

A WEB-ENGINEERING SOLUTION TO ACADEMIC MANAGEMENT SYSTEM OF AN EDUCATIONAL INSTITUTE

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Abstract: The internet and worldwide web has revolutionized the whole world. In recent years, there has been rapid growth, in web application development process and their management. The technologies have drawn us all (with billions more who will eventually follow) into the information age. They have become integral to daily life in every way. Internet together with web application tools have given solution to many problems and have made the processing and dissemination of information fast and timely. In this paper we will try to provide a web-engineering solution to academic management of an educational organization. We have tried to provide the whole process of software development for the organization includes the technologies, platform and hardware requirements.

Keywords: world wide web(www); web-engineering(WebE); system analysis; data flow diagrams(DFD); testing .

INTRODUCTION

The worldwide Web and the internet that empowers it are arguably the most important developments in the history of computing. The technologies have drawn us all (with billions more who will eventually follow) into the information age. They have become integral to daily life in every way.

For those of us who can remember a world without the web, the chaotic growth of the technology harkens back to another era- the early days of software. Web-based systems and applications deliver a complex array of content and functionality to a broad population of end-users. Web-engineering (WebE) is the process that is used to create high quality Web-Apps. WebE is not a perfect clone of software engineering, but it borrows many of software engineering's fundamental concepts and principles. In addition, the WebE process emphasizes similar technical and management activities.

As Web-Apps became increasingly integrated in business strategies for small and large companies (e.g. E-commerce), the need to build reliable, usable and adaptable systems grows in importance. That's why a disciplined approach to Web-Apps development is necessary.

OBJECTIVE

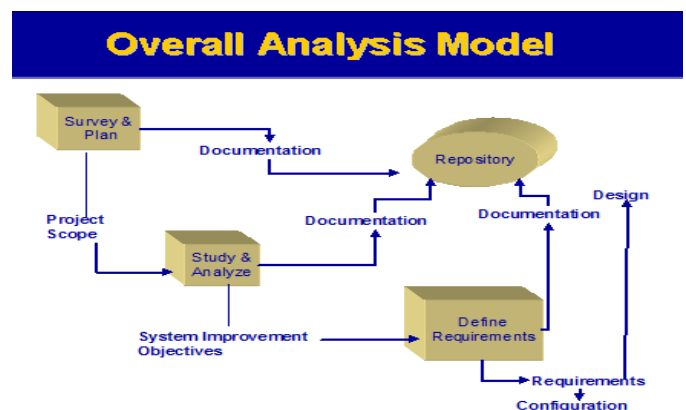
To build an online community which enables all members of that community to access all our electronic research, teaching and learning resources and our administrative services.

WHY AN ONLINE APPLICATION

- i. Complex array of content to a broad level of end users.
- ii. Reliable, widely usable and adaptable system grows.
- iii. Concurrency at higher level is achieved.

- iv. Unpredictable load.
- v. Optimum performance.
- vi. High level of security.
- vii. Broader level of feedback is derived from the users across the globe.
- viii. Interactive and more useful output to the end user.

ANALYSIS



SYSTEM ANALYSIS

Survey andPlan

The primary role of academic body is to provide education and research opportunities to different types of students viz. graduate, post graduate students, researchers, faculty members. In order to maintain the academic management process of the Educational Institute. The traditional file system and a little computing system is mainly involved. Anyways there is no role played by the web applications in order to make the educational institution a global one.

At departmental level there is no or negligible role played by the internet supported applications for the formulation of the important stuff for the students like:

- i. Detailed academic information.
- ii. Timetable.
- iii. Attendance records.
- iv. Marks assessment records.
- v. Extra-Curricular activities records.

In addition to that there is no or negligible role played by the Internet supported applications for the interim departmental information storage like:

- i. Asset(s) information.
- ii. Faculty information.
- iii. Employee information.

Apart from that there is poor information retrieval system currently in progress as the internet supported applications have no role to play.

SYSTEM STUDY BASIS

- i. Traditional way of Course Definition & Duration in the Educational Institute.
- ii. Traditional Student admission & Registration system in the Educational Institute.
- iii. Paper Evaluation pattern in the Educational Institute..
- iv. Traditional book keeping system for students.
 - a. Academic performance.
 - b. Extra-curricular activities.
 - c. Academic history.
 - d. Attendance details.
 - e. Personal and parental information.
- v. Subject wise student Attendance Procedure.
- vi. Faculty Detailed Information storage.
- vii. Employee Detailed Information storage.
- viii. Time Table Construction Mechanism in each Department.
- ix. Academic Calendar updates in the Educational Institute..

DRAWBACKS OF THE EXISTING SYSTEM:

- i. All the processes related to the academics management are carried out manually which results it a time consuming job causing inconvenience.
- ii. No security of data in the sense of privacy and natural hazards.
- iii. Data is redundant.
- iv. Due to the use of manual procedures, more errors are likely to be committed.
- v. Data redundancy causes non-integrity of data causing problems to the technical staff dealing with the system.
- vi. Data is not centralized.
- vii. Poor retrieval of the data as internet has no role to play.
- viii. Poor feedback is derived from the system users as no globalization concept is introduced or in play.

SYSTEM STUDY

Proposed Plan

- i. An online application will be available in place of the present system, which can allow wide range of users to interact with the system.

- ii. Higher level of concurrency can be achieved as the application being totally and purely a web application.
- iii. The students, faculty and the officials will be provided with efficient and interactive interface to interact with the system with optimum output.
- iv. As the whole academics management will be done using a more secure web application there will be specific role management.
- v. Broader level of feedback can be derived from the users across the globe.
- vi. Store the information in a more coherent way.
- vii. Add database support to avoid data redundancy and handle a higher data volume.

Will be more secure; operate in two modes viz. general user mode with limited privileges and super user mode with full privileges which acts as the administrator of the system.

Feasibility Study

Feasibility study is a process that identifies, describes and evaluates the system. The objective of feasibility study is to acquire a sense of its scope for solving the problem. During the study, the problem definition was crystallized and all aspects of the problem to be included in the system were determined. The result was simply a report - a formal document detailing the nature and scope of the proposed solution. The key considerations involved are:

Technical Feasibility:- The purpose of assessing technical feasibility is to gain an understanding of the organizations ability to construct the proposed system. Technical feasibility determines whether the technology needed for the proposed system is available and how it can be integrated within the organization. It must also assess whether the staff have technical expertise to assimilate and use the new technology.

This study should answer the following questions:

- i. Whether the project can be carried out with the existing equipment?
- ii. Can the work be done with the existing personnel?
- iii. If a new technology is required, how best can it be implanted?

Thus we see that technical feasibility is concerned with specifying equipment and software that will successfully support the required. Since all the properties are satisfied by our proposed system so it is said to be technically feasible.

Operational Feasibility:- Operational feasibility must determine how the proposed system will fit in with the current operations and what, if any, job reconstruction and training will be needed to implement the system.

This study should answer the following questions:

- i. Whether the system can be used if it id developed and implemented?
- ii. Will there be resistance from users that will cripple the possible application benefits?

The proposed system does meet the organizations operating needs and increases the operational efficiency of the staff as well. Also there is sufficient support for the project from the users and is acceptable to users, so the proposed system is operationally feasible.

Economic Feasibility:- Economic Feasibility study is the most frequently used method for evaluating the effectiveness of a used method for evaluating the effectiveness of a new system.

It is performed to determine the benefits and savings that are expected from the new system and compare them with costs.

This study should answer the following questions:-

- i. Whether the project is economically feasible?
- ii. If enough funds are not available, then what the sources of funds?
- iii. Whether there are sufficient benefits when compared to the costs is incurred?

In our case the cost of software tools and the required hardware are less as compared to the expenditure on the manual labour. The proposed system is economically feasible.

SCOPE OF THE SYSTEM

The first activity in software project planning is the determination of software scope. Function and performance allocated to software during system engineering should be assessed to establish a project scope that is unambiguous and understandable at the management and technical levels. A statement of software scope must be bounded. Software scope describes the data and control to be processed, function, performance constraints, interfaces, and reliability. Functions described in the statement of scope are evaluated and in some cases refined to provide more detail prior to the beginning of estimation. The proposed system can be used as a replacement for the existing manual system. The proposed system will enable the authorities to perform the following operations:

- i. Addition of Departments.
- ii. Addition of courses in the departments.
- iii. Addition of semesters and respective subjects.
- iv. Generation of academic calendar of the Educational Institute.
- v. Generation of timetable for students.
- vi. Attendance management for students.
- vii. Extracurricular activities reports management.
- viii. Internal assessment reports generation.
- ix. External Examination reports generation.

All the above-described operations will be available using a user friendly Web-Portal developed.

INFORMATION GATHERING TECHNIQUES USED:

Interviewing: -

It refers to the process of gathering information about the existing system by asking questions. The primary purpose of interviewing is to obtain both qualitative and quantitative data regarding user requirements, policies, procedures and practices. We used group interviews, where in we interviewed a collection n of people belonging to a particular information sources at the same time and at the same place. Relevant information was collected by the interviewing technique. This technique was found most helpful in gathering information. In our case, we first started interviewing top level management who gives us the overview of the existing system. They gave us the objectives to be met by the overview of the existing system. They gave us the objectives to be met by the proposed system. At this stage we prepared a gross model and verified it. The next step was to interview middle level management and operational staff from which day-to-day operational

requirements and information required for current use is gathered. Here the earlier gross model was expanded and refined. It was not for us to obtain all information during the course of a single interview with the users, so we made 3-4 interview meetings to get the necessary information about the existing system.

- i. Describe the exact requirements.
- ii. Briefly describe working of the existing system.
- iii. What is the procedure for selecting a candidate for the post?
- iv. What is the criterion for selecting the candidate?
- v. How information is maintained?
- vi. What are the important working components of the system?

From the process of interviewing the concerned personnel we concluded the following points:

- i. This technique was proved to be a fruitful for individuals who do not communicate effectively in writing.
- ii. It helped us in discovering areas of misunderstanding, unrealistic expectations, and even indications of resistance to the proposed system.
- iii. Interviews stand as the best source of qualitative information.
- iv. This technique gave us an opportunity to motivate the Interview to respond freely and openly to questions.

Site Visits:-

Another method used by us was the on-site or direct observation, which helped us to gain information, which could not be obtained by any other method. Here our role was an information seeker. Through observation, we obtain first hand information about how the activities are carried out. During this we actually observed how documents are handled, how processes are carried out and whether specified steps are actually followed. This technique us close view of the working of the system. Here we observed people, objects, documents and occurrences of the events occurred in the existing system. From the on-site observation we concluded the following points:

- i. Data gathered by on-site observation was highly reliable.
- ii. Observation was inexpensive.

It is by on-site observation we were able to see exactly what is being done. Complex tasks are sometimes to clearly explain in words, it was the direct observation which filled this gape of complexity. This technique helped us in identifying tasks that have been missed or inaccurately described by previously mentioned technique.

During site-Visits we kept in mind the following points:

- i. Obtained permission from the authority for on-site observation.
- ii. We didn't made assumptions.
- iii. We were ready to listen more than talk.
- iv. We didn't give any advice.
- v. Took notes during or immediately after the observation.
- vi. Didn't interrupt individuals at work.
- vii. We conducted observation when the workload was normal; Afterwards, observations were made during peak hours to gather information for measuring the effects by the increased volume of work.

Presentations: -

Presentation is the activity of communicating findings, recommendation and the documentation for review by interested users and mongering body. Presentation is useful in situations where the users are passive or too busy to actively explain things. Here, an analyst may use study of existing records and questionnaires to put together a presentation. Sometimes people are not very forthcoming with comments and it is easier for them to respond to a presentation than to explain the entire procedure. It gave us an idea of how correct is the perspective that we have gained.

DATA FLOW DIAGRAMS

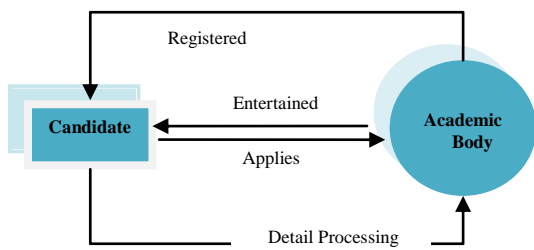


Figure 1. Context Level DFD

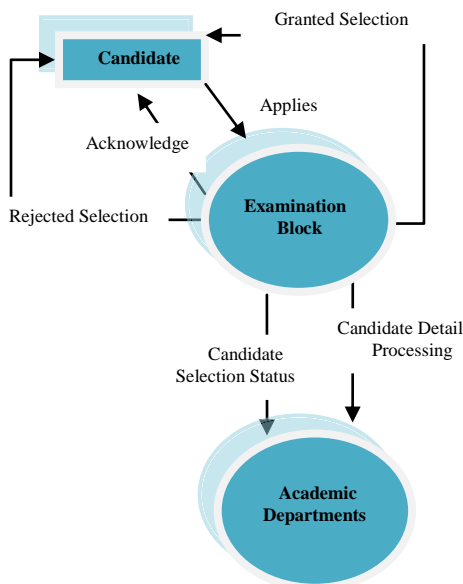


Figure 2. Zero Level DFD

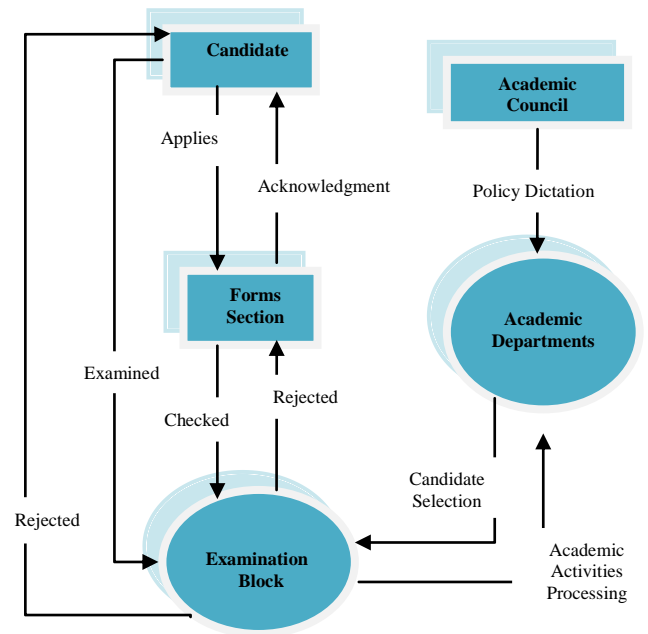


Figure 3. Level-1 DFD 1.1

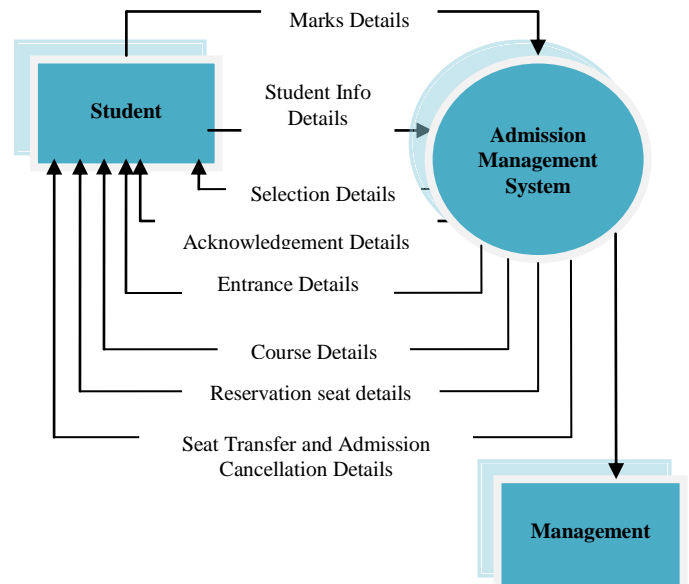


Figure 4. Level-1 DFD 1.2

Internal Assessment / Time-Table / Attendance

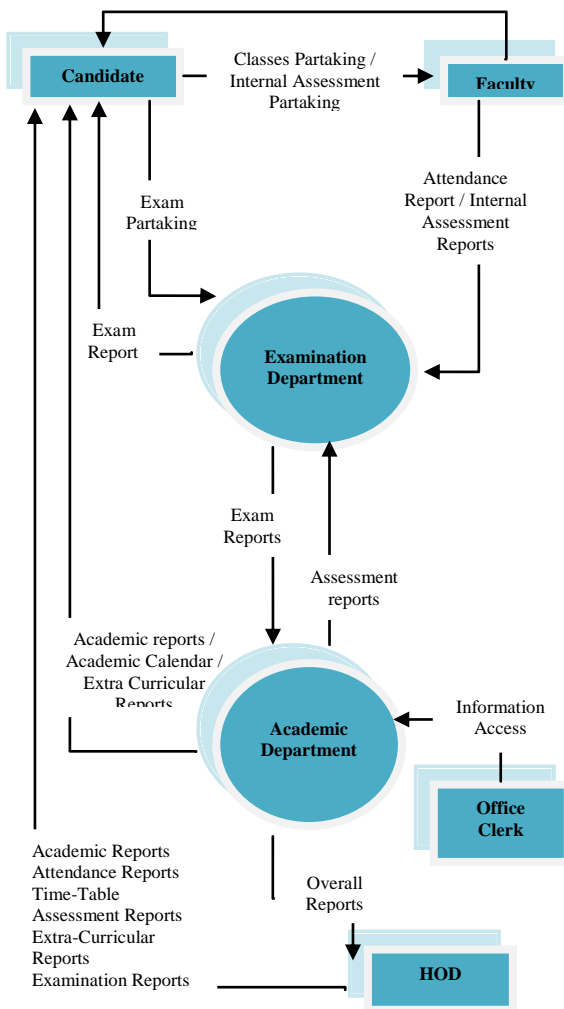


Figure 5. Level-2 DFD

SYSTEM REQUIREMENT SPECIFICATION

Specific and Functional Requirements:-

The Academic Management System of an Educational Institute requires the given features to be automated and we also came with the given requirement features in the Educational Institute. Educational Institute to be automated using the web application to be developed.

Course Definition:

- i. Duration, Syllabus, Evaluation Pattern (Theory & Practical, Credit Definition)
- ii. Class Room Definition: Seating Capacity, Courses Available for?
- iii. Laboratory Definition: Laboratory type? Course , Mapping to Laboratory.
- iv. Seminar / Presentation Room Definition.

Academic Schedule Definition:

- i. Time Table for Courses.
- ii. Time Table Academic Resource Mapping.
- iii. Holiday Details.

Detailed Student information collection:

- i. Academic Performance (Theory / Practical Information).

- ii. Extracurricular activities - Hobbies Information, Competition participation, prize-winning details, specific achievements etc.

Parental Information: Occupations, designations, service or business information, office addresses, phone numbers etc storage for students.

Attendance Information: Attendance data entry, average attendance calculation, finding out students below average attendance etc.

SYSTEM DESIGN

System design is the evaluation of alternative solution and the specification of a detailed computer-based solution. It is also called physical design. Design is a meaningful engineering representation of something that is to be built. It can be traced to customer's requirements and at the same time assessed for quality against a set of predefined criteria for good design. The design of a system is a plan for a solution such that if the plan is implemented. The implemented system will satisfy requirements of the system. Design is essentially the bridge between the requirements specification and the final solution for satisfying the requirements. It is a blueprint of a system, for the solution of a system in which we consider to be set components with clearly defined behaviour. The input to the design phase is the specifications for the system to be designed. Relative to the information system building blocks, system design addresses Data, processes, Interfaces and Geography from the system designer's perspective. Thus we can say that, system Design builds on the knowledge derived from system analysis.

System Design encompasses of the following phases:-

- i. Configuration Phase.
- ii. Procurement Phase
- iii. Design and Integration Phase.

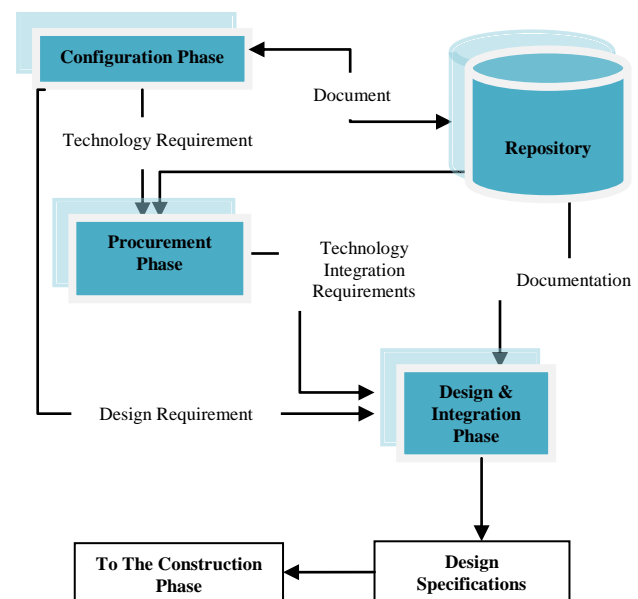


Figure 6. System Design Overview

Configuration Phase:-

The purpose of this phase is to identify candidate solutions, analyze those solutions and recommend a target system that will be designed and implemented. Alternative solutions to be considered should be those that address the requirements of the system, we can finally address how the new system, including computer-based alternatives, might operate. During the configuration phase. It imperative that we should identify options, analyze objectives of configuration phase are:

- i. To identify and research alternative manual and computer-based solutions to support our target system.
- ii. To evaluate the feasibility of alternative solutions and recommended the best overall alternative solution.
- iii. The configuration phase is primarily concerned with the technology requirements for the target system. Thus we will address how technology may be used to support the target system. The technology decisions made during this phase will impact the Data, Process, interface and Geography.

Data:- In this case it focuses on the database technology to be used which depends on project subjects and data requirements.

Processes:- In this case it focuses on the software and hardware technology to be used which in turn depends on the system context and interface requirements.

Interface:- Focuses on the interface technology and standards which depend on system context and interface requirements.

Geography:- Depends on operating locations and communication requirements and focuses on networking technology and standards.

Procurement Phase:-

The procurement of software and hardware is not necessary for all new systems. On the other hand, when new software or hardware is needed; the selection of appropriate products is often difficult. The system analyst is becoming increasingly involved in the procurement of software packages, peripherals and computers to support specific applications being developed by that analyst.

There are four fundamental objectives of the procurement phase:-

- i. To identify and research specific products that could support our recommended solution for the target information system.
- ii. To solicit, evaluate and rank user proposals.
- iii. To select and recommend the best user proposals.
- iv. To establish requirements for integrating the award users product.

Design and integration Phase:-

This phase involves developing technical design specifications. The goal of this phase is twofold:

- i. First and foremost, the analyst seeks to design a system that both fulfils requirements and will be friendly to its end users.
- ii. Secondly and still very important is that the analyst seeks to present clear and complete specifications to the computer programmers and technicians.

SYSTEM IMPLEMENTATION

It is the process of construction of the new system and delivery of that into production i.e. day-to-day operation. Implementation is nothing but coding, testing and installing a developed software package on the client end. Keeping these

three main processes in consideration implementation is grouped into two main phases:

Construction Phase

In this phase we perform coding for the system components and test them. After several iterations of the design / construction loop;

- i. To build and test a functional system that fulfills system and design phase requirements.
- ii. To implement the interfaces between the new system and existing production system.

In this phase the project team constructed the databases, application programs, user/system interfaces and networks. For this purpose we depend on various available resources which we require during and before the implementation of the proposed system.

Hardware Components

- Processor(Intel Pentium IV)
- RAM(256 onwards.)
- Hard disk(40 GB onwards)

Software Requirements

- i. Windows-XP with IIS Server.
- ii. Microsoft Visual Studio 2005.
- iii. ASP.Net 2.0 (Integral part of Microsoft.Net 8.0).
- iv. C# .Net as Programming Paradigm.
- v. SQL Server 2005 as Back End.

Architecture Followed

For the development of our web application for the Academics management we followed a three tier standard architecture

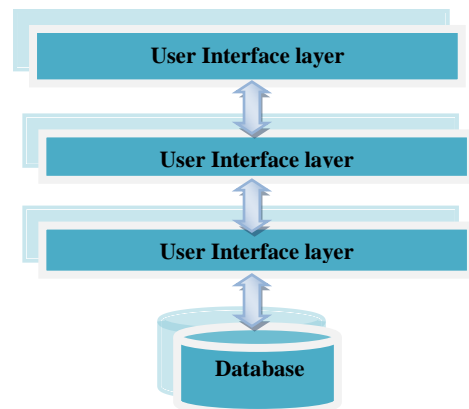


Figure 7. Application Architecture

Delivery Phase:-

The purpose of the delivery phase is to smoothly convert from the old system to the new system. To achieve this, the developers had to accomplish the following objectives:

- i. Conduct a system test to ensure that the new system works properly.
- ii. Prepare a conversion plan to provide a smooth transition to the new system.
- iii. Install databases to be used by the new system.
- iv. Provide training and documentation from the individuals who will be using the new system.
- v. Convert from old system to the new system and evaluate the project and final system.

TESTING PROCESS

The system development phases involve many activities where chances for occurrences of human errors are enormous. Logical error, carelessness, improper communication, the need to hurry through the whole process of software development due to time constraint etc. provide ways for errors to creep in. The system must be tested thoroughly so that such errors are detected and corrected as early as possible. A successful test is one that uncovers every possible error. Large systems are built out of sub-systems which are in turn built out of modules. The testing process therefore proceeds in stages, where testing is carried out. The testing process is an iterative one, with information being fed back from later stages to earlier parts of the process repeatedly.

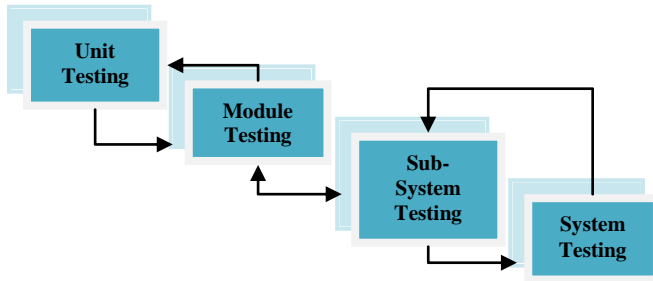


Figure 8. Application Testing Mechanism

CONCLUSION

In this paper, we have tried to give a detailed feasible solution to the traditional academic management system of an educational institute using the web application technology. We have adopted used the software engineering methodology and concepts for its solution. Though a number of technologies and solution are available which can produce the product but the software engineering methodologies will remain same. One unique contribution of this paper is that we do not add

any new technology to the already existing large collection, rather we emphasize on the solution to academic management of an organization.

REFERENCES

- [1] Beginning XML, 4th Edition, Copyright © 2007 by Wiley Publishing, Inc., Indianapolis, Indiana.
- [2] Bill Evjen, Scott Hanselman, Devin Rader, Farhan Muhammad, Srinivasa Sivakumar, Professional ASP.NET 2.0 Special Addition, Wrox Professional Guides.
- [3] Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner, Karli Watson, Professional C# 2008, Wrox Professional Guides.
- [4] Pressman, S. Roger., "Software Engineering, A Practitioner's Approach, Sixth Edition", McGraw-Hill International Edition.
- [5] Lyu, M.R., Handbook of Software Reliability Engineering, McGraw- Hill, 1996.
- [6] McClanahan, Craig R., "The Evolution of Web Application Architectures" O'Reilly Open Source Convention August 1 - 5, 2005
- [7] Pressman, S. Roger., "Software Engineering, A Practitioner's Approach, Sixth Edition", McGraw-Hill International Edition.
- [8] Rico Mariano; Corcho Oscar; A Macías José; Camacho David, "A Tool Suite to Enable Web Designers, Web Application Developers and End-users to Handle Semantic Data", International Journal on Semantic Web and Information Systems, Volume: 6, Issue: 3 (2010).
- [9] XML Programming Bible Copyright (c) 2003 by Wiley Publishing, Inc., Indianapolis, Indiana.
- [10] Zhang . Jia, Chung. Jen-Yao et al, "Migration to web services oriented architecture: a case study".ACM Symposium on Applied Computing, 2004.