Records of Revisions

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Executive Summary

The purpose of this document is to communicate our software development work methodology. This document covers all the issues related to the software development effort undertaken by Information Technology Department, PIA and provides a comprehensive view of how software projects are dealt with.

These methodologies are deduced from classical software life cycle and Rapid Application Development (RAD) paradigms.

The standards for the preparation of system specification document, system design document and data dictionary are presented here with brief layouts.

Software coding standards are also presented. Apart of these, we have maintained our quality control methodology which is a part of our software development effort. Standard test sheets are also attached in the annexes.

The following work methodology serves as templates for most of the projects being handled at Information Technology Department, PIA. *However, minor modifications and deviations from this methodology are possible depending upon the nature and requirements of the project.*

Software Development Methodology

Normally we follow a modified version of the classical software development life cycle (SDLC) to complete the local software projects. This life cycle consists of various phases:

1. Project Planning
2. System Requirement Analysis
3. Software Requirement Analysis
4. System Design and Prototyping
5. Coding
6. Testing
7. User Training / Implementation
8. Maintenance

Project Planning

Before the start of a project, project-planning sessions are conducted. A full-time project manager is deputed for carrying out the project. In these sessions, the following persons may participate:

1. Project Manager
2. Marketing Manager
3. Team Leader
4. Domain Experts

The major objectives that are aimed in this phase are:

1. Project Planning
2. Resources planning
3. Time estimates
4. Work methodology
5. Guidelines

System Requirement Analysis

Starting with the system requirement analysis, we initially depute a team of systems analysts to conduct initial requirement analysis. This team is normally consist of

- Domain experts
- Marketing Manager
- Software/MIS experts
- And/or Project Manager

Meetings with the concerned people from clients are held and initial investigation is performed. The outcome of this phase is a ***Requirements Specification Document*** that addresses:

- Features of the current system (whether manual or automated)
- Functional requirements of the new system

This document is presented to the client for verification and approval. Once this document is verified, it serves as a basis for the next phases of the system development effort for this project.

Software Requirement Analysis

After the requirement specification is verified, a detail analysis of the system is performed for the design of the new software system. The following people carry out this phase:

1. Project Manager
2. Systems Analysts
3. System Designers

The outcome of this phase is a ***Functional Specifications Document***. This document is presented to the client and a feedback is expected. After the feedback from the client, modifications identified by the client are incorporated and a final version of the functional specification document is prepared. This document, after final approval from the client, is then frozen and serves as the final specifications based on that the new system is designed.

During this phase, possible solutions of the problem are devised and presented to the client. The best solution based on various factors is adopted and further improved through iterative method. The selected solution is used for the system development and designed in the next phase of the software development life cycle.

System Design

Based on the functional specifications, two major tasks are carried out in this phase:
1. Prototype
2. Program Specifications

- The prototype is demonstrated to the client.
- The ***program specification document*** is provided to the programmers for coding in the next phase.

The standard we have achieved for the program specifications has been evolved over period. Program specifications are based on the system design and the system design is based on the following tasks:

1. Data Modeling (outcome is Data Dictionary)
2. Process Modeling (outcome is Process Specs)
3. Control Modeling (outcome is Control Specs)

The design specifications are prepared aiming the following objectives:
1. Database design
2. Object Design
3. System Control Flow
4. Programs Structures and Flow
5. Algorithms Design
6. Data Structures
7. Test Specifications
8. Test Plans

When the system design phase is completed, a review meeting is conducted. All the resources that are assigned to the project attend this review meeting. Some MIS experts from within the organisation may be invited to participate in this meeting. After this review meeting the final system design documents are distributed to all the members and a detail development plan is prepared for the subsequent coding phase.

The following documents are normally prepared:
1. Data Dictionary
2. Program Specifications

The formats of these documents are presented below.

Program Specs

For each individual screen, the following properties are provided:
1. Screen description
2. Tables used (small ERD)

3. Screen layout
4. Brief description of each field
5. Relationship between DB fields and screen fields
6. Algorithms of major process related to the screen
7. Test procedures

Data Dictionary

Each table is defined with the following properties:

1. Table name
2. List of programs that uses this table
3. Primary key
4. Foreign key(s)
5. Indexes

Each attribute/field of a table is defined with the following properties:

1. Data Element: the name of the field
2. Datatype: data type of the field
3. Size: size of the field
4. Null: null values allowed or not
5. Description: brief description of the field
6. Contents: contents that this field may contain
7. Purpose: purpose of using this field in the data model
8. Example: sample data that this field may contain

Coding

When the system design is completed and the design documents are prepared, these documents are fed to the programmers. Programmers find these documents very helpful in subsequent programming effort. A complete description of each module is available in this document and almost 70-80 % of the time, programmers doesn't need to consult the systems analysts/designers for clarifications.

Before the actual coding is started, a detailed development plan is prepared and the feedback regarding the time estimates is taken from the developers. If necessary, the development plan is modified. The final development plan is provided to the developers. This plan is also forwarded to the top management for control purposes.

Development effort is monitored and controlled by the project manager and the top management is periodically updated about the project status.

We have devised our coding standards based on our practice and the international standards for each of the platform and working environments. The standard documents are attached.

The development team strictly follows the coding standards. We also perform a code review to conform the standards.

Testing

Testing is done on a cumulative basis from day one. A permanent tester is part of the design and programming team. This approach adds tremendous value to the quality of the final product. Besides a permanent tester towards the end of the coding phase, an independent test team takes over the project and performs the following activities:

Activity	**Description**
Unit Testing	Ensure all modules work independently
Integration Testing	Ensure all modules work together
Cycle Testing	Ensure the system flow
Stress Testing	Ensure that the system does not break with increasing load

The unit testing is based on the test procedures available in the program specifications. There are two types of test:

1. Pre-printed standard test sheets containing the normal test procedures
2. Specific test related to each screen/module

The integration testing is based on the program flow and control flow of the system. It consists of at-least the following tests:

1. Standard screen design/layout tests
2. Standard system crash tests
3. Standard functionality tests
4. Specific functionality tests

Once the Quality Assurance Team certifies the product, the product is always reviewed for performance gains.

User Training / Implementation

After the testing of the software is done and the QA Team approves the product for implementation, an implementation plan is devised. In this plan the following things are included:

1. User training plan
2. Existing data conversion plan and procedures
3. Data feeding methodology
4. Parallel run of manual and automated system
5. Final hand-over of the system to the end users

Maintenance

When the implementation phase is over, software development effort is almost completed. A maintenance lifecycle is prepared after interacting with user department.