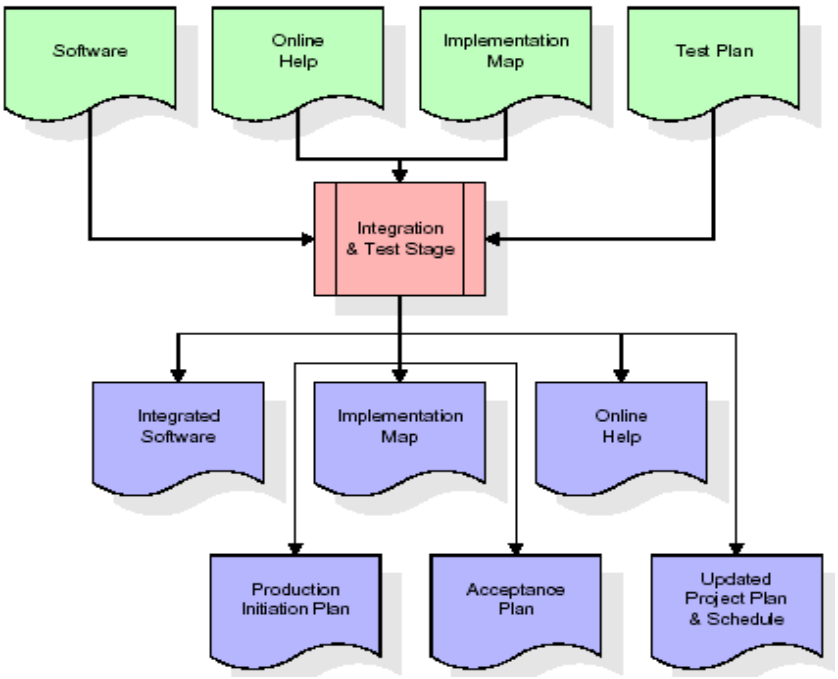

Fig 2.7.5: Integration & Test Stage

The outputs of the integration and test stages include an integrated set of software, an online help system, an implementation map, a production initiation plan that describes reference data and production users, an acceptance plan that contains the final suite of test cases, and an updated project plan.

Installation and Acceptance Test

During the installation and acceptance stages, the software artefacts, online help, and initial production data are loaded onto the production server. At this point, all test cases are run to verify the correctness and completeness of the software. Successful execution of the test suite is a prerequisite to acceptance of the software by the customer. After customer personnel have verified that the initial production data load is correct and the test suite has been executed with satisfactory results, the customer formally accepts the delivery of the software.

The primary outputs of the installation and acceptance stages include a production application, a completed acceptance test suite, and a memorandum of customer acceptance of the software. Finally, the PDR enters the last of the actual labour data into the project schedule and locks the project as a permanent project record. At this point, the PDR "locks" the project by archiving all software items, the implementation map, the source code, and the documentation for future reference.

Maintenance

The outer rectangle represents maintenance of a project. The maintenance team will start with a requirement study and understanding of documentation. Later, employees will be assigned work, and they will undergo training on that particular assigned category. For this life cycle, there is no end; it will be continued so on like an umbrella.

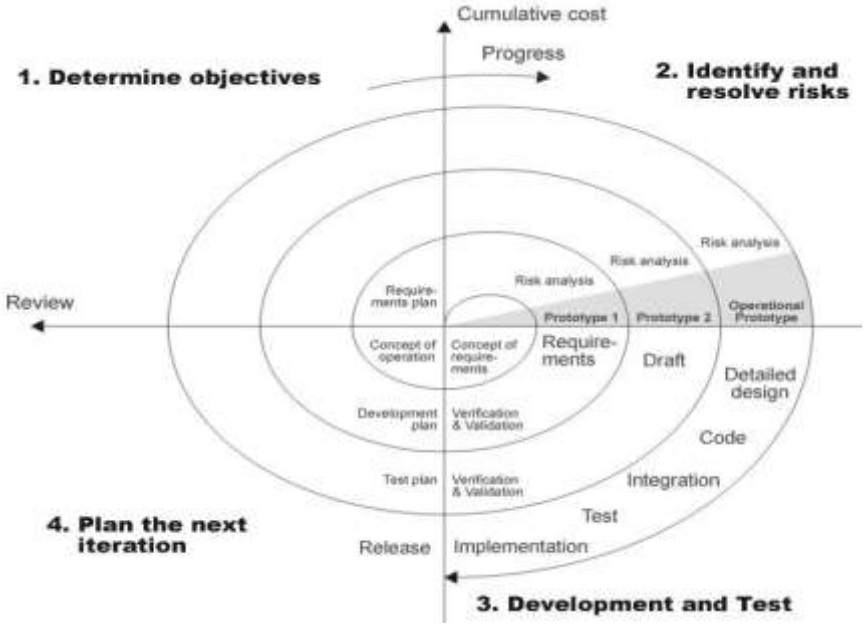

Fig 2.7.6: Spiral Model

Advantages

- Risk analysis done here reduces the scope of risk occurrence.
- Any requirement change can be accommodated in the next iteration.
- Model is good for large projects that are prone to risks and the requirement keeps on changing.