

WORKFLOW, WORKFLOW TOOLS AND DESIGN OF WORKFLOW

A Thesis

Submitted to the Department of Computer Science and Engineering

of

BRAC University

by

Samina Azad

Student ID: 01101049

In Partial Fulfillment of the requirements for the Degree

of

Bachelor of Science in Computer Science

May 2005

DECLARATION

I hereby declare that this thesis is based on the results found by myself. Materials of work found by other researcher are mentioned by reference. This thesis, neither in whole nor in part, has been previously submitted for any degree.

**Signature of
Supervisor**

**Signature of
Author**

ACKNOWLEDGMENTS

Special thanks, to Unocal Bangladesh Limited for giving me the opportunity to do my thesis in such a renowned organization. I am grateful to the HR Manager D. S, Zulfiker Hydar for giving me the topic of thesis. Also I am grateful to Mozammel Mehedi Arif, Sayeeda Salam and Naved Ferdous Iqbal for iving me information about the processes and for guiding my task in the organization. I am fortunate enough as my advisor Matin Saad Abdullah accepted the difficult task of overseeing this work to completion and for giving me the direction of doing thesis. He has helped me in each and every phase of my research. I am gratified to him for his support. I am also thankful to the members of the Advisory Committee for taking time out of their busy schedules to consider this work. I want to thank my friends Zahiduzzaman, Hasnaine Feroze, Mahbubuzzaman and Khalequzzaman as well for helping me through out the thesis period and helping me to get an idea about thesis organization and formation. Lastly, I am grateful to almighty Allah for His blessings.

ABSTRACT

Unocal Bangladesh HR department has wanted to enjoy the fruit of computer technology to achieve the goals “reduce the cost of doing business and speed up the business processes”, thus assigned me the task to analyze the HR processes and to recommend available tools required for automation. In my research I found workflow technology to be the best suitable tools for HR process automation. This paper portrays an overview of workflow to make readers understand; concepts associated with it and provided available workflow tools (Workflow Engine) required to automate. Workflow diagram prepared in Microsoft Office Visio-2003 has shown in this paper. All phases of prototype have described in details. In addition improvements and suggestions have offered for process level, prototype and workflow engine as well. Finally, I hope this paper would be able to stimulate interest of readers and create an instinct to do further research on it.

TABLE OF CONTENTS

	Page
TITLE.....	i
DECLARATION.....	ii
ACKNOWLEDGEMENTS.....	iii
ABSTRACT.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	xi
LIST OF FIGUR4ES.....	xii
CHAPTER I. INTRODUCTION	
1.1 Company Overview.....	1
1.2 My Task in Unocal Bangladesh.....	1
1.3 An Overview of Process.....	2
1.3.1 Material process.....	2
1.3.2 Information process.....	3
1.3.3 Business process.....	3
1.4 Workflow.....	3
1.5 Work Flow Management System (WFMS)	4
1.5.1 Difference between WFMS and Business Process Management System (BPMS).....	4
1.6 Definition of Some Basic Terminology	4
1.7 Organization of the Paper	5
CHAPTER II DISCUSSION ON WORKFLOW AND WORKFLOW MANAGEMENT.	
2.1 Workflow and Workflow Management	6
2.2 Characterizing Workflows	6
2.2.1 Trade press workflow characterization.....	6
2.3 Workflow Management.....	9
2.3.1 Process modeling and workflow specification.....	10

	Page
2.3.1.1 Methodologies for process modeling.....	11
2.3.2 Reengineering a process.....	14
2.3.3 Implementing and automating a workflow.....	14
2.4 Where to Use WFMS.....	15
2.5 A Workflow Management System.....	16
2.5.1 Four layers of process definition.....	17
2.5.2 Commercial workflow management systems.....	18
2.5.2.1 Workflow model.....	19
2.5.2.2 Specification language	19
2.5.2.3 Testing, analysis, and monitoring tools.....	21
2.5.2.4 Systems architecture and interoperability.....	21
2.5.2.5 Implementation support.....	22
2.5.2.6 Correctness and reliability.....	22
2.6 Benefits of Workflow Management System.....	23
2.7 Limitations of Workflow Management System.....	24
 CHAPTER III ANALYSIS OF THE CURRENT SYSTEM AND DESIGN OF WORKFLOW	
3.1 Existing Recruitment Process Flowchart and Description.....	28
3.1.1 Recruitment process flowchart provided in APPENDIX-A...	28
3.1.2 Recruitment process description.....	28
3.1.3 Screenshots of existing HR recruitment system.....	31
3.1.4 Screenshots of existing HR employee information storage system.....	35

3.2 Existing Training Process Flowchart and Description.....	36
3.2.1 Training process flowchart provided in APPENDIX-B.....	36
3.2.2 Training process description.....	37
Page	
3.2.3 Screenshots of existing HR training system.....	39

CHAPTER IV PROPOSED SYSTEM THAT IS AVAILABLE WORKFLOW TOOLS AND SELECTION OF WORKFLOW ENGINE WHICH IS BEST

SUITABLE TO UNOCAL BANGLADESH HR DEPARTMENT

4.1 What is Workflow Software?.....	44
4.2 <i>Academic Community for Workflow Research</i>	44
4.3 <i>Open Source Projects</i>	45
4.4 Commercial Workflow Tools for HR Process Automation.....	48
4.4.1 HR ACAS Automation Projects FY05 – FY08.....	48
4.4.2 ViciFlow.....	50
4.4.2.1 ViciDocs Enterprise.....	53
4.4.2.2 Email Safe.....	57
4.4.2.3 ViciDocs Vault.....	58
4.4.2.4 ViciForm.....	58
4.4.2.5 ViciDocs-Pronto.....	59
4.4.2.6 DocRetriever.....	60
4.4.3 Some others links are given below.....	60
4.4.4 A recommendation for Unocal HR department to build their own workflow engine.....	61

	Page
CHAPTER V PROTOTYPE AND DESIGN OF WORKFLOW	
5.1 Prototype.....	63
5.2 Prototyping Models.....	63
5.3 How Building a Prototype Solves the Problems.....	63
5.4 Planning Phase.....	66
5.4.1 System request.....	66
5.4.2 Technical feasibility analysis.....	68
5.5 Analysis Phase.....	69
5.5.1 Requirements gathering.....	69
5.5.2 Designing prototype from the initial concept.....	69
5.5.3 Interviewing the Users.....	71
5.5.4 Feedback from the users about the prototype.....	74
5.5.5 Finalizing the Design of the Prototype.....	74
5.5.6 Functional Hierarchy.....	77
5.6 Structuring System Requirements: Process Modeling.....	77
5.6.1 Context diagram of recruitment process provided in APPENDIX-D.....	77
5.6.2 Data Flow Diagrams of recruitment process provided in APPENDIX-E.....	77
5.6.3 Context diagram of training process provided in APPENDIX-F.....	78
5.6.4 Data Flow Diagrams of training process provided in APPENDIX-G.....	78
5.6.5 Workflow diagram of recruitment process in Microsoft Office Visio-2003 provided in APPENDIX-H.....	78

5.6.6 Workflow diagram of training process in Microsoft Office Visio-2003 provided in APPENDIX-I.....	78
5.6.7 Use-Case modeling.....	78
	Page
5.6.7.1 UML diagram of employee information database system.....	78
5.6.7.2 Use-Case description.....	79
5.7 Design Phase.....	84
5.7.1 Designing the database.....	84
5.7.2 Designing the user interface.....	86
5.7.3 Descriptions of forms.....	88
5.7.4 Form operations.....	92
5.7.5 Validations in forms.....	95
5.7.6 Report operation.....	96
5.7.6.1 Preview report.....	96
5.7.6.2 Mail Report.....	98
5.7.6.3 Send Report to file.....	99
5.7.7 Quit from data base.....	101
5.7.8 Other forms for HR department.....	101
5.7.9 Accessibility of users.....	103
5.7.10 Authentication right.....	105
5.8 Implementation Phase.....	106
5.8.1 Coding and testing.....	106
5.8.2 Error messages.....	108
5.9 Strong and Weak Areas of the Demo system.....	109
5.10 End Notes about the Prototype.....	110
 CHAPTER VI RECOMMENDATIONS	
6.1 For the Recruitment Process.....	111
6.2 For the Training Process.....	111
6.3 For Workflow Engine.....	112
6.4 For the Prototype.....	112

CHAPTER VII CONCLUSION

7.1 Concluding Remarks.....	114
	Page
REFERENCES.....	116
APPENDICES	
A. RECRUITMENT PROCESS FLOWCHART.....	120
B. TRAINING PROCESS FLOWCHART.....	124
C. BUILDING CUSTOM WORKFLOW PROCESSES FOR ORACLE APPLICATIONS 11i.....	126
D. CONTEXT DIAGRAM OF RECRUITMENT PROCESS.....	148
E. DATA FLOW DIAGRAM OF RECRUITMENT PROCESS.....	149
F. CONTEXT DIAGRAM OF TRAINING PROCESS.....	152
G. DATAFLOW DIAGRAMS OF TRAINING PROCESS.....	153
H. WORKFLOW DIAGRAM OF RECRUITMENT PROCESS IN MICROSOFT OFFICE VISIO-2003.....	156
I. WORKFLOW DIAGRAM OF TRAINING PROCESS IN MICROSOFT OFFICE VISIO-2003.....	160

LIST OF TABLES

Table	Page
5.1 Initial employee information	70
5.2 Final employee detail info	74
5.3 Position profile	75
5.4 Person profile	75
5.5 Description of Manage Users Use-Case.....	79
5.6 Description of Manage Security Use-Case.....	80
5.7 Description of Receive and Record Employee Information Use-Case...	81
5.8 Description of Edit/Update Employee Info Use-Case.....	82
5.9 Description of Edit/Update Person and Position Profile Use-Case.....	83
5.10 Description of Generate and View Report Use-Case.....	84
5.11 Description of Employee Detail Info table.....	85
5.12 Testing.....	107

LIST OF FIGURES

Figure	Page
2.1 Telecommunication workflow.....	11
2.2 Conversation for Action model.....	12
2.3 Workflow for procuring materials.....	13
2.4 A Workflow Management System.....	16
3.1. Manpower Forecast Form prepared in MS Word.....	31
3.2. Annual Recruitment Plan prepared in MS Excel.....	31
3.3. Recommendation/ Approval for New Hire Form prepared in MS Word..	32
3.4. Position Profile Form prepared in MS Word.....	33
3.5. Induction Program Checklist Form prepared in MS Word.....	34
3.6. Employee Contact Info Database implemented in MS Excel.....	35
3.7. Employee Detail Info Database implemented in MS Excel.....	36
3.8. Training needs created in MS Excel.....	39
3.9. Annual Training Plan prepared in MS Excel.....	40
3.10. Training Request Form prepared in MS Excel.....	40
3.11. Training Evaluation Form prepared in MS Word.....	41
3.12. Training Details of Employee stored in Training History Database.....	41
3.13. Training Cost Details Section of Training History Database prepared in MS Excel.....	42
3.14. Training Feedback Information of Training History Database prepared in MS Excel.....	42

3.15. Training Feedback Charts of Training History Database prepared in MS Excel.....	43
3.16 Training Efficiency Calculation of Training History Database prepared in MS Excel.....	43
4.1 ViciFlow Designer.....	51

Figure

Page

4.2 ViciFlow Handler.....	52
4.3 Barcode Reader.....	54
5.1 A functional hierarchy diagram for Unocal employee information Database.....	77
5.2 UML Diagram of Employee Information Database System.....	78
5.3. Front End.....	88
5.4. Logon.....	88
5.5 Employee contact info form.....	89
5.6. Employee detail info form.....	89
5.7. Expatriate employee info form.....	90
5.8. Preview report form.....	90
5.9. Mail report form.....	91
5.10. Report to file form.....	91
5.11. Add operation form.....	92
5.12 Delete operation form.....	92
5.13. Find operation form.....	93
5.14. Replace operation.....	94
5.15. MS-Excel window.....	95
5.16. Employee age grouping report.....	96
5.17. Employee birthday report form.....	97
5.18. National employee birthday report.....	97

5.19. Employee retirement grouping report mailing option.....	98
5.20. Outlook message window.....	99
5.21. Send employee service info report to file options.....	100
5.22. Destination of file options.....	101
5.23. Position profile form.....	101

Figure

Page

5.24. Person profile form.....	102
5.25. Outside career portion of person profile form.....	103
5.26. Permission denied for unauthorized user.....	104
5.27. Permission denied for viewing record.....	104
5.28 Creation and deletion of user accounts.....	105
5.29. Permission for user and group accounts.....	106
5.30. Error message for wrong user name or password.....	108
5.31. Error message for duplicate entry.....	108
5.32 Error message for wrong input that is text input in numeric field...	109

CHAPTER I

1. INTRODUCTION

1.1 Company Overview

Unocal Bangladesh, the single largest private U.S. investor in Bangladesh has been active in oil and gas exploration and production for a number of years in greater Sylhet region. Unocal's vision is to work in partnership with the Government of Bangladesh and Petrobangle, the state owned oil and Gas Company, to develop the country's energy resources in a safe, environmentally responsible and efficient manner for the benefit of the people of Bangladesh. Unocal supports Bangladesh's goal to reduce the nation's reliance on imported energy by actively investing in projects that deliver more gas to Petrobangle [1]. The company is currently producing natural gas from the Jalalabad Field, developing the Moulvi Bazar Field and negotiating with the government of Bangladesh to develop the Bibiyana Field. Roughly 650 people work directly or indirectly for Unocal Bangladesh, of which approximately 96% are Bangladesh nationals.

1.2 My Task in Unocal Bangladesh

The Human Resources Department of Unocal Bangladesh has several manual processes. My task is to analyze these processes, design the workflow and suggest tools required to automate these processes. Among these processes my major focus is on their recruitment and training process.

Unocal's existing recruitment processes is a combination of manual and computerize processes. Only the mechanism to collect potential resumes is a computerize process, done by www.bdjjobs.com. Besides it e-mailing is the only technology that they use to communicate and MS-Excel to prepare Annual Recruitment Plan.

Training process of Unocal Bangladesh is actually a manual process with a small part of computer usage. Only MS-Excel is used to build Training History Database and Annual Training Plan. Email is the basic communication tool that exists here.

Both recruitment and training processes use some electronic form available in a share folder in the Unocal's Intranet called public folder. But the submission and manipulation of these forms are a total manual process.

In this paper, I am going to describe these processes in details, provide design of the workflow, discuss the latest available tools called workflow engine, which can be used to automate the HR, processes and a prototype developed by me.

1.3 An Overview of Process

Initially, processes were carried out entirely by human who manipulated physical objects. With the introduction of information technology, processes in the work place are partially or totally automated by information systems, i.e., computer programs performing tasks and enforcing rules that were previously

implemented by humans. [2] Categorizes processes in an organization into material processes, information processes, and business processes.

1.3.1 Material process

The scope of it is to accumulate physical components and deliver physical products. That is, material processes relate human tasks that include, moving, storing, transforming, measuring, and assembling physical objects [3].

1.3.2 Information process

Relates to automated tasks (i.e., tasks performed by programs) and partially automated tasks (i.e., tasks performed by humans interacting with computers) that create, process, manage, and provide information. Database, transaction processing, and distributed systems technologies provide the basic infrastructure for supporting information processes. Information process reengineering involves determining how to use legacy, new information systems and computers to automate the reengineered business processes. Business process redesign can explicitly address the issues of customer satisfaction. The information process reengineering can address the issues of information system efficiency and cost, and take advantage of advancements in technology. So the two activities can be performed iteratively to provide mutual feedback [3].

1.3.3 Business process

A business process is engineered to fulfill a business contract or satisfy a specific customer need. Thus, the concept of a business process is conceptually at a higher level than the notion of information or material process. Business process reengineering involves explicit reconsideration and redesign of the

business process. It is performed before information systems and computers are used for automating these processes [3].

1.4 Workflow

Workflow is a concept closely related to reengineering and automating business and information processes in an organization. A workflow may describe business process tasks at a conceptual level necessary for understanding, evaluating, and redesigning the business process.

1.5 Work Flow Management System (WFMS)

WFMS is a software component that takes as input a formal description of business processes and maintains the state of processes executions, thus delegating activities amongst people and applications.

1.5.1 Difference between WFMS and Business Process Management System (BPMS)

The term workflow is used to indicate a chain of related interactions between people and a computer system. Workflow is more familiar in developer communities and is more often used in a technical context. Business process management (BPM) has a broader scope. It implies also the non-technical issues like analysis and organizational impact, from the viewpoint of a manager [3].

1.6 Definition of Some Basic Terminology

Process: It is a formal description of a business procedure.

Process Instance: It is one execution of a process definition.

Process Context Variable: It is a variable associated with a process instance. For example the start-date of a holiday request.

State: In a process, it specifies a dependency upon an external actor. At process execution time, this means that the workflow engine has to wait until the external actor notifies the WFMS that the state is finished. For example: waiting for an approval.

Action: An action is a piece of programming logic to be executed by the WFMS upon a specified event that occurs during process execution. For example: sending an email when a state is assigned to an actor.

Enterprise Application Integration (EAI): It is the discipline of implementing software requirements that involve multiple dedicated applications

1.7 Organization of the Paper

The paper is organized as follows: In chapter2 WFMS will be discussed in a greater detail, in chapter3 the current system will be analyzed, in chapter4 the proposed system that is available workflow tools will be given and my selection of workflow engine that is best suitable to Unocal Bangladesh HR department will be included, in chapter5 the prototype will be portrayed and design of workflow will be added, in chapter6 some improvements and suggestions will be given and finally chapter7 will conclude the paper.

CHAPTER II

2. DISCUSSION ON WORKFLOW AND WORKFLOW MANAGEMENT

2.1 Workflow and Workflow Management

Workflow can be defined as a collection of tasks organized to accomplish some business process. A task can be performed by one or more software systems, one or more team of humans, or a combination of both. A workflow also defines the order of task invocation or conditions under which tasks must be invoked, task synchronization and information flow.

2.2 Characterizing Workflows

2.2.1 Trade press workflow characterization

It defines three kinds of workflow namely ad hoc, administrative and production.

Ad hoc workflow: perform office processes that have no set pattern for moving information among people [4, 5] such as product documentation or sales proposals. Normally, it involves human coordination, collaboration, or co-decision [6]. Thus, the ad hoc workflow is not automated but is instead controlled by humans and the task ordering and coordination decisions are made while the workflow is performed. Small team of professionals are typically engaged in ad hoc workflows and are intended to support short term activities which require a rapid workflow solution, e.g., supporting the process of putting together the

program of a professional conference. WFMSs that support ad hoc workflows must provide functionality for facilitating human coordination, collaboration, and co-decision. Users of an ad hoc workflow need to access the WFMS to determine work completion. Also, ad hoc WFMSs are not mission critical, i.e., periodic failure of such workflows does not significantly interfere with the overall business process. Ad hoc WFMSs usually use electronic mail, databases to store shared information and are also called *groupware*.

An example of ad hoc workflow is the review process for conference papers. The review process can be described as select reviewers, distribute the papers to the selected reviewers, have the reviewers perform the reviews and collaborate in producing a joint review document, and finally forward it to the authors. This is an ad hoc workflow because it involves:

- ❖ Negotiation for selecting the reviewers, and
- ❖ Collaboration between the reviewers for producing a joint review.

Thus it has no set pattern for moving information among people.

Administrative workflow: Involves repetitive, predictable processes with simple task coordination rules, such as routing an expense report or travel request through an authorization process. The ordering and coordination of tasks in administrative workflows can be automated. WFMS that support administrative workflow handle simple information routing and document approval functions. Administrative workflow does not encompass a complex information process and does not require access to multiple information systems used for supporting production and/or customer services. Periodic failure of this workflow does not significantly interfere with the overall business process. The infrastructure technology that is currently in use is typically based on electronic mail. Consider a paper review process where the same reviewers are used for all paper reviews and produce individual reviews that are considered by the editor who makes the final decision. Thus the paper review workflow becomes an administrative workflow. In an administrative workflow users are actively *prompted* to perform

their tasks. Reviewers using an administrative WFMS may receive email with review instructions along with the paper to be reviewed and a reviewer's comments form. When the form is completed, it is automatically routed to the program committee chairperson.

Production workflow: Involves repetitive and predictable business processes, such as loan applications or insurance claims. It typically encompasses a complex information process involving access to multiple information systems. The ordering and coordination of tasks in such workflows can be automated. But automation of production workflows is complicated due to: (i) information process complexity, and (ii) accesses to multiple information systems to perform work and retrieve data for making decisions. Production WFMSs are often mission critical that is periodic failure of this workflow significantly interfere with the overall business.

Consider the simplified health claim process workflow- a claim form is first manually scanned and stored into an object database. Then the data are manually indexed in a relational database. This information is subsequently analyzed by an expert system which uses a database to determine if payment should be made. If result is negative, an associated representative discusses the claim with the customer and either agrees to make some payment, or to reject the claim. If payment is made, the "make payment" task accesses the finance database and records the payment. The significant differences between this production workflow and either the ad hoc or administrative workflow are:

- (i) The interaction of information systems with the business process, and
- (ii) The use of automated task performers.

Other characterizations of workflows have recently appeared in the trade press [7, 8]. In [7] it divides workflows into ad hoc workgroup support, task automation, document flow and process automation and in [8] it divides workflows into three categories: mail-centric, document centric and process-centric.

In [9] it characterizes workflow into human-oriented and system-oriented. On the one extreme, *human-oriented* workflow involves humans collaborating in performing tasks and coordinating tasks. The requirements for WFMSs in this environment are to support the coordination and collaboration of humans and to improve human throughput. Humans, however, must ensure the consistency of documents and workflow results. On the other hand, *system-oriented* workflow involves computer systems that perform computation-intensive operations and specialized software tasks. In human-oriented workflows the WFMS is there to assist people and is not responsible for maintaining data consistency, since it has no information semantics. On the other hand, system-oriented workflows have more knowledge of information semantics. In human-oriented workflow, the main issues to address include [9]:

- Human-computer interaction
 - Matching human skills to task requirements
 - Changing office culture, i.e., how people need or prefer to work
- in system-oriented workflow, the issues to address include:
- Matching business process requirements to functionality and data provided by existing information systems and/or their applications
 - Interoperability among HAD(Heterogeneous, Autonomous and Distributed) systems
 - Finding appropriate software tasks to perform
 - Determining new software required to automate business processes
 - Ensuring correct and reliable system execution

2.3 Workflow Management

Workflow management involves everything from modeling processes up to synchronizing the activities of information systems and humans that perform the processes. It includes the following [9]:

1. Process modeling and workflow specification: requires workflow models and methodologies for capturing a process as a workflow specification.
2. Process reengineering: requires methodologies for optimizing the process.
3. Workflow implementation and automation: requires methodologies/technology for using information systems, and human performers to implement, schedule, execute and control the workflow tasks as described by the workflow specification.

Each of these workflow management issues are described in details below:

2.3.1 Process modeling and workflow specification

Usually it involves interviewing people with expert knowledge about the process. When enough knowledge about the process is obtained, workflow specification is performed to capture the process. GTE Telephone Operations is performing a large process reengineering effort [9]. For that project they formed reengineering teams of 20-25 employees to capture existing business processes and redesign its core business processes. Teams documented existing business processes by conducting 1000 interviews and 10,000 observations to produce corresponding workflow specifications using a workflow specification tool. A workflow specification captures a process abstraction. The process abstraction level depends on the intended use of the workflow specification. For example, a workflow specification may describe a process at the highest conceptual level necessary for understanding, evaluating, and redesigning the process. On the other hand, another workflow specification may describe the same process at a lower level of detail required for performing workflow implementation [9].

Performing workflow specification requires a *workflow model and Workflow specification language*. A workflow model typically includes a set of concepts that are useful to describe processes, tasks, the dependencies among tasks, and required *roles to perform* (i.e., skills of the individuals or information

systems) specific tasks. Workflow specification languages in commercial WFMS use rules, constraints, and/or graphical constructs to describe the ordering and synchronization of tasks in a workflow, and task attributes to describe the tasks and the roles to perform them [9].

An example rule in a rule-based specification of the New Service Provisioning process in Figure 2.1 might be: *On task T1 completions do start T2, T3, T4, and T6*. This rule captures the fact that tasks T2, T3, T4, and T6 must be executed after the completion of task T1.

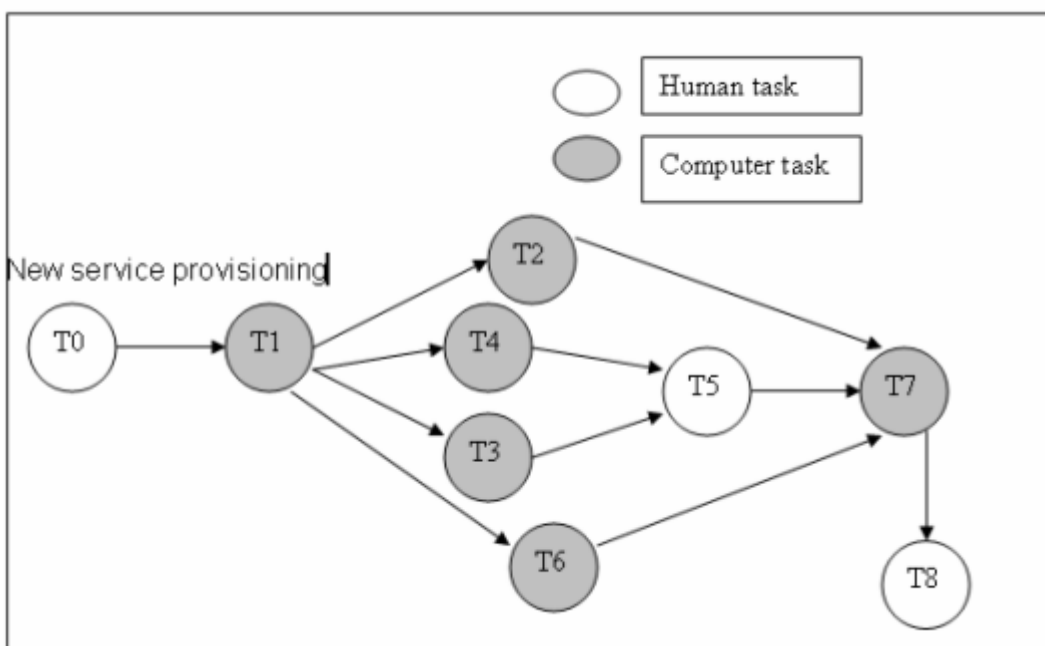


Fig. 2.1 Telecommunication workflows

2.3.1.1 Methodologies for process modeling

There are two basic categories of process modeling methodologies are mentioned here:

- Communication based
- Activity-based [29].

The *communication-based methodologies* assume that the objective of business process re-engineering is to improve customer satisfaction [9]. It

reduces every action in a workflow to four phases based on communication between a customer and a performer (illustrated in Figure 2.1):

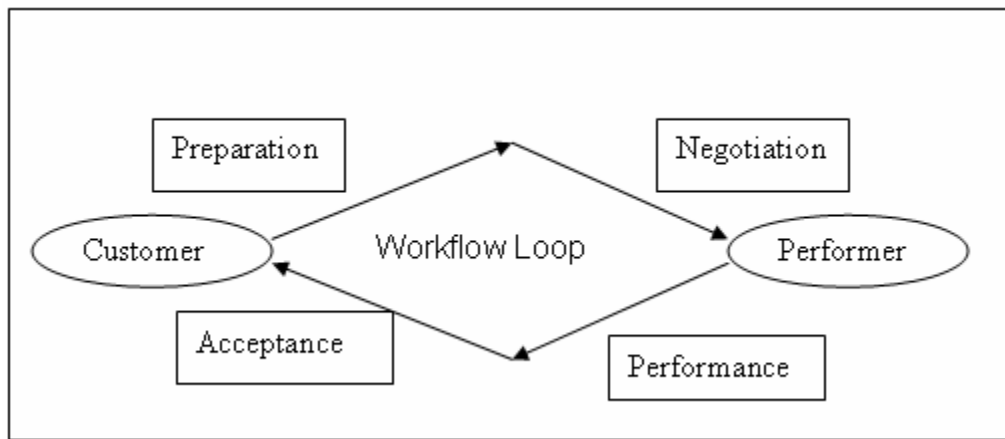


Fig. 2.2 Conversion for action model

1. Preparation - a customer requests an action to be performed or a performer offers to do some action
2. Negotiation - both customer and performer agree on the action to be performed and define the terms of satisfaction
3. Performance - the action is performed according to the terms established
4. Acceptance - the customer reports satisfaction or dissatisfaction about the action

Each *workflow loop* between a customer and performer can be joined with other workflow loops to complete a business process. The performer in one workflow loop can be a customer in another workflow loop. The resulting business process is a social network in which a group of people performs various roles to fulfill a business process [9]. Let's see a business process for procuring materials.

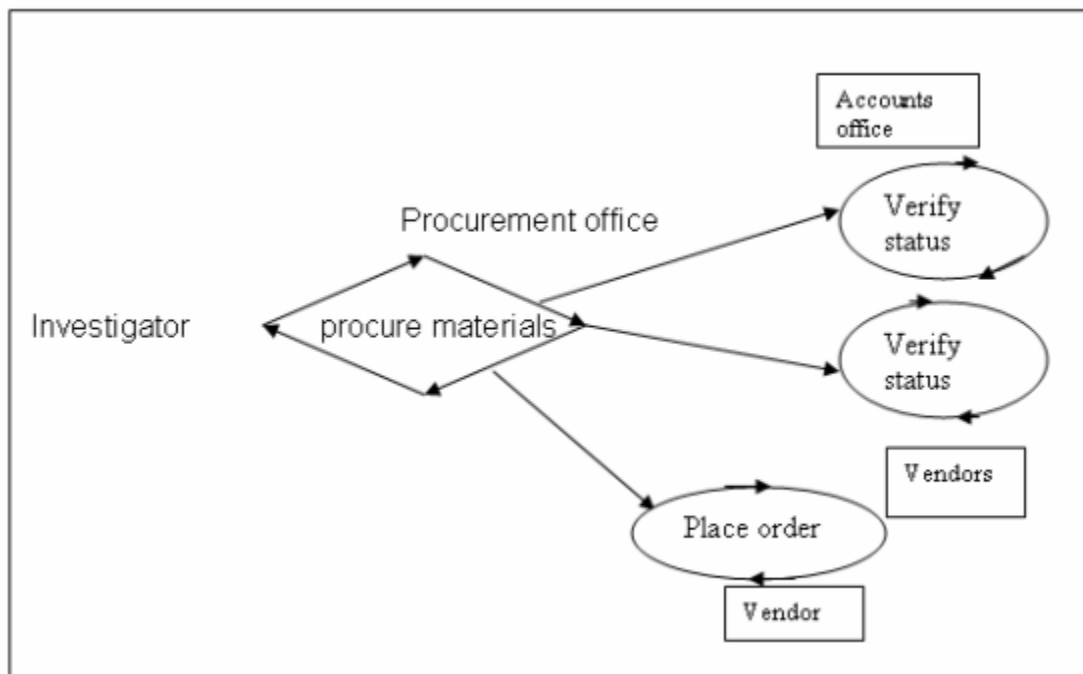


Fig. 2.3 Workflow for procuring materials

The main workflow loop (procure materials) requires several secondary workflow loops during the performance phase (verify status, get bids, place order). In particular, an investigator requests services from the procurement office for materials. The procurement office instructs the accounts office to verify the account status of the purchaser. The procurement office then contacts vendors for bids, and finally selects a vendor to place an order. The workflow is completed (i.e., the main loop is closed) when the procurement office reports to the investigator that the materials have been procured. This workflow specifications methodology does not indicate which activities can be in parallel or if there are conditional or alternative actions. Since this methodology assumes that the objective of business process re-engineering is to improve customer satisfaction, the emphasis is on the customer. Therefore, it is not appropriate for modeling business processes with objectives other than customer satisfaction [9].

Activity-based methodologies focus on modeling the work instead of modelling the commitments among humans. Activity-based methodologies do not capture process objectives such as customer satisfaction.

The communication-based and activity-based workflow models can be combined when process re-engineering objectives are compatible with both models (for example: satisfy the customer by minimizing workflow tasks and human roles). For example, the workflow model showed at figure 2.1 can be viewed as- following both activity based and communication-based methodologies.

2.3.2 Reengineering a process

The objective of re-engineering methodologies is to optimize business processes. Process optimization strategies depend on the reengineering objectives like increasing customer satisfaction, reducing the cost of doing business, introducing new products or services etc. Reengineering methodologies are currently an art.

2.3.3 Implementing and automating a workflow

Implementation deals with using computers, software, information systems, and/or WFMSs. Workflow automation deals with scheduling and controlling workflow execution. No workflow implementation or automation is required when the *only* reason for workflow specification is to capture business processes and judging their efficiency. Otherwise, workflow specifications are used to implement and automate workflows. Workflow specification and implementation can be loosely coupled (e.g., workflow specifications are implemented by software engineers) or tightly coupled (e.g., workflow specifications are provided as direct input to a WFMS that either generates code or interprets specifications for controlling workflow execution). The dividing line

between what is the workflow specification and workflow implementation is not always sharp. A WFMS has to deal with application integration, interoperability, implementation correctness and reliability [9].

2.4 Where to Use WFMS

First Option: Use a WFMS as an Enterprise Application Integration (EAI) platform. Currently, in most enterprise environments, the IT infrastructure has various diverse applications and databases running in an intranet. These applications have a clear purpose when they are introduced in the organization. Examples are customer management, document management, billing, resource planning etc. These are called dedicated applications. Each of these dedicated applications contains knowledge about the business processes they have to support. The enterprise fits these automated processes of the software components into their manual business processes by installing and running those. A WFMS on the other hand has got no prior knowledge of the domain. A WFMS takes a description of a business process as input and manages the executions of the process instances. That makes it much more flexible than dedicated applications but one needs to create a formal description of the business process. That is why WFMS and dedicated applications are complementary. A WFMS can be used to manage the overall process. Thus the first way to use a WFMS is to tie together all dedicated applications and create an EAI-platform with it [3].

A second option where a WFMS delivers high added value is for the development of workflow software that has a lot of people-related tasks.

The third option is to embed a workflow engine inside another application. The companies that develop dedicated applications can embed workflow engine inside their software. The workflow engine is in this case only used as an application component, hiding it from the application users. The main reason for

embedding a workflow engine inside an application is for reuse and maintainability of the application software [3].

2.5 A Workflow Management System

Interfaces

A WFMS takes process definitions as input. A process definition as a UML activity diagram is given below [3].

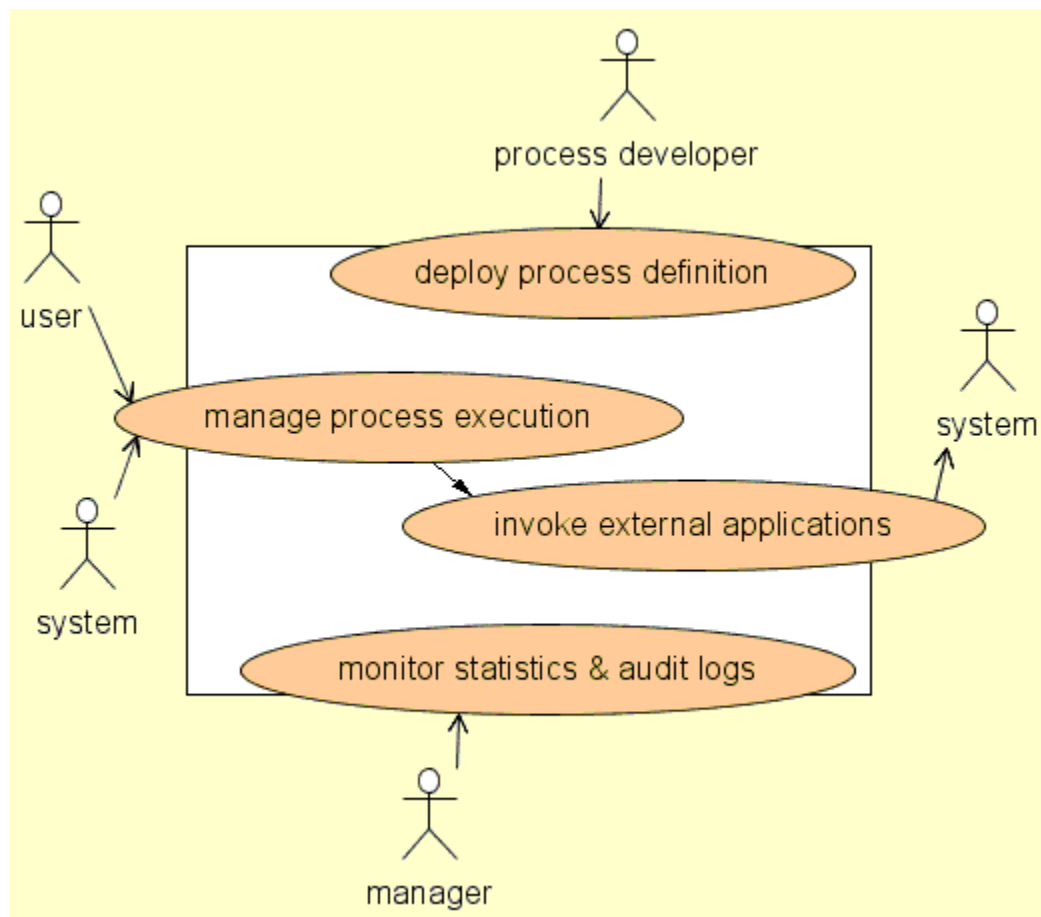


Fig 2.4 A Workflow Management System (WFMS)

Let's take a look at its four different interfaces [3]:

- **Definition-** The definition interface of a WFMS allows process developers to deploy process definitions. Note that the actor *process developer* is a placeholder for both business analyst and a software developer.
- **Execution-** The execution interface allows users and systems to act upon process instances. Process instances are executions of process definitions. The control flow of a process definition is a description of a state machine. The two main methods in the execution interface are starting a process instance and signaling the end of a state to the WFMS.
- **Application-** The application interface denotes interaction between a WFMS and external systems. A process definition can specify a piece of programming logic that has to be executed upon an event. The program logic can communicate with other systems inside or outside of the organization.
- **Monitoring-** With monitoring interface, managers can gain insights through extracting statistics on the execution logs of the processes. Sometimes, the execution logs are also referred to as the inspection track

2.5.1 Four layers of process definition

The state layer: The state layer of a business process consists of states and control flow. Control flow can be defined as the sequence of instructions that have to be executed. It determines the order in which we write the instructions, if-statements, loop-statements, and so on. The basic element of control flow in a business process is a state [3].

A state (also known as wait-state) in a process specifies a dependency upon an external actor. The meaning of a state is like "Now system X or person Y has to do something. Wait here until an external trigger of that actor signals the completion of the task." A typical example of a state is an approval step.

The context layer: A process context variable allows a process developer to store data during the lifetime of the process instance (e.g. a record in a database or a file on a network drive). WFMS turns data into information. By presenting only relevant data-items, data that resides on distinct systems is transformed and presented as information [3].

The programming logic layer: The programming logic layer combines all pieces of software with the information that specifies on which events these pieces of software need to be executed. Examples of programming logic for integration are sending an email, sending a message on a message broker, fetching data from an Enterprise Resource Planning (ERP)-system and updating a database [3].

The user interface layer: When an actor triggers the end of a state, usually that is the event where data is flow into the process variables. E.g. for a holiday request example, when a boss signals to the WFMS that the state 'evaluation' is done, the boss provides the value 'approved' or 'disapproved' into the process. User interface layer is used to signal that it requests information from a user. For example- web application allows actors to submit generated forms based upon a process definition [3].

2.5.2 Commercial workflow management systems

In this section I am going to discuss the features and capabilities currently supported by commercial WFMSs with respect to workflow model, specification language, tools for testing/ analysis and monitoring, system architectures and interoperability, implementation support, correctness and reliability.

2.5.2.1 Workflow model

Most WFMSs supports activity-based workflow models, and consist of elements similar to the following:

- Workflows: a partial or total ordering of a set of tasks
- Tasks: a partial or total order of operations, descriptions for human actions, or other tasks
- Manipulated objects: documents, data records, images, phones, fax machines, printers, etc.
- Roles: a placeholder for a human skill or an information system service required to perform a particular task
- Agents: humans or information systems that fill roles, perform tasks, and interact during workflow execution

To provide different levels of abstraction, WFMSs typically support the nesting of tasks. For example, the workflow that provides a new customer with telephone service involves tasks of acquiring customer information, allocating facilities, and setting up customer billing. Each level of abstraction provides a view to the workflow specification. Higher levels of abstractions help management follow or control a business process. The lower levels of abstraction are required to identify exactly what is required to implement a workflow. The definition of roles in a workflow is particularly beneficial when a task can be performed by multiple agents.

2.5.2.2 Specification language

WFMSs provide graphical workflow specification languages. In addition, many WFMSs provide rule-based or constrained workflow specification languages. These languages are higher-level languages than standard

programming languages such as C and C++. They support the specification of the following [9]:

- ❖ task structure (control flow) and information exchange between tasks (dataflow) in a workflow (e.g. specifying that tasks can be executed in parallel, or that a task needs to wait for data from other tasks)
- ❖ exception handling (e.g. specifying what actions are necessary if a task fails or a workflow cannot be completed)
- ❖ task duration (e.g. specifying initiation and completion time of a task)
- ❖ priority attributes (e.g. specifying priorities for task scheduling)

In rule or constraint-based workflow specification languages, the workflow structure and dataflow are typically specified by defining *routing* rules or constraints. Routing is often classified as *conditional*, *rule-based*, or *parallel*. Conditional routing involves scheduling a task based on data values. For example, “if, item cost > 1000, then contact Manager”. Rule-based routing is more powerful than conditional routing and can involve complex rules stated in a rule-based language. Parallel routing allows one task to branch into others to be executable in parallel. A few languages also explicitly support task rendezvous. Graphical user interfaces (GUIs) are provided for both graphical workflow specification and graphical task specification. Graphical workflow specification languages support the iconic representation of workflow tasks and the ability to sequence those tasks graphically, by connecting arrows and decision icons among tasks. Many WFMSs use graphical specification to automatically generate code or set up rules for a workflow implementation and execution. GUIs for task specification support the creation of programming interfaces for tasks, involving programs and graphical interfaces for tasks, involving humans [9].

2.5.2.3 Testing, analysis, and monitoring tools

Workflow testing tools simulate a workflow by allowing input of sample data and triggering events such as task completion, deadline expiration, and exceptions. Simulation is needed to uncover logic errors and to estimate workflow completion time. Workflow analysis tools are needed to predict possible bottlenecks in a workflow by analyzing the specification. The analysis is done by taking into account workflow execution or simulation statistics. For example, analysis tools can gather statistics on workflow performance and suggest alterations to the workflow specification to improve efficiency [9].

Once a workflow is implemented, we need to monitor its progress. WFMSs provide GUIs that can present different views of workflow execution like which task or tasks are currently active, by whom they are performed, the task priorities, task deadlines, task durations, and task dependencies. Managers can use such monitoring tools to access workflow statistics such as task completion times, workloads, and user performance, as well as to generate reports and provide periodic summary of workflow executions [9].

2.5.2.4 Systems architecture and interoperability

Some commercial WFMSs have open client-server architectures and complete Application Programming Interfaces (APIs). WFMSs support exchange of information among users or systems via email or a shared database (usually WFMS vendor proprietary). Email supports human notification and databases are used to maintain shared documents. Administrative WFMSs are often operates based on email. Ad hoc and production WFMSs usually store information in a shared database [9].

2.5.2.5 Implementation support

Some other supports (with or without GUIs) that allows easier implementation, maintenance, and use are listed below [9]-

- *Dynamic modification of workflow* - the ability to change task sequencing or introduce new tasks into an executing workflow
- *Event signaling and notification* - the ability for programmers to raise events in one task and have another task “notice” that take action on it. For example, a WFMS may support deadline management which notifies users when active tasks approach their deadline
- *User administration* - associate users are responsible for performing roles and support the management of these associations. Some popular WFMS features are Dynamic Workflow Modification, Event Signaling (Event-Action Triggers), and Role/ User Administration.

2.5.2.6 Correctness and reliability

When multiple objects (e.g., databases, files, documents, devices) are accessed by a workflow execution, data consistency problems can arise either from concurrency, application failures, system failures, or network failures that result in the need for *concurrency control*, *recovery*, and *transaction coordination*. Workflow recovery involves [9]

- How to undo completed or partially completed tasks that cannot be completed due to a failure
- How to undo a cancelled workflow.

For example, consider a telephone service provisioning workflow that, updates a customer database and billing database, and allocates facilities for the customer. If a customer requests service and later cancels service before installation is completed, two options are possible [9]:

- (i) Allow the workflow to complete and execute a separate workflow that cancels service
- (ii) Discontinue the workflow and undo completed tasks.

The first option is simpler but results in following events-

- Compute power is wasted to finish processing a workflow known to be useless
- Human effort is wasted if facilities must be installed to support service that will soon be disconnected
- A second workflow must be executed taking additional resources
- Allocated facilities cannot be used to support the needs of other workflows.

The second option is free from the above concerns. However, the ability to stop or abort a workflow in the middle of execution requires the WFMS to maintain the state of each task and use these to reach a consistent state from which it can undo the effects of failed workflows [9].

As tasks and workflows become more automated, the speed at which business processes are performed and the volume of data being affected makes human-controlled recovery impractical.

2.6 Benefits of Workflow Management System

Introducing workflow in an organization delivers benefits on the software development level as well as the business level.

Software development level

A workflow management system makes development and maintenance of standard enterprise software easier [9].

- Reduced development risk - the business analyst will talk the same language as the developer (in terms of states and actions) that is the

developer will not have to make a translation from user requirements to a software design.

- Centralized implementation - it's the business processes that change so the biggest advantage of using a workflow system is that the implementation is not a fuzzy combination of software pieces scattered over various systems.
- Rapid application development -software will be free from the task of keeping track of the participants in a process, leading to faster development and code that is better maintainable.

Business level

- Improved efficiency - automation of many business processes results in the elimination of many unnecessary steps
- Better process control - improved management of business processes achieved through standardizing working methods and the availability of audit trails
- Improved customer service - consistency in the processes leads to greater predictability in levels of response to customers.
- Flexibility - software control over processes enables their re-design in order to changing business needs
- Business process improvement - a focus on business processes leads to their modernizing and simplification.

2.7 Limitations of Workflow Management System

WFMS suffers from a number of significant limitations. These are described below [9]-

- Lack of standards for WFMS – There is only one standards body called the Work Flow Management Coalition, was formed in 1993 to promote interoperability among WFMSs. Their standards address the areas of (i) APIs for consistent access to WFMS services/functions, (ii) specifications

for formats and protocols between WFMSs themselves, and between WFMSs and applications, and (iii) workflow model interchange specifications to allow the interchange of workflow specification among multiple WFMSs. Most WFMS vendors are members of this coalition.

- Lack of support for HAD system interoperability and integration- Interoperability among HAD systems, WFMSs, and workflow implementations is important for the following reasons:
 - I. it simplifies workflow implementation by allowing WFMSs to access HAD systems without requiring any HAD system-specific code
 - II. it allows fast workflow implementation as do not include HAD system-specific code. So, can be developed faster than those that involve programming and
 - III. it requires minimal workflow re-implementation to cope with changes in HAD system functionality, i.e., it requires no code changes in workflow implementations except re-specification of HAD system interfaces.

Very few commercial WFMSs support limited interoperability among office applications meeting specific platform, interface, or operating system requirements. For example, some WFMSs (e.g., Lotus Notes) use Microsoft's OLE as a protocol for document interoperability. However, further interoperability requires WFMSs to take advantage of technology that complies with industry standards for interoperability.

- Inadequate performance - Commercial WFMSs typically support no more than a few hundred workflows a day where as some processes require handling a larger number of workflows. For example telecommunications companies currently need to process ten thousand service workflows a day and a few thousand service provisioning workflows per hour at peak

time. Commercial WFMSs are currently not capable of handling such workloads.

- Lack of support for correctness and reliability in the presence of concurrency and failures - Workflow execution must ensure the following three *correctness* concerns:
 - The consistency of individual tasks,
 - The consistency of individual workflows i.e. concurrent execution of tasks that belong to the same workflow and
 - The consistency of concurrent executions of tasks that belong to different workflows.

Usually, the person who implements a task is responsible for ensuring the production of correct results when it is executed alone. If correct tasks are executed one after another in an order allowed by workflow specification rules, it indicates that the workflow preserves consistency of design. But, when tasks are executed concurrently in the same or other workflows, then individual operations may interleave in such a way that produce incorrect results. Database transaction processing suffers mostly from this problem [9]

The workflow reliability problem involves restoring consistency when a workflow terminates abnormally (e.g., due to a system failure, lack of available resources, or inability to achieve objectives). Completed tasks of a partially completed workflow may be undone or compensated. Alternatively, incomplete tasks of a partially completed workflow may need to be redone or contingency tasks need to be performed. Clearly, it is important to know which tasks have been completed, which are still active, which have not begun, and which tasks need to be undone or redone to restore consistency. To deal with these problems, WFMSs rely on (i) workflow designers for providing specifications that include compensating

tasks and actions, and (ii) task/workflow programmers for providing code for concurrency control and keeping logs. But these solutions are unrealistic, as most workflow designers/programmers are not skilled in concurrency control and recovery technology. Moreover, implementation of software for concurrency control and recovery mechanisms is complex. Finally, testing and debugging software with hard coded correctness and reliability functions is time-consuming and error prone [9].

- Weak tool support for analysis, testing, and debugging of workflow specifications and implementations - tools for analysis, testing, and debugging are needed to estimate workflow specification and implementation efficiency, simulate workflow execution, and determine the source of workflow specification and implementation problems. The weak supports of such tools directly have negative impacts on rapid prototyping and simplicity of workflow specification and implementation [9].

CHAPTER III

3. ANALYSIS OF THE CURRENT SYSTEM AND DESIGN OF WORKFLOW

3.1 Existing Recruitment Process Flowchart and Description

3.1.1 Recruitment process flowchart provided in APPENDIX-A

3.1.2 Recruitment process description

- Recruitment process begins with manpower forecasting. Human Resources Department and line managers are engaged in manpower forecast for the organization in a year. Human Resources Department maintains a document that shows details of manpower forecast like- job title, job grade, number of people, desired month of placement and remarks.
- Job opening arises from various sources like new project creation, new position creation, transfer, job separation etc which is not forecasted. It is basically under control of line managers. When a job opening occurs, line managers inform Human Resources Department about recommendations for new hire, job profile, deadline for the hire etc. Job opening causes Human Resources Department to recruit based on immediate recruitment plan.
- Based on manpower forecast Human Resources Department prepares an annual recruitment plan for the organization. This plan focuses on which office and department needs the placement, required number of person,

position title, tentative joining, and actions deadline (include each step of employee selection till joining). Thus the planning phase of recruitment process ends.

- Next phase of recruitment process is selection of interviewees. Line manager begins the phase by sending recommendation of new hire and job profile (job description, salary grade, qualification including academic, experience, skill and proficiency etc.) in Human Resources Department.
- Human Resources Department prepare the lay out for sourcing and take line manager's approval.
- After approval, the main challenging task is sourcing. Human Resources Department has a web based resume bank in www.bdjjobs.com. If web based resume bank search is not used then in house circular (like using notice board, sending mail by the HR Manager with the bdjob's link to see the circular and requesting for apply online), newspaper circular, online circular and head hunting companies are the sources for collection of potential resume.
- Human Resources Department has a web based sorting engine in www.bdjjobs.com to accumulate qualified candidates from web based resume bank. Even in newspaper circular, online circular and in house circular, job seekers are asked to drop their resume in the bdjob's resume bank. Head hunting companies perform the entire task to select best candidates. But the final selection of candidates is done through a final interview by the Organization (HR Department and Line managers).
- After selection of candidates Human Resources Department take assessors appointment on a common date and time for assessing

candidates. Based on that Human Resources Department sends interview invitation.

- All invited candidates need to go through a Behavioral Event Interview (conducted by HR/ cross functional assessors/ line managers) and a skill test. The result is an average of both assessments. The top scorers are then invited for a final selection session conducted by Human Resources Department and line manager. The result process can be variable based on requirement.
- Human Resources Department handover offer letters to selected candidates and also to candidates selected by head hunting company. If rejection happens then the prioritize candidates will get the opportunity.
- If acceptance happens then the next step is medical check up, security background check and reference check.
- If all the requirements are satisfied then Human Resources Department handover employment letter (contains joining date, position, salary and benefit, work schedule, rules and regulations etc.).
- The induction program is conducted by Human Resources Department at the joining day of the newly hired employee. It is a two to three days program, to make the new employee familiar with the operation of the organization, department, values, code of conducts etc. Employees need to fill up an induction checklist that will be recorded in Human Resources Department.

UNOCAL 76
Unocal Bangladesh

Recommendation / Approval for New Hire

**THE PURPOSE OF THIS FORM IS TO DOCUMENT AND COMMUNICATE
RECOMMENDATIONS / APPROVALS FOR NEW HIRE**

JOB VACANCY TITLE		Salary Grade	
DEPARTMENT		Location	
STATUS (Regular/Casual/Temporary)		Effective Date	
JOB SPECIFICATION			
<input type="checkbox"/> Qualification		
<input type="checkbox"/> Experience		
<input type="checkbox"/> Skills		
<input type="checkbox"/> Knowledge		
<input type="checkbox"/> Abilities		
JOB RESPONSIBILITIES			
<input type="checkbox"/> Reporting Relationships		
<input type="checkbox"/> Principal Accountabilities		
JOB PROFILE			
<input type="checkbox"/> New		
<input type="checkbox"/> Extra		
REMARKS			
Recommendation:		Approval:	
<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
_____ Supervisor Date:		_____ Incident & Managing Director Date:	
_____ Department Manager Date:		_____ Manager, HR & OD Date:	
INSTRUCTIONS: ✓ Department Manager			

Fig. 3.3 Recommendation/ Approval for New Hire Form prepared in MS Word

UNOCAL
POSITION PROFILE

<i>Position/Title:</i>	Land Coordinator	<i>Division/Dept:</i>	Law		
<i>Supervisor's Position:</i>	Manager, Land	<i>Location:</i>	Sylhet	<i>Salary Grade</i>	50
<i>Purpose of Position:</i> Is to administer physical / legal possession of Bibiyana (Block -12) Gas Plant and concerned pipeline land areas.					
<i>Key Deliverables:</i>					
<ol style="list-style-type: none"> To protect all the Company/ Petrobangla's land physically and legally. To supervise land survey work . To coordinate with the government officials concerning land particularly of Habigonj and Moulavi Bazar Districts and to build up a good working relationship with the land owners and all other neighbors. 			<ol style="list-style-type: none"> To ensure that all the joint surveys are properly supervised, progress monitored and completed in time and land schedules properly prepared by the surveyors. To ensure proper assessment of the land and supervise and coordinate all the related payments. To ensure proper land demarcation of all the Company land. To follow up the mutation process of the lands. To provide quality assistance to the Legal Department in case of disputes and litigation. 		
<i>Scope Data :</i>		<i>Job Profile:</i>		<i>Other Positions Reporting to Supervisor:</i>	
<ul style="list-style-type: none"> Block 12, 13 & 14 Mainly at Habigonj and Moulvibazar Interfacing with Government and community 		<ul style="list-style-type: none"> Leadership 10% Managerial 5% Business 10% Technical 75 % Total 100 % 		Land Coordinator	
<i>Employees Supervised:</i>	<i>Ex. 0</i>	<i>Nx. 0</i>	<i>Contract 0</i>	<i>Total:0</i>	
<i>Technical / Business Knowledge, Skills and Experience:</i>			<i>Competencies:</i>		
<ul style="list-style-type: none"> University graduate with a degree in social science and with knowledge on land and community; Minimum 4 years experience in handling land matters; 4 years experience in community related matters; Legal knowledge on land matters; Good computer skills; 			<ul style="list-style-type: none"> High ethical standards; Ability to work independently; Attention to details; Willing to work long and unusual hours and under pressure Liaison with external agencies Good command in English as well as in Bengali; Good interpersonal skills; 		
<i>Key Performance Situations</i>					
<ul style="list-style-type: none"> ✓ Interfacing with government officials/ agencies and local community ✓ Land survey and mapping (working with contractors) ✓ Advocate company's interest legally and legitimately 					

Fig. 3.4 Position Profile Form prepared in MS Word

INDUCTION PROGRAM		
Name	Designation	Department
Rafiq Wazir Bohaid	Warehouse Coordinator	Crating

APRIL 17, 2006 SUNDAY			
Time	Subject	Responsibility & Venue	Signature
9:00 a.m.-9:30 a.m.	Organizational Overview: <ul style="list-style-type: none"> - Business unit overview - Company vision, values, and guiding principles - Organizational culture Human Resources: <ul style="list-style-type: none"> - Overview of HR policies - Employee benefits - Training & Development - Performance & Career Management - Medical Plan - My Global Database 	Zulfiqar Hyder Manager, Human Resources & Organizational Development Red Building (3 rd floor) HR Manager's Office	
9:30 a.m.-10:00 a.m.	Operations: <ul style="list-style-type: none"> - Operations overview - Operations Management System (OMS) 	Mark Ivenovitch Director, Operations Red Building (3 rd floor) Executive Floor Conference Room	
10:00 a.m.-11:00 a.m.	Health, Environment & Safety: <ul style="list-style-type: none"> - Onboarding - Safety Orientation - Environment Management Plan (EMP) & OMS Environmental Care - Operations Management System 	Moinuddin Ahmed HES Staff Specialist-Safety & Mubasher Noman Finance HES Specialist- Environment Red Building (3 rd floor) Executive Floor Conference Room	
11:00 a.m.-12:00 p.m.	Research Engineering: <ul style="list-style-type: none"> - About the department - Current activities 	Deepak Agrawal Director, Research Engineering Red Building (3 rd floor) Res. Eng. Director's Office	
Reschedule	Legal: <ul style="list-style-type: none"> - Production Sharing Contract (PSC) - MCA and Code of Ethics 	Chye H. Koh Director, Legal Red Building (3 rd floor) Legal Director's Office	
1:00 p.m.-2:00 p.m.	External Affairs: <ul style="list-style-type: none"> - About the department - Community affairs and CSR activities 	Nasir Ahmed Manager, External Affairs White Building (3 rd floor) External Affairs Manager's Office	

Fig. 3.5 Induction Program Checklist Form prepared in MS Word

3.1.4 Screenshots of existing HR employee information storage system

Microsoft Excel - Unocal Employee's Contact number				
File Edit View Insert Format Tools Data Window Help				
J76				
	A	B	C	D
53	Name & Address	Extn. No.	Mobile Number	Residence Number
54	John Coleman	117	0171-590301	9885297
55	Director, Exploration			
56	Ms. Coleman		0171-590302	
57	House-10, Road-3, Baridhara, Dhaka			
58	A.H.M. Shamsuddin	210	0171-538019	8811170
59	Chief Geologist			
60	House -5, Road - 112, Flat B/2, Gulshan			
61	Shamsuddin Sumon	163	0187-105782	7217461
62	Technical Coordinator		0171-634396	
63	383/2 Khilgaon, Block - A, Ekota Sharak			
64	Ditee Famida Rahman	124	8622068	0173-015440
65	Team Assistant			
66	44/2, Free School Street by lane,1st flr. Hatirpool-1205			
67				
68	Production, HES & Logistics			
69				
70	Name & Address	Extn. No.	Mobile Number	Residence Number
71	Mark Ivanowicz	147	0171-531557	8826782
72	Production, HES & Logistics Manager			
73	Ms. Ivanowicz		0171-531554	
74	House - 8, Road - 4, Baridhara, Dhaka			
75	Tabarak Hossain	191	0171-277297	8021528
76	Senior Assistant, Production			

Fig. 3.6 Employee Contact Info Database implemented in MS Excel

Microsoft Excel - Employee Service Years Age - Nov. 2002

File Edit View Insert Format Tools Data Window Help

Reply with Changes... End Review...

C181 Project Coordinator

SI No	Employee Name	Title	Department	Location	Date of Birth	Age	Date of Retirement	Date of Joining	Completed Years of Service	
160	163	Sheikh Mostafizur Rahman	Trainee Electrical Technician	Production Operations	Gas Plant	November 25, 1977	27.40	November 11, 2034	September 1, 2004	0.6
161	164	Kurshed Arefin	Trainee Electrical Technician	Production Operations	Gas Plant	December 30, 1978	26.30	December 16, 2035	September 1, 2004	0.6
162	165	Abu Hena Md. Hasanuzzaman	Trainee Mechanical Technician	Production Operations	Gas Plant	December 2, 1980	24.38	November 18, 2037	September 1, 2004	0.6
163	166	Shafiqul Islam	Trainee Mechanical Technician	Production Operations	Gas Plant	June 30, 1973	31.81	June 16, 2030	September 1, 2004	0.6
164	167	Chaitanya Chandra Das	Trainee HES Specialist	Production Operations	Gas Plant	December 15, 1969	35.35	December 1, 2026	September 1, 2004	0.6
165	168	Md. Sadu Miah	Trainee Maintenance Technician	Production Operations	Gas Plant	June 22, 1978	26.83	June 8, 2035	September 1, 2004	0.6
166	169	Mohammad Abdul Aziz	Trainee HES Specialist	Production Operations	Gas Plant	January 4, 1974	31.29	December 21, 2030	September 16, 2004	0.6
167	170	Md. Zahid Siddique	Field Security Administrator	Production Operations	Gas Plant	September 1, 1969	35.64	August 18, 2032	September 19, 2004	0.6
168		Almed Sharif	Associate Accountant	Finance	Dhaka	December 5, 1975	29.38	November 20, 2032	November 1, 2004	0.4
169		Ahsanul Kabir	Mechanical Technician	Production	Sylhet	June 1, 1979	25.88	May 17, 2036	October 3, 2004	0.5
170		Alauddin Al Azad	Trainee Mechanical Technician	Operations	Sylhet	May 25, 1975	29.91	May 10, 2032	January 2, 2005	0.3
171		Ashiq S. Rahman	Lead System Administrator	IC&T	Dhaka	September 13, 1975	29.60	August 23, 2032	November 8, 2004	0.4
172		Ashraf Ali	Driver	Security, Transport & Facilities Administration	Dhaka	January 1, 1968	37.31	December 17, 2024	February 6, 2005	0.2
173		Babul Akhter	Office Assistant	Office Assistant	Sylhet	November 5, 1974	30.46	October 22, 2031	January 2, 2005	0.3
174		Babul Singha	Driver	Operations	Sylhet	January 1, 1970	35.30	December 18, 2026	January 2, 2005	0.3
175		Dewan Ali	Fitter	Operations	Sylhet	October 16, 1970	34.52	October 2, 2027	January 2, 2005	0.3
176		Humayun Akmed	Welder	Operations	Sylhet	October 14, 1970	34.52	September 30, 2027	January 2, 2005	0.3
177		jahangir Hossain	Driver	Security, Transport & Facilities Administration	Dhaka	January 1, 1965	40.31	December 18, 2021	February 6, 2005	0.2
178		Kanak Ranjan Dev Nath	Trainee Electrical Technician	Operations	Sylhet	March 1, 1979	26.14	February 15, 2036	January 2, 2005	0.3
179		Kazi Mahmudur Rahman	Trainee Plant Operator	Operations	Sylhet	January 1, 1977	28.30	December 18, 2033	January 2, 2005	0.3
180		Khondakar Rashedul Alam	Trainee Field Medical Technician	Production	Sylhet	November 17, 1981	23.42	November 3, 2038	October 17, 2004	0.5
181		Masudul Haq Mazumder	Project Coordinator	Reservoir Engineering	Dhaka	May 1, 1971	33.98	April 16, 2028	March 1, 2005	0.1
182		Md. Kamal Uddin	Office Assistant	Operations	Sylhet	October 3, 1968	36.85	September 19, 2025	January 2, 2005	0.3
183		Md. Moaiqul Alam	Trainee Instrument Technician	Operations	Sylhet	December 30, 1973	31.31	December 16, 2030	January 2, 2005	0.3
184		Md. Rafiqul Islam3	Driver	Operations	Sylhet	July 24, 1968	36.75	July 10, 2025	January 2, 2005	0.3
185		Mehedi Hasan Sohel	Trainee Plant Operator	Operations	Sylhet	January 10, 1981	24.27	December 27, 2037	January 2, 2005	0.3
186		Mohammad Anwar Hossain	Trainee Field Medical Technician	Production	Sylhet	February 1, 1977	28.21	January 18, 2034	October 17, 2004	0.5

Employees / Expatriate /

Ready NUM

start | Inbox - Microso... | For other HR | reference docs(... | Microsoft Excel ... | screenshots of ... | untitled - Paint | 2:56 PM

Fig. 3.7 Employee Detail Info Database implemented in MS Excel

Individual user implements these systems. Each employee builds his/ her Excel and Word document to manage his/her database oriented task.

3.2 Existing Training Process Flowchart and Description

3.2.1 Training process flowchart provided in APPENDIX-B

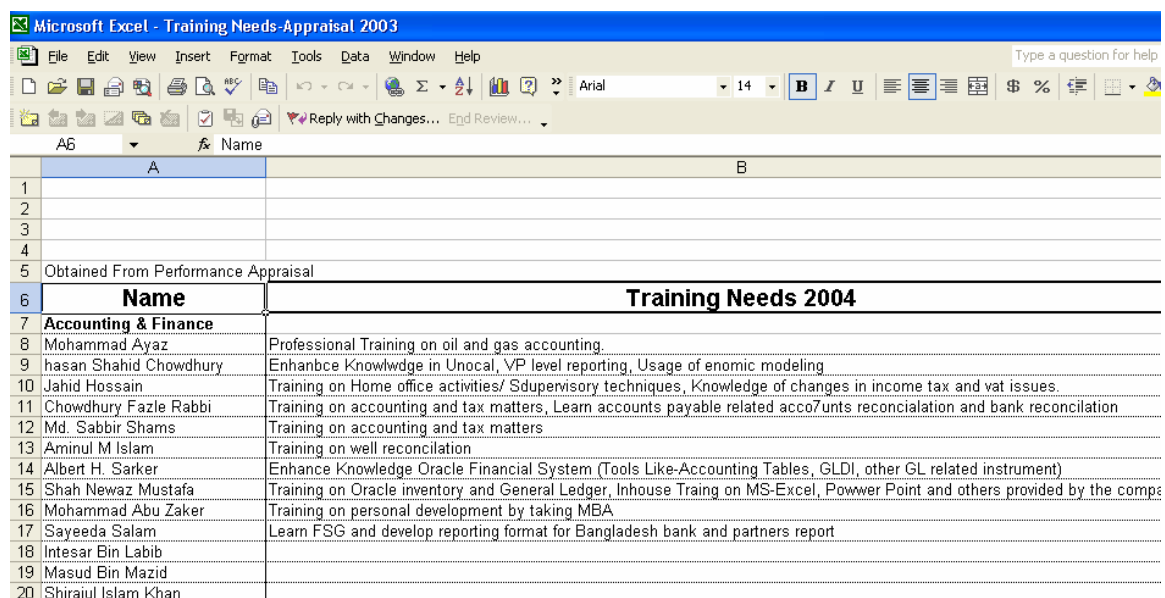
3.2.2 Training process description

- The training needs of employees are assessed by their supervisors/line managers during the performance appraisal session.
- The supervisor identifies the needs in terms of the following dimensions:
 - for behavioral (leadership) development
 - for knowledge/skill (functional/general) development
- Based on the assessment Human Resources Department builds an annual training plan. It contains training topic/area, total participants in each program, identified participants by department, period of training (on quarter basis), category (in house, local and foreign) and facilitation (domestic and foreign).
- The training plan has the following training classifications:
 - Leadership/Competency Training Programs
 - ❖ Consist of cross-functional participants
 - ❖ Scheduled by Human Resources Department for implementation
 - Generic Training Programs
 - ❖ Consists of cross functional participants
 - ❖ Scheduled by Human Resources Department for implementation
 - Job Technical/Functional Training Programs
 - ❖ Consists of participants of the function for which the development need is core.
 - ❖ Scheduled by concerned line managers/supervisors if the training program is in house.

- ❖ Scheduled by Human Resources Department from employee enrollment if the training program is local or overseas.
- Human Resources Department sends the training plan to each departmental head.
- Human Resources Department prepares an annual budget based on estimated cost for the training program.
- Human Resources Department arrange training provider or engage in vendor sourcing.
- To enroll into any external (local/foreign) training program, a nominated employee for training need to fill the Training/Educational Course Request Form (available in public folder) and take the approvals of corresponding supervisor or line manager.
- After the approval of line manager the employee should send this form in Human Resources Department for approval of the Manager, Human Resources & Organizational Development. The department preserves a copy for records and returns the original to the employee.
- After the arrangement of the training program like location, duration, hotel reservation (for foreign program) etc. the Human Resources Department send the confirmation and training information to all candidates.
- After the completion of the training program, each candidate should provide their feedback to Human Resources department in Training Evaluation form.

- The Human Resources department has a Training History Database to store all the training information regarding each training program that helps them to know how many expertise they have in different department possessing certain skills. It contains following fields: name of employee, department, location, training code, name of program, host country, organization and duration.
- Human Resources department has a standard point (calculated using frequency distribution) to ensure the quality of each training programs. After the evaluation they calculate points for each program and compare it with the standard point for that particular program. If it is less than the standard point then bring modification or changes in the corresponding program like change of facilitator, mentoring, coaching etc.

3.2.3 Screenshots of existing HR training system



Obtained From Performance Appraisal	
Name	Training Needs 2004
Accounting & Finance	
Mohammad Ayaz	Professional Training on oil and gas accounting.
hasan Shahid Chowdhury	Enhance Knowledge in Unocal, VP level reporting, Usage of enomic modeling
Jahid Hossain	Training on Home office activities/ Sduperisory techniques, Knowledge of changes in income tax and vat issues.
Chowdhury Fazle Rabbi	Training on accounting and tax matters, Learn accounts payable related acco7unts reconciliation and bank reconciliation
Md. Sabbir Shams	Training on accounting and tax matters
Aminul M Islam	Training on well reconciliation
Albert H. Sarker	Enhance Knowledge Oracle Financial System (Tools Like-Accounting Tables, GLDI, other GL related instrument)
Shah Newaz Mustafa	Training on Oracle inventory and General Ledger, Inhouse Traing on MS-Excel, Powwer Point and others provided by the compa
Mohammad Abu Zaker	Training on personal development by taking MBA
Sayeeda Salam	Learn FSG and develop reporting format for Bangladesh bank and partners report
Intesar Bin Labib	
Masud Bin Mazid	
Shirajul Islam Khan	

Fig. 3.8 Training needs created in MS Excel

Training Evaluation Form (Preview) - Microsoft Word

File Edit View Insert Format Tools Table Window Help

72%

Type a question f

UNOCAL Bangladesh

TRAINING EVALUATION FORM

Course Title: _____ Course Date: _____ Location: _____
 Instructor Name(s): _____ Vendor: _____

Course Design:	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. Course objectives were clearly stated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Course objectives were linked to my job requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Course content sequence facilitated the effectiveness of my learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Practical exercises were good.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Time allocation for each module/topic/activity was appropriate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. The program length was about right.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning Environment:					
7. Training room (layout) was setup acceptably for this course.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Equipment (projectors, TV, VDO, flip chart) in the training room was ready for use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Learning materials (handouts, job sheets, instruments) were well prepared and easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. This course was run in a collaborative environment (group work, Peertrainer coaching, questions and answers, observation, feedback).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 3.11 Training Evaluation Form prepared in MS Word

Training History Database: Implemented in MS Excel

Unocal Bangladesh

				Local Training	
	Codes			In-house Training	
				Foreign Training	
Name of Employee	Department	Location	Code	Name of Program	Host Country
Azadur Rahman	Drilling	Dhaka	IHTP	Project Management Training	Dhaka, Bangladesh
Azadur Rahman	Drilling	Dhaka	IHTP	HES Networking and Group Discussion	Dhaka, Bangladesh
Chowdhury Fazle Rabbi	Finance	Dhaka	L	Workshop On "Corporate And Personal Income Tax Issues"	Dhaka, Bangladesh
Chowdhury Fazle Rabbi	Finance	Dhaka	F	Exploration & Production Accounting-Level 2	Kuala Lumpur, Malaysia
Chye Hock Koh	Legal	Dhaka	IHTP	Behavioral Event Interviewing	Dhaka, Bangladesh
Chye Hock Koh	Legal	Dhaka	IHTP	Project Management Training	Dhaka, Bangladesh
David Smith	Finance	Dhaka	IHTP	Behavioral Event Interviewing	Dhaka, Bangladesh
David Smith	Finance	Dhaka	IHTP	Project Management Training	Dhaka, Bangladesh
David Smith	Finance	Dhaka	F	Advanced International Petroleum Accounting and Financial Management	USA
Ehsan Karim	IC & T	Dhaka	IHTP	Behavioral Event Interviewing	Dhaka, Bangladesh
Ehsan Karim	IC & T	Dhaka	IHTP	Project Management Training	Dhaka, Bangladesh
Ehsan Karim	IC & T	Dhaka	L	Microsoft Project	Dhaka, Bangladesh
Ehsan Karim	IC & T	Dhaka	L	Crisis/Risk Communication	Dhaka, Bangladesh
Hasan Shahid Chowdhury	Finance	Dhaka	F	Advanced International Petroleum Accounting and Financial Management	USA
Hasnain Ibrahim	Drilling	Dhaka	IHTP	Project Management Training	Dhaka, Bangladesh
small Hossain Chowdhury	CEO Office	Dhaka	IHTP	Behavioral Event Interviewing	Dhaka, Bangladesh
small Hossain Chowdhury	CEO Office	Dhaka	IHTP	Project Management Training	Dhaka, Bangladesh
small Hossain Chowdhury	CEO Office	Dhaka	IHTP	Cardiac Pulmonary Resuscitation	Dhaka, Bangladesh
small Hossain Chowdhury	CEO Office	Dhaka	L	Crisis/Risk Communication	Dhaka, Bangladesh
John T., Coleman	Exploration	Dhaka	IHTP	Project Management Training	Dhaka, Bangladesh

Fig. 3.12 Training Details of Employee stored in Training History Database

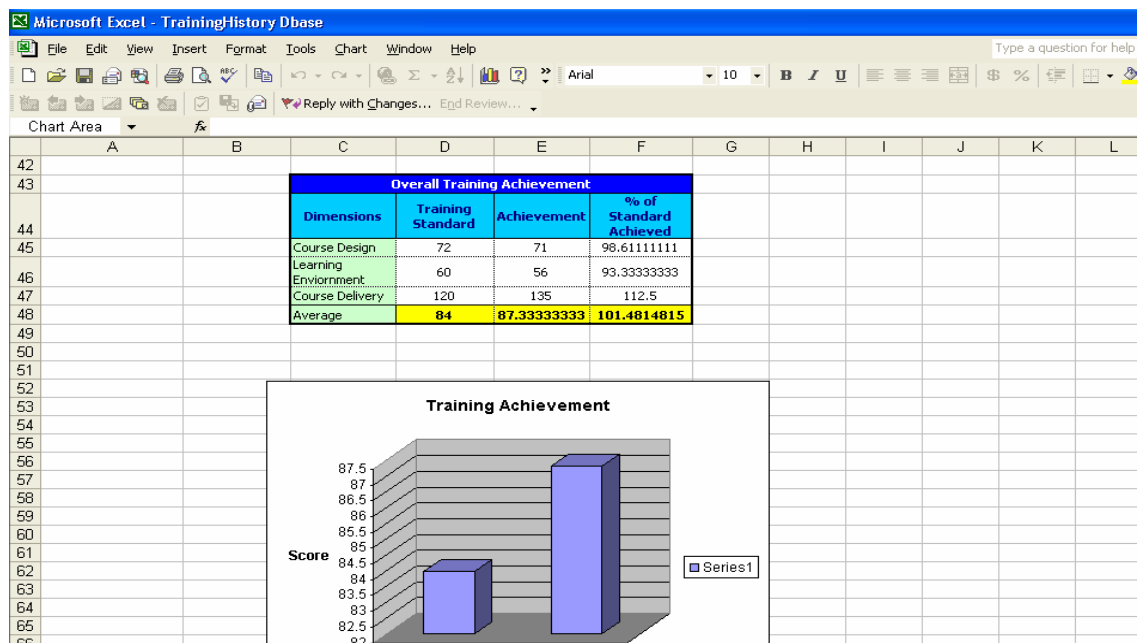


Fig. 3.15 Training Feedback Charts of Training History Database prepared in MS Excel

The screenshot shows a Microsoft Excel spreadsheet titled 'TrainingHistory Dbase' with a table for 'TRAINING EFFICIENCY_2005'. The table has the following structure:

Month	Training Title	Training Hours	No. of participants	Total Training Manhours	Total No. of employees	Training manhours/head/month
Jan	Microsoft Outlook-Advanced	4.5	19	85.5	241	0.354771784
	Microsoft Word	3	9	27	245	0.110204082
Feb				0		
				0		
				0		
				0		
				0		#DIV/0!
Mar				0		
				0		
				0		#DIV/0!

Fig. 3.16 Training Efficiency Calculation of Training History Database prepared in MS Excel

These systems are implemented by individual user. Each employee builds his/ her Excel and Word document to manage his/her database oriented task.

CHAPTER IV

4. PROPOSED SYSTEM THAT IS AVAILABLE WORKFLOW TOOLS AND SELECTION OF WORKFLOW ENGINE WHICH IS BEST SUITABLE TO UNOCAL BANGLADESH HR DEPARTMENT

4.1 What is Workflow Software?

Workflow software enables modern business to automate work flow on day to day operations. Workflow software is an IT technology which uses electronic systems to manage and monitor business processes. It allows the flow of work between individuals and/or departments to be defined and tracked. Although, documents are often used as a medium, for transporting information in a workflow software system. It is mostly associated with document management, content management and knowledge management where the workflow system is used to track the process of creating and reviewing and distributing documents [10].

Workflow software helps business automate a range of business tasks, and electronically route the right information to the right people at the right time. With the help of workflow software, users are notified of pending work, and help managers' route approvals through the system quickly [10].

Workflow software supports workflow which is a combination of states and transitions that make up a process. Each workflow consists of configurable states and transitions that must be followed from the time an issue or feature is opened to the time it is closed [10].

4.2 Academic Community for Workflow Research

The academic community has the longest track record of involvement with workflow that dates back from the late seventies. The current trend in the

research community considers petri nets [11] as the mother of all process definition languages [12]. One of the best pieces of research that is made accessible and understandable for a large audience is workflow patterns [13]. Workflow patterns compared a number of workflow management systems and expressed the common process modelling concepts in terms of petri nets [3].

4.3 Open Source Projects

This section shows a list of the links of real workflow management systems that Unocal Hr department can use to automate the HR Process. In [3] the sources to compose this list are list of Tom Baeyens [14], the list of Carlos E Perez [15], and list by Topicus [16].

- **jBpm** [17] - jBpm is a flexible, extensible workflow management system written by Tom Baeyens. Business processes, expressed in a simple and powerful language and packaged in process archives, serve as input for the jBpm runtime server. jBpm combines easy development of workflow-applications with excellent Enterprise Application Integration (EAI) capabilities. jBpm includes a web-application and a scheduler. jBpm is a set of J2SE components that can also be deployed as a clustered J2EE application.
- **OpenEbXML** [18] - The Open EbXML project is working to providing a EbXML framework that primarily supports the v2.0 set of EbXML specifications soon to be released by UN/CEFACT and OASIS.
- **Werkflow** [19] - Werkflow is a flexible, extensible process- and state-based workflow engine. It aims to satisfy a myriad of possible workflow scenarios, from enterprise-scale business processes to small-scale user-interaction processes. Using a pluggable and layered architecture, workflows with varying semantics can easily be accommodated.
- **OSWorkflow** [20] - What makes OSWorkflow different is that it is extremely flexible.

- **wfmOpen** [21] - WfMOpen is a J2EE based implementation of a workflow facility (workflow engine) as proposed by the Workflow Management Coalition (WfMC) and the Object Management Group (OMG). Workflows are specified using WfMC's XML Process Definition Language (XPDL) with some extensions.
- **OFBiz** [22] - The Open for Business Workflow Engine is based on the WfMC and OMG specifications. OFBiz Workflow Engine uses XPDL as its process definition language.
- **ObjectWeb Bonita** [23] - Bonita is a flexible cooperative workflow system, compliant to WfMC specifications. A comprehensive set of integrated graphical tools for performing different kind of actions such as process conception, definition, instantiation, control of processes, and interaction with the users and external applications. 100% browser-based environment with Web Services integration that uses SOAP and XML Data binding technologies in order to encapsulate existing workflow business methods and publish them as a J2EE-based web services. A Third Generation Workflow engine based in the activity anticipation model.
- **Bigbross Bossa** [24] - The engine is very fast and lightweight, uses a very expressive Petri net [11] notation to define workflows, does not requires a RDBMS and is very simple to use and to integrate with java applications. Actually, it was designed to be embedded.
- **XFlow** [25] - XFlow runs within an EJB and servlet container.
- **Taverna** [26] - The Taverna project aims to provide a language and software tools to facilitate easy use of workflow and distributed compute technology within the eScience community.
- **Enhydra Shark** [27] - Shark is completely based on standards from WfMC and OMG using XPDL as its native workflow definition format. Storage of processes and activities is done using Enhydra DODS.
- **PowerFolder** [28] - PowerFolder consists of a developer studio, administration environment, and a runtime engine.

- **Breeze** [29] - Breeze is a lightweight, cross-platform component-based workflow engine prototype.
- **Open Business Engine** [30]- Open Business Engine is an open source Java workflow engine which supports the Workflow Management Coalition's (WfMC) workflow specifications, including interface 1, also known as XPDL, interface 2/3 known as WAPI and interface 5 for auditing. OBE provides an environment for executing activities in a controlled, centralized environment. OBE supports both synchronous and asynchronous execution of workflows. The primary OBE implementation is based on J2EE.
- **OpenWFE** [31] - OpenWFE is an open source java workflow engine. It features 3 components, easily scalable: an engine, a worklist and a web interface. Its workflow definition language is inspired of Scheme, a Lisp dialect, though it is expressed in XML.
- **Freefluo** [32] - Freefluo is a workflow orchestration tool for web services. It can handle WSDL based web service invocation. It supports two XML workflow languages, one based on IBM's WSFL and another named XScufl. Freefluo is very flexible as its core is a reusable orchestration framework that is not tied to any workflow language or execution architecture. Freefluo includes extension libraries that enable execution of workflows written in a subset of WSFL.
- **ZBuilder** [33] - ZBuilder3 is a second generation of workflow development and management system which intends to be an open source product. It defines a set of standard JMX management interfaces for different workflow engines and their workflows.
- **Twister** [34] - Twister's aim is to provide a new generation, easily integrate able, B2B oriented workflow solution in Java, based on the latest specification efforts in this field. The process engine is based on the BPEL business process specifications and Web Services standards.

- **Con:cern** [35] - Con:cern is a workflow engine based on an extended case handling approach. A process is described as a set of activities with pre- and post-conditions.

Looking for open source tools is not so difficult. In a searching engine site just search by writing -“freeware workflow tools” or “Open source workflow engine” and will find a list of variety tools and workflow engine site links. But the most difficult task in workflow is actually choosing the best workflow tool. Therefore in my report I have first explained the basic concepts of workflow to make readers better perform the selection process. Though I myself realized that comparing workflow systems is one of the most challenging tasks and also linking the theoretical knowledge of workflow to the available workflow systems is really difficult. But as we know that it is better to cope up with one choice rather than no choice at all.

4.4 Commercial Workflow Tools for HR Process Automation

4.4.1 HR ACAS Automation Projects FY05 – FY08

- **Supervisor Information Collection (FY05):** Currently, HR does not track an employee’s supervisor information. The collection of the supervisor information will be critical in automating many of the HR ACAS projects, including approvals of electronic job forms and web timesheets. This will also enable Unocal HR department to identify supervisors for managerial information and training [36].
- **Web Recruitment and Reporting (FY05):** Right now this functionality is not available, so HR would like to outsource the web recruitment and reporting services to a web recruitment provider. This process would also provide additional recruitment reports and information that is currently not available [36].

- **Automate Position Description Collection/Review Process (FY05-FY06):** This implementation will provide the ability for Unocal HR department to submit, update, approve, and review position descriptions via a secure web environment. This will reduce the handling and distribution costs of the current manual process, allow for timelier updating of position descriptions, and provide HR electronic access to all of Unocal's position descriptions [36].
- **Web Compensation Statement (FY05-FY06):** Develop an automated web compensation statement to provide employees with their salary information and the value of their various benefits in one easy location. This will also help increase employee awareness thus raises the value Unocal's benefit programs [36].
- **Electronic Approvals of Job Activity (FY06-FY08):** This is a streamlined, electronic process to submit, route, approve, and apply job and employment changes. This simplified process would reduce processing time for the Performance Appraisal process, create an approval routing trail specific to the type of event occurring, and reduce HR data entry. This process, in conjunction with the workflow tool, will also enhance communication to the employee, supervisor, HR, and other departments. HR currently creates/updates the base employee and job records each year, mostly via a manual data entry process [36].
- **Web Information for Managers and Execs (FY08):** This project will provide HR related managerial and executive information in an easy access, secure web environment. The full scope of this is yet to be determined but could include web reports for managers regarding their staff's employment information, statistical HR information for executives and employee status in training programs [36].

- **Training Tracking (FY08):** As Unocal develops employee training programs and career development plans it will be necessary to track the employees progress through the training programs. This project will also assist HR in managing the classes provided. Right now training tracking capability is not available so, Unocal can purchase or build this tool [36].
- **Smaller Scale Implementation Projects (FY05-FY08):** Automation of Family Medical Leave tracking can be done [36],

4.4.2 ViciFlow

ViciFlow is a comprehensive and intuitive workflow solution that enables organizations to automate their business processes [37]. The solution comprises three-applications [38]:

- ◆ ViciFlow Manager: The server component of ViciFlow
- ◆ ViciFlow designer: The application allows users to map their business processes using a intuitive GUI based designer. It uses nodes to represent users/ groups and links to represent actions thus creating a visual representation of the business process. It also allows ad-hoc workflow creation. Sample screenshots are provided in next page:

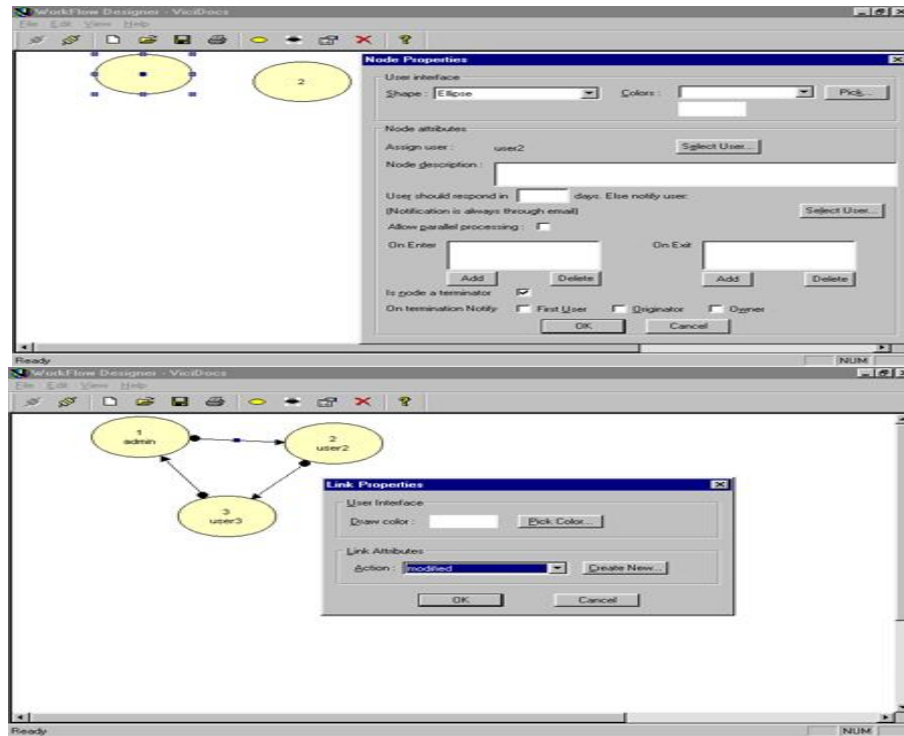


Fig. 4.1 ViciFlow Designer

3) ViciFlow Handler: This is the application used to process document by the users of the system. Users can view their inbox with the status of each document. They can process the document by adding comments, annotations or by editing the document and creating a new version. After processing the document they can choose an Action defined the ViciFlow Designer which routes the document to the next user.

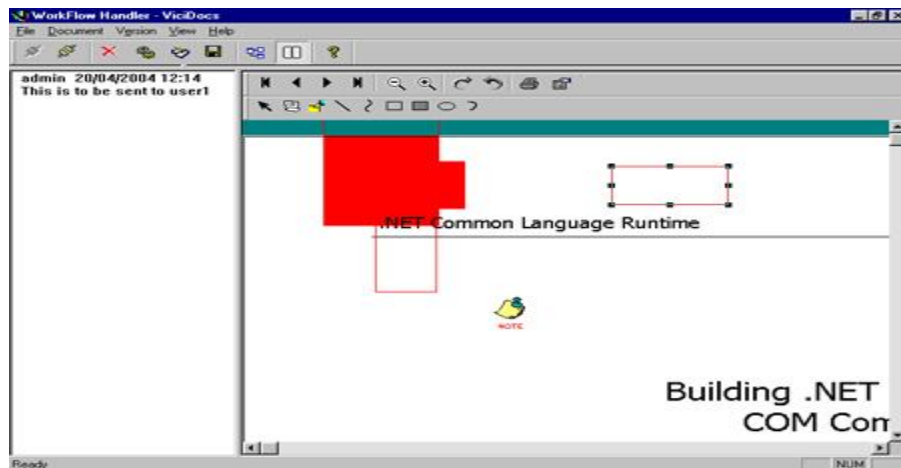
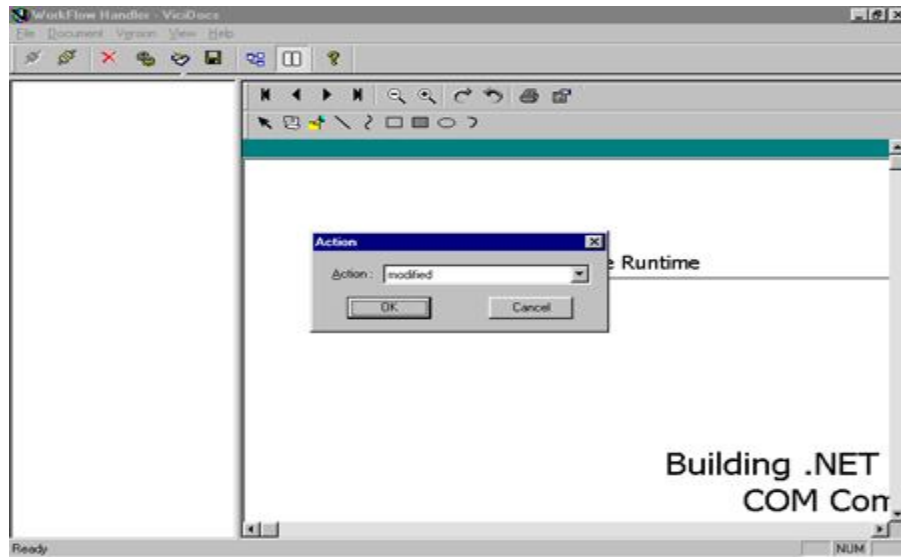


Fig. 4.2 ViciFlow Handler

Highlights of the solution include:

- Supports more than 150 formats in the universal viewer for processing - formats include image formats (TIFF, JPEG etc.) and document formats (MS OFFICE, PDF etc.)
- Escalation to superior if user does not process document within a set period of time
- Option for sequential (i.e. any one) and parallel (i.e. all simultaneously) processing for groups

- Rich annotation features include adding notes, highlighting, underlining, blacking out etc.
- Email alerts linked to document progress
- E-forms can be integrated

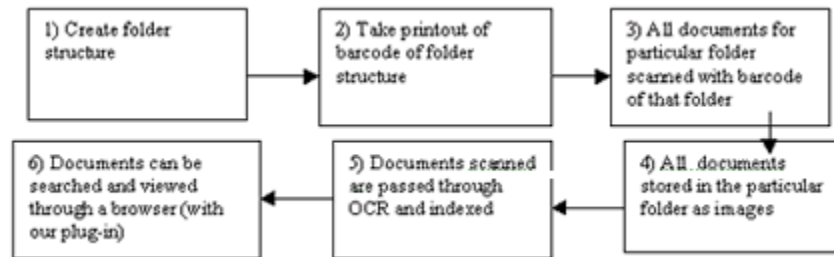
4.4.2.1 ViciDocs Enterprise

ViciDocs Enterprise document management system is easy to use and user-friendly, and produces indexed archives that can be stored in user-defined hierarchy of folders. The output can be searched by key words or properties of the documents or even on a full text basis. What's more - It is even possible to copy the indexed documents and proprietary DocViewer onto a CD-ROM or even a web location. It is also possible to define folder level access controls [39].

The main steps involved in the process of storage and retrieval are [39]:

1. Definition of hierarchy of folders by users and printing bar codes from ViciDocs using Capture Client application
2. Scanning documents along with the bar code sheets
3. Converting images into text using Text Extractor
4. Indexing the text using ViciDocManager
5. Storing the images, text and the index in the relevant folders
6. Retrieving the documents using the search features and viewing them in the DocViewer
7. Version controlling of the documents with single checkout feature
8. Subjecting documents to a specific workflow involving various actions and user verifications.

The description is as follows [39]:



1. The folder structure can be created on any windows machine using Capture Client application. - for e.g. if documents pertaining to year 2002 are to be stored in a directory then a directory named YEAR2002 can be created.
2. For each folder the system (Capture Client application) creates a barcode. The printout of the barcode is used to store scanned documents in the folder. A typical barcode for a folder is as follows:

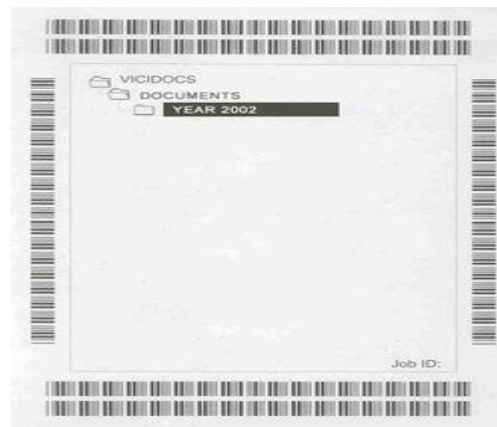


Fig. 4.3 Barcode Reader

3. When a folder is created security can also be set to the folder so that only certain users and groups can be provided the relevant access to the documents in the folder. The various types of permissions allowed are NoAccess, Search, ReadOnly, ReadAndWrite, Delete and FullControl.

4. Once a folder is created additional information in the form of meta data can be set. Index Data and KeyWords are the two forms of meta data that can be added to a folder. User defined fields can be created and data can be added to those fields for each of the folders created.
5. All documents which are to be stored in a particular folder are placed after the barcode sheet of the folder and scanned.
6. The software automatically stores the documents after the barcode into the folder to which the barcode pertains.
7. To search for documents it is necessary to convert the images (obtained after scanning the documents) to text this is done through an Optical Character Recognition (OCR) engine. This allows searching for any word through the documents. After converting the images to text, the position of each word of the text is stored i.e. indexed. This helps in searching for full phrases (e.g. 'rains in Mumbai') rather than words only.
8. The DMS has a browser-based Viewer which has the following advantages :
 - It allows for page navigation, for instance, if 5 pages of a magazine article have been scanned then user can go from page 2 to page 3 through the 'Next' button on the viewer rather than opening pages separately
 - It allows for zooming in and out, rotating the page etc.
 - ViciDocs provides a comprehensive version control through Capture Client with the following features:
 - ◆ Version history - User can view the detailed history of a document and can view any of the versions of the document.

- ◆ Latest version download - By default the latest version is downloaded for the user to work upon.
- ◆ Check-in/Check-out control - This feature allows the user to check out a document for working on it and Check it back in once the modifications are done.
- ◆ Single User Check Out option prevents multiple users from editing the same document simultaneously thus maintaining the documents authenticity.

ViciDocs WorkFlow System:

- ViciDocs has a simple yet extremely powerful workflow system, which allows the various users of the organization to route the documents to appropriate users [39].
- The administrator can create various workflow templates and apply those templates to various documents so that the documents can follow the rules laid down in the workflow template [39].
- The ViciDocs WorkFlow provides automatic e-mail notifications when specified events, such as placement of a document in a folder or when a document is finalized by one of the users in the workflow [39].
- Reports based on the status of a document in a workflow can be generated for supervision [39].

4.4.2.2 Email Safe

Overview

Email data management is a critical need today considering the following [40]:

- It is estimated that today 60% of business critical information is stored within corporate messaging systems.
- A recent study of corporate IT users found that the average user sends 34 emails every day and receives 99 emails every day, which translates to a 14.7 MB of email data per day, a 53% growth over last year.

Email Safe helps organizations manage their email data in a comprehensive and secure manner. Key highlights of the solution include [40]:

- Support for popular email clients like Outlook Express, Microsoft Outlook and Lotus Notes.
- Enables setting of intuitive policies by users to auto archive emails.
- Powerful storage algorithms for speedy search and retrieval.
- Functionality accessed through the email client interface itself as well as through the web interface.

Benefits

- Finding information in emails is easier as attachments can be searched for full text.
- Helps the organization comply with the legal regulations for data retention.
- Reduces the amount of storage needed on mail servers (like Exchange/Lotus), helping them to run more efficiently.
- Eliminates the need for end users to employ individual archive files to offload information from their mail stores.

4.4.2.3 ViciDocs Vault

ViciDocs Vault is the document archival and retrieval service provided by ViciSoft. ViciSoft will take care of all the hardware and software infrastructure required and will also provide scanning and digitizing as part of this service [41].

Once a Client signs up for this Service, ViciSoft will study the document types and volumes and will work out a comprehensive Service Level Agreement and Confidentiality Agreement with the Client for protection of secrecy. The service will include document-scanning, import of electronic documents, indexing, storing and retrieving and providing specific documents as and when required. The Service would entail a fixed Annual Maintenance fee (a function of volume of documents) and a variable Service Charge for Scanning, Importing and Searching for new documents. The Processes at the Client's end will be appropriately reengineered to make all the key documents pass through the ViciDocs Vault. This service can be offered onsite as well as offsite at ViciSoft's premises [41].

4.4.2.4 ViciForm

ViciForm is a powerful distributed capture solution which includes world leading engines like Abbyy and Scansoft for ICR/OCR recognition. Primary features of the product include [42]:

- Distributed capture wherein workstations on a network can be used to scan and index document simultaneously
- Rich scanning features which include multipage creation, barcode enabled routing of documents to folders etc.
- Easy to use key-from-imaging tool which enables more efficient validation of the recognized fields

- Separation of the scanning and recognition processes which optimize the hardware resources for e.g. scanning can be done on 5 workstations while OCR/ICR recognition is performed at one high end machine.
- World's leading engines like Abbyy and Scansoft integrated for very high accuracy
- GUI-based designer module for creating zones which are to be recognized - particularly useful for form processing

Benefits

- Save data entry costs - automatic recognition by OCR/ICR/OMR/barcode engines ensure lower manpower costs for data entry and validation
- Lower licensing cost - since the product enables distributed capture licensing costs for OCR/ICR engine is much lower. For instance 5 workstations may be used for scanning and indexing but only one OCR/ICR license may be required
- Export the recognized data in XML or any other standard format for integration with any application or database

4.4.2.5 ViciDocs-Pronto

ViciDocs Pronto is a simple, yet powerful Document Management Solution that is very easy and quick to install and use. It works on a Stand Alone basis on any Windows machine. With options to archive physical (through scanning) as well as electronic (through the import option) documents into the repository that works with Access database, ViciDocs Pronto is the solution that small and medium sized organizations need most [43].

ViciDocs Pronto comes with a single application with features for [43]:

- Folder definition
- Scanning of documents

- Import of existing electronic documents
- User configurable metadata definition at document level
- Option to stack and unstack multiple Tiff Images
- Search based on Metadata

4.4.2.6 DocRetriever

DocRetrieverR is an indexing and search engine which enables users to search for documents on a CD without any need to install software on the PC. It has two parts [44]:

- 1) The indexing engine which creates the searchable index out of the content of the CD. This index needs to be loaded on the CD before distribution
- 2) The search software which is loaded on the CDs to allow users to search through the content.

Features

- Any textual content in the form of HTML, WORD, Excel, PDF, PowerPoint etc. can be searched upon using DocRetriever
- Search interface can be customized
- Words searched for are highlighted and linked to other documents containing the same word thus allowing for easy navigation for user

4.4.3 Some others links are given below [3]

- Bea's WLI [45]
- Carnot [46]
- Dralasoft [47]
- Filenet [48]
- Fujitsu's i-Flow [49]

- [IBM's holosofx tool](#) [50]
- [Intalio](#) [51]
- [Lombardi](#) [52]
- [Oakgrove's reactor](#) [53]
- [Oracle's integration platform](#) [54]
- [Q-Link](#) [55]
- [SAP's NetWeaver](#) [56]
- [Savvion](#) [57]
- [Seebeyond](#) [58]
- [Sonic's orchestration server](#) [59]
- [Staffware](#) [60]
- [Ultimus](#) [61]
- [Versata](#) [62]
- [WebMethod's process modeling](#) [63]

4.4.4 A recommendation for Unocal HR department to build their own workflow engine:

Unocal Bangladesh has option to use ORACLE. Though access to it is difficult but HR Management can consult with higher authority about access to it. HR department can also request the Sugarland, USA head office to build a workflow engine for the department. Also the IT department of Dhaka head office can be engaged in implementation of the work flow engine for the HR Department.

The Oracle Applications 11i can be used to Build Custom Workflow Processes for HR department

Oracle Applications 11i contains numerous standard workflow processes within various application modules. When a company's specific business needs are not met through these standard workflow processes, a custom solution must be delivered. This link [64] contains the paper that documents the various steps taken in designing, developing and implementing a custom workflow solution within the Oracle Applications Human Resources module. This includes a Solution Design Phase, Solution Development Phase and a Solution Testing

Phase. The whole guideline to implement the workflow engine in ORACLE 11i is also included in APPENDIX-C.

CHAPTER V

5. PROTOTYPE AND DESIGN OF WORKFLOW

5.1 Prototype

A prototype is a quick-and-dirty program that provides minimal amount of features. It however helps the user to conceptualize what the final system would look like very quickly. So the users can interact with the prototype (quickly put together by the analyst) and thus understand whether the analyst understood, what they want and also helps the analyst to refine real requirements quickly by modifying the prototype with the given feedback [65].

5.2 Prototyping Models

The prototyping model is a software development process that begins with a brief requirements collection, followed by prototyping and user evaluation. Attempting to build a prototype before detailed requirement collection helps the analyst to decide what questions to ask. Often the end users may not be able to provide a complete set of application objectives, detailed input, processing, or output requirements in the early stage. After the user evaluation, another prototype is made based on feedback from users, and again the cycle returns to client for user evaluation [65].

5.3 How Building a Prototype Solves the Problems

The development of a complete system is a complex task involving many different groups of people. Systems are complex because they usually have a lot of functionality and often need to cooperate and/or integrate with other systems.

Also, the interface of a system is complex. The interface is that part of the system that interacts with the users of the system and therefore has to operate in real time as users don't like to wait [65].

It is impossible to start building a system immediately without first investigating the required functionality and identifying the parts of the whole system. Moreover, the different groups of people involved in building the system do not have the same area of expertise. For example there are managers, designers, programmers and users. Still these people have to be able to communicate with each other about the required functionality of the system to be developed. So, all people must use a common method of abstraction.

In Unocal HR department, managers and users are not trained computer scientists or professional users and they have no knowledge of advanced design methods used in computer science. Therefore the method of abstraction must be simple yet effective and not require much learning. Prototyping offers such an abstraction. Prototyping or throw-away prototyping has the following advantages:

Easier to create interface

One problem prototypes solve is, the designing of the interface. Nowadays prototypes are mostly used to create user interfaces. It is becoming increasingly important to prototype user interfaces first, because they are becoming more complex. Today almost all user interfaces are graphical, the so called Graphical User Interfaces or GUIs. These interfaces are easier to use than older types of interfaces (e.g. command-line interfaces), but they are harder to create. A prototype doesn't have all the features of real software, so the interface is easier to construct [65].

Improved ease of use

Products developed using prototype is easier. Improvement in ease of use is an advantage for throw-away and evolutionary prototyping equally. Users have an opportunity to interact with the prototype, and give direct feedback to designers. For example, in some cases users are not sure that they want certain functions implemented until they actually can try them. Users may also find certain features or terminology confusing. Also, the need for certain features may not be apparent until the system is actually exercised. Users are more comfortable reacting to a prototype than reading a written technical specification [65].

Better match with user needs

Rapid prototyping results in a product which better matches actual user needs. Sometime Omissions of function are often difficult for the user to recognize in formal specifications. Prototyping helps ensure that the focus of a system is right before the expenditure of resources for development of the entire system. The first attempt to develop a whole system will likely fail to meet user needs, and be discarded. It is better that the first effort is a prototype rather than a final deliverable [65].

Reduction in maintainability

Reduction in maintainability can be gained if prototypes are used in the initial phase that is prototyping can lead to maintainable products. There are also indirect reductions in maintenance costs due to better match of user needs will and reduction in maintenance associated with changing requirements. If software coding starts at the beginning then changing the design and code becomes difficult later. There is normally no direct software coding at the stage of

prototype use. Normally the software coding starts when the use of prototype is completed. So, prototype can lead to easily maintainable code [65].

I have used Microsoft® Access as the prototype tool for user feedback. Access is a powerful tool to create user friendly input environment using data entry forms. It is also very easy to change a segment on Access without changing the whole format. So, it is best suitable as a prototype tool.

5.4 Planning Phase

5.4.1 System request

Usually a request for a software system includes four elements [66]:

- ✓ Project sponsor
- ✓ Business need
- ✓ Functionality
- ✓ Expected value

The project sponsor is the person who has an interest in seeing the system succeed. This is the person who initiated the proposed project and who will serve as the primary point of contact for the system on the business side. For this project D.S. Zulfikar Hyder, the HR Manager of Unocal Bangladesh Ltd played the role of project sponsor. With his help the system request was prepared and is described below:

System Request for the project

Project Name: Automation of HR Processes (Employee Information Database and Person Profile Database)

Project sponsor: D.S. Zulfikar Hyder, The HR Manager of Unocal Bangladesh Ltd

Phone: 9885881 Extn-146

Business Need: Use modern technology to make HR processes faster and efficient

Functionality:

Using the automated system users should be able to complete a HR procedure. The initial focus should be on tool assistance for better HR process performance. The users should be able to

- Work on a HR process from planning phase to modification
- Search through any information in the employee information form
- Add, delete and update/edit record easily
- Get a complete picture of person profile by looking at one form
- Can learn about HR information by viewing the reports.

Expected values:

Tangible:

- A faster completion of HR tasks after the system has been operating for 6 months to 1 year.

Intangible:

- Faster search and report generation from database.
- Improved HR processes by monitoring the process cycle.
- Improved user and employee satisfaction.

Special issues or constraints:

- Intranet exists in the organization but accessibility is a problem. So, a web based database is not possible in this short period of time. Oracle

database exists in Unocal but accessibility and lack of user friendliness causes HR department to use their own database.

5.4.2 Technical feasibility analysis

Once the needs for the system and its basic functionality have been defined, a more detailed technical feasibility analysis was carried out to better understand the opportunities and limitations associated with the proposed project. This feasibility analysis guided the organization in determining whether to proceed with this project. I mainly focused on these aspects:

- ✓ Familiarity with the application.
- ✓ Familiarity with technology
- ✓ Project size.

The Technical feasibility analysis for Unocal Bangladesh Ltd is stated here:

Technical feasibility (not risky)

Familiarity with the application (excellent):

- The HR department already has the experience to work in a PC environment. The department is also experienced in using Internet and Intranet.

Familiarity with technology (medium):

- The users have no experience of working in a web based database environment or using MS Access.
- Accessibility to LAN and Wan connection is very few.

Project size (moderate):

- The project is moderate in size.

- With some effort the to-be system can be replaced by the current system without much complexity.

5.5 Analysis Phase

5.5.1 Requirements gathering

For requirements gathering it was important to select the “right person”. Unocal Bangladesh Ltd has 4-5 employees who are working with the current system. But Manager of HR Department Mr. D S Zulfikar Hyder has total control of the overall HR system. So, I selected him as the primary person who will participate during analysis. I chose interviewing as the way in which information should be collected.

As I knew a little about how a real life HR Department works, it was very difficult for me to decide - what questions to ask so that the requirements could be collected properly. But my organizational supervisor makes it easier by assigning Mr. Naved Ferdous Iqbal and Mr. Mozammel Mehedi to provide and educate me about HR recruitment and training processes. After discussing with them I learned about those processes and prepare the flowchart and process description. Then by providing feedback they help me to finalize the HR process description and flowchart to suggest tools for automation of these processes. Ms. Sayeeda Salam provides me required data in building my Employee Information and Person Profile database. While building the prototype the problems I faced helped me to understand exactly what questions to ask to the users for requirements gathering.

5.5.2 Designing prototype from the initial concept

The Unocal HR management provided me an idea about what they wanted from the future system. Their main concentration was on:

- Process automation.
- Individual database for assigned functionality.
- Special interest of the users.

Thus I have designed fields in the Access database that can store the inputs for the desired outputs.

Designing the initial database

According to me Employee Information is a key table that should exist in the database. Another two tables that I designed were Employee Contact Information and Personal Profile table .In Employee information table I set Employee ID as a primary key. It contains following:

Table 5.1
Initial employee Info

Employee ID
Department Name
Title
Date of Birth
Date of Joining
Date of Retirement

Designing the datasheets

To build a prototype for user demonstration and entry I preferred Access data forms because it is easy to change according to user need and data doesn't give a complicated view to a new user. That's why I converted my table designs into Microsoft® Access datasheets. According to the user requirement I have assigned employee name as a primary key because, HR department finds it

easier to remember name of employees rather than their ID. So they want employee name as a primary key. Thus to avoid duplicate name the same names will be numbered as 1, 2, 3 and so on. Also some more fields were added based on user requirements like office location, birthday month, age and completed years of service

Several interviews were taken for requirements gathering and some user feedback forms were also given to get an idea about what the users actually wanted.

5.5.3 Interviewing the Users

Interview is the most commonly used requirement gathering technique [66]. The interviews conducted for this project were mostly one-on-one (one interviewer and one interviewee).

Designing questions for interview [65]

Designing the questions for the interview is very important. There are three types of interview questions:

- Closed-ended questions.
- Open-ended questions.
- Probes.

Closed-ended questions are normally those that require specific answer. So, these questions are used when the analyst is looking for specific, precise information [66].

Open-ended questions are those that leave scope for elaboration on the part of the interviewee. Open-ended questions are designed to gather rich information and give the interviewee more control over the information [66].

Finally, probing questions follow up on what has just been discussed in order to learn more. They are often used when the interviewer is unclear about an interviewee's answer [66].

The initial questions were prepared based on the problems occurred during the development of the prototype. Several formal and informal interviews and meetings were carried out during the project life time. A sample interview report is given here:

Interview Report [65]

Interview Notes Approved By:

(Mozammel Mehedi Arif)

Person Interviewed:

Mozammel Mehedi Arif (Recruitment Officer, Unocal Bangladesh Ltd)

Interviewer:

Samina Azad

Date: 6th March 2005.

Primary Purpose:

Collect information about the current HR recruitment process and to identify tools required to automate the process, problems and solutions for future improvement of the current system.

Question Format:

Q1. Give me a brief idea about the current HR Recruitment process practiced here?

Ans: Manpower forecasting and job opening begins the recruitment process. Recruitment process progress is based on annual recruitment plan

Online, newspaper and in house circular are the sources of potential candidates. By applying sorting potential candidates are selected. Behavioral Event interview and skill test are used to select job candidate. Finally HR and Line manger decide which candidate should be appointed

Q2. What are the main problems in this current system?

Ans: The recruitment process is basically manual. So it is time consuming. Sometime a department may be late to notice a request for recruitment. Also there exists no database to store information. Also the task that requires filling and submission of forms makes process slower.

Q3. What are possibilities of improving the current system?

Ans: There are some possibilities:

- ✓ If there is a system monitoring for the applicants interest then it will be better to understand customer needs.
- ✓ Changes in the process (if possible) to make it smaller
- ✓ Suggest modification that makes forecasting more accurate

Summary of Interview:

After questioning it is seen that the current system has some limitations. Precise problems can be realized from user point of view. The current system will be more efficient if the problems are solved.

Open Items:

- ✓ It is clear that a workflow engine will help the users a lot to make process faster
- ✓ Employee information database will reduce the burden of storing files for individual employee manually

5.5.4 Feedback from the users about the prototype

The main idea of using prototype was to provide a scope to users so that they can give feedback. A large number of user and user feedbacks were helpful to improve the prototype. Both verbal and written feedbacks were taken.

5.5.5 Finalizing the Design of the Prototype

After repeatedly changing the prototype according to gained feedback given, the design was finalized by the associated database user in the company and my faculty advisor. The final database tables are given below-

Table 5.2
Final employee detail information

SI No
Employee Name
Title
Department Name
Office Location
Date of Birth
Birthday Month
Age
Date of Joining
Date of Retirement
Completed Years of Service

Table 5.3
Position profile hyperlink

Position profile hyperlink

Table 5.4
Person profile

Global ID
Employee Name
Position
Salary Grade
Language
Department Name
Date of Joining
Photograph
Performance Rating1
Performance Rating2
Performance Rating3
Position1
Duration1
Location1
Position2
Duration2
Location2
Position3
Duration3
Location3
Position4
Duration4
Location4

Position5
Duration5
Location5
Training Education1
Training Education2
Training Education3
Training Education4
Training Education5
Outside Position1
Outside Duratuion1
Outside Location1
Outside Position2
Outside Duratuion2
Outside Location2
Outside Position3
Outside Duratuion3
Outside Location3
Outside Position4
Outside Duratuion4
Outside Location4
Outside Position5
Outside Duratuion5
Outside Location5
Outside Position6
Outside Duratuion6
Outside Location6
Outside Position7
Outside Duratuion7
Outside Location7

Outside Position8
Outside Duratuion8
Outside Location8
Outside Position9
Outside Duratuion9
Outside Location9
Outside Position10
Outside Duratuion10
Outside Location10

5.5.6 Functional Hierarchy

The following hierarchy diagram shows the Unocal's system process at a high aggregate level or at a highly detailed level. The employee information database works with these four high level processes.

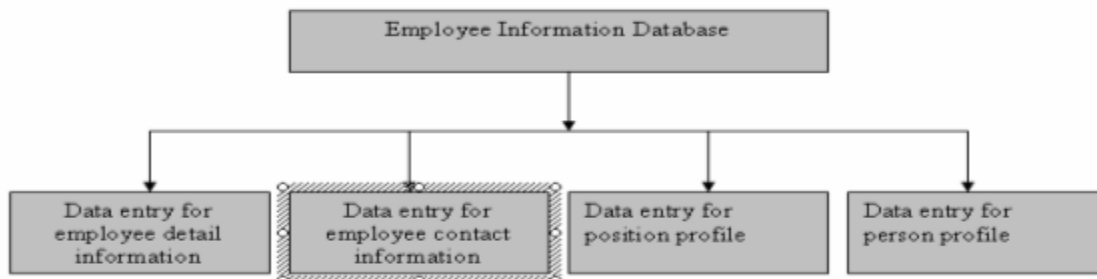


Fig. 5.1 Functional hierarchy diagram of Unocal Bangladesh Employee Information Database

5.6 Structuring System Requirements: Process Modeling [66]

5.6.1 Context diagram of recruitment process provided in APPENDIX-D

5.6.2 Data Flow Diagrams of recruitment process provided in APPENDIX-E

5.6.3 Context diagram of training process provided in APPENDIX-F

5.6.4 Data Flow Diagrams of training process provided in APPENDIX-G

5.6.5 Workflow diagram of recruitment process in Microsoft Office Visio-2003 provided in APPENDIX-H

5.6.6 Workflow diagram of training process in Microsoft Office Visio-2003 provided in APPENDIX-I

5.6.7 Use-Case modeling [67]

5.6.7.1 UML diagram of employee information database system

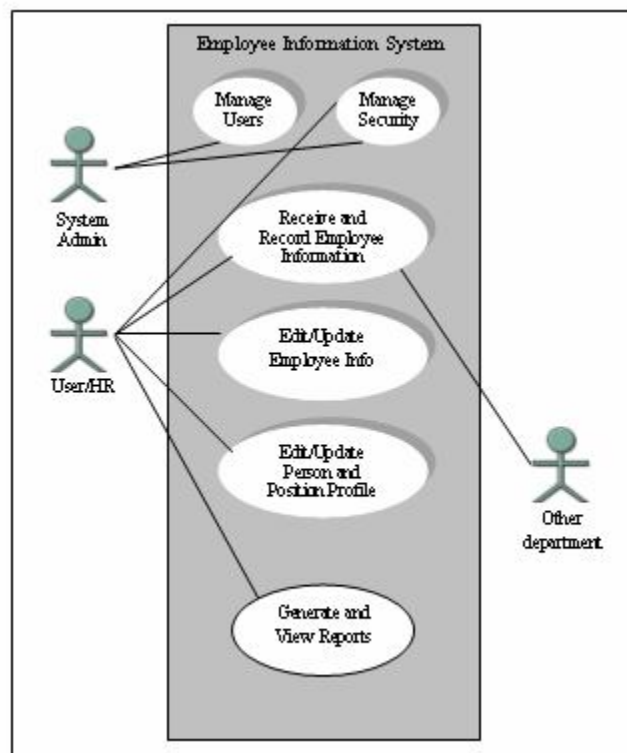


Fig. 5.2 UML Diagram of Employee Information Database System

5.6.7.2 Use-Case description

Here is the use-case descriptions containing all the information needed to build the use-case diagram for Unocal Bangladesh Employee Information Database System [68].

Table 5.5
Description of Manage Users Use-Case

Use case name: Manage Users	ID: 1	Importance level: Medium
Primary actor: System Admin	Use case type: Overview, essential	
Stakeholders and interests: System Admin- wants to create or delete users. User- wants to get login information if necessary.		
Pre-condition: A new user requests to login or a user need to be deleted. Post-condition: A new user successfully logged in or a user successfully deleted		
Main Success Scenario: <ul style="list-style-type: none"> ➤ The new user asks for user name and password to the system admin. ➤ System admin logins to the system. ➤ System admin creates a user account for the user. or <ul style="list-style-type: none"> ➤ A request comes to the system admin for a user deletion. ➤ System admin logins to the system. ➤ System admin deletes that particular user account. 		

Table 5.6
Description of Manage Security Use-Case

Use case name: Manage Security	ID: 2	Importance level: Medium
Primary actor: System Admin User	Use case type: Overview, essential	
Stakeholders and interests: <p>System Admin- wants to change his/her password for security.</p> <p>User- wants to change his/her password for security or wants to know the password that he/ she <u>has</u> forgotten.</p>		
Pre-condition: (i) User account should exist (ii) A password for that account should exist Post-condition: (i) Successfully change his/her password (ii) Know existing forgotten password		
Main Success Scenario: <ul style="list-style-type: none"> ➤ System admin logins to the system. ➤ He/she changes the password by confirming his/her old password. or ➤ A user logins to the system. ➤ He/she changes the password by confirming his/her old password. or ➤ A user requested system admin to know about his forgotten password ➤ System admin finds the password in printed copy or in log file and give it to user 		

Table 5.7
Description of Receive and Record Employee Information Use-Case

Use case name: Receive and Record Employee Information	ID: 3	Importance level: High
Primary actor: User	Use case type: Overview, essential	
Stakeholders and interests:		
<p>User- wants to receive and record employee information.</p> <p>Other- Provide required information</p>		
Pre-condition: Requests employee to provide necessary information		
Post-condition: Employee have provided required information and successfully those information are recorded		
Main Success Scenario		
<ul style="list-style-type: none"> ➤ An employee information has gathered from individual employee file. ➤ User notes down person profile, employee detail info and employee contact info of the employee. ➤ User separately enter data in the employee information database or ➤ A new employee information has gathered ➤ User notes down person profile, employee detail info and employee contact info of the employee. ➤ User separately enter data in the employee information database 		

Table 5.8
Description of Edit/Update Employee Info Use-Case

Use case name: Edit/Update Employee Info	ID: 4	Importance level: High
Primary actor: User	Use case type: Overview, essential	
Stakeholders and interests: User- wants to Edit/Update employee information.		
Pre-condition: User gathers employee information required to update or edit. Post-condition: User has successfully edited/updated information		
Main Success Scenario: <ul style="list-style-type: none"> ➤ User edits an employee information table with additional personal details of the employee by giving necessary entries. ➤ If there is any change in <u>employees</u> data then the table is updated accordingly by the user. ➤ If any employee is no longer valid for the company then his/her information is deleted from the employee information database. 		

Table 5.9
Description of Edit/Update person/position profile Use-Case

Use case name: Edit/Update person and position profile	ID: 5	Importance level: High
Primary actor: User	Use case type: Overview, essential	
Stakeholders and interests: User- wants to Edit/Update person and position profile.		
Pre-condition: User gathers employee's person profile and position profile required to update or edit.		
Post-condition: User has successfully edited/updated person and position profile		
Main Success Scenario: <ul style="list-style-type: none"> ➤ User edits an employee's person profile or position profile with additional personal and positional details of the employee by giving necessary entries. ➤ If there is any change in employee's person profile or position profile then the table is updated accordingly by the user. ➤ If any employee is no longer valid for the company then his/her person profile is deleted from the employee information database. 		

Table 5.10
Description of Generate and View Report Use-Case

Use case name: Generate and View Reports	ID: 6	Importance level: High
Primary actor: User	Use case type: Overview, essential	
Stakeholders and interests: <p style="margin-left: 40px;">User- wants to generate and view report based on employee information.</p> <p style="margin-left: 40px;">Other- wants to view report based on employee information</p>		
Pre-condition: What kind of reports are required should be listed		
Post-condition: Reports are successfully generated and viewed		
Main Success Scenario: <ul style="list-style-type: none"> ➤ User has gone through tables and queries and identified which fields are required to generate desired reports. ➤ User finalizes the design of the reports ➤ User generates reports. ➤ User assigns accessibility to view reports by others 		

5.7 Design Phase

5.7.1 Designing the database

The final database contains four tables. These are listed below

- ✓ Employee Detail Info
- ✓ Employee Contact Info
- ✓ Position Profile
- ✓ Person Profile

Detail Table descriptions of Employees Detail Info is included in next page [66].

Table 5.11
Description of Employee Detail Info table

Table Name: Employees Detail Info	
Description: Stores Employees detail info regarding personal and official matters.	
Fields: Primary key (Employee Name)	
Field Name	Description
Global ID	ID of the Employee. It gives individual identity to the employee in the database
Employee Name	Name of the employee
Title	Organizational designation of the employee
Department Name	Department in which the employee belongs to
Office Location	Location where the employee works
Date of Birth	Records birthday of the employee in mm/dd/yy format
Birthday Month	Month of employee birthday to make report generation for birthday much easier
Age	Age of the employee.
Date of Joining	The date in which the employee begins his/her service in the organization
Date of Retirement	The date in which the employee will end his/her service in the organization
Completed Years of Service	Contains the life time of the employee in the organization

5.7.2 Designing the user interface

The user interface of the final system is designed in standard Windows approach. The main differences between the interface of Access datasheet and the final system are:

- ✓ The final system has text fields for data entry.
- ✓ It uses command buttons to complete most of the tasks.
- ✓ A user-friendly Front End categorizes all the tasks.
- ✓ It uses separate forms to find data.
- ✓ It has a login option as a security feature.
- ✓ A user from other department can only view limited forms and reports and has no access to change the back-end database.

The principles that were kept in mind while designing the front end are:

➤ Layout

The text fields are placed in chronological order and the Person Profile form contains everything about an employee in only one form as desired by the HR Manager of Unocal Bangladesh.

➤ Content awareness

All forms have titles and separate buttons for each task. Each data field has its own label to identify that field.

➤ Aesthetics

Forms have a minimum amount of white spaces and all texts are in the same font. The background of each form is different to make user aware about the forms where to give input

➤ User experience

The forms are user friendly. So, both experienced and non experienced users will feel comfortable to use them. For adding information from Excel file it contains an option to run MS-Excel in the form.

➤ Consistency

All the forms have consistency. Looking at one form of a specific type will give the user an idea about how the other forms will work.

➤ Minimal user effort

Finally the interface is designed in a way that minimizes the amount of effort needed to accomplish tasks. The front end contains separate button to view forms and reports. Also it contains options to mail report and send reports to file. Each form has the option to come back to front end. Only front end contains the button to quit from database.

5.7.3 Descriptions of forms



Fig. 5.3 Front End

While opening the database the user will find a Login option. A user can login to the system as an administrator or as a user with the user name HR and password hrdept. Also the other department's employee can access the database with the user name other and password other. But they don't have all accessibility like HR. A wrong user name or password will display a warning message about wrong user name or password.



Fig. 5.4 Logon

The front end has separate buttons to view the forms where to give input. Also it contains preview report, mail report and sends report to file option. By clicking to a form to give input the user views the followings-

After clicking at the Open Employee Contact Info Form button the user can view

Employee Name	<input type="text" value="A.H.M. Shamsuddin"/>	<input type="button" value="Find Record"/>
Extension No	<input type="text" value="210"/>	
Department name	<input type="text" value="GeoScience & Exploration"/>	<input type="button" value="Go to First Record"/>
Title	<input type="text" value="Chief Geologist"/>	
Address	<input type="text" value="House -5, Road - 112, Flat B/2, Gulshan"/>	<input type="button" value="Go to Last Record"/>
Residence No	<input type="text" value="8811170"/>	
Mobile No	<input type="text" value="0171-538019"/>	<input type="button" value="Go to Next Record"/>
		<input type="button" value="Go to Previous Record"/>
<input type="button" value="Add New Record"/> <input type="button" value="Delete Record"/> <input type="button" value="Save Record"/> <input type="button" value="Close Form"/>		

Fig. 5.5 Employee contact info form

After clicking at the Open Employee Detail Info Form button the user can view

Sl No	<input type="text" value="36"/>	<input type="button" value="Find Record"/>
Employee Name	<input type="text" value="Abdul Mallik"/>	
Title	<input type="text" value="Office Assistant"/>	<input type="button" value="Go to First Record"/>
Department Name	<input type="text" value="HR & Administration"/>	
Office Location	<input type="text" value="Dhaka"/>	<input type="button" value="Go to Last Record"/>
Date of Birth	<input type="text" value="1/2/1950"/>	<input type="button" value="Go to Next Record"/>
Birthday Month	<input type="text" value="January"/>	<input type="button" value="Go to Previous Record"/>
Age	<input type="text" value="55.29"/>	
Date of Joining	<input type="text" value="5/1/1995"/>	
Date of Retirement	<input type="text" value="12/19/2006"/>	
Completed Years of Service	<input type="text" value="9.9"/>	
<input type="button" value="Add New Record"/> <input type="button" value="Delete Record"/> <input type="button" value="Save Record"/> <input type="button" value="Close Form"/>		

Open MS- Excel to Input Date of Birth to Completed Years of Service

Fig. 5.6 Employee detail info form

After clicking at the Open Expatriate Employee Info Form button the user can view

SI No	<input type="text"/>	<input type="button" value="Find Record"/>
Employee Name	Andrew Fawthrop	<input type="button" value="Go to First Record"/>
Title	President and Managing L	<input type="button" value="Go to Last Record"/>
Department Name	Executive	<input type="button" value="Go to Next Record"/>
Office Location	Dhaka	<input type="button" value="Go to Previous Record"/>
Date of Birth	6/19/1952	
Birthday Month	June	
Age	Dhaka	
Date of Joining	3/28/1977	
Date of Retirement	6/5/2009	
Completed Years of service	28.0	
<input type="button" value="Add New Record"/>		<input type="button" value="Delete Record"/>
<input type="button" value="Save Record"/>		<input type="button" value="Close Form"/>

Fig. 5.7 Expatriate employee info form

After clicking at the Want to Preview Report button the user can view

<input type="button" value="Preview Employee Age Grouping Report"/>	<input type="button" value="Preview Employee Service Info Report"/>	<input type="button" value="Preview All Expatriate Employee Info Report"/>
<input type="button" value="Preview Employees Birthday Repoet"/>	<input type="button" value="Preview Employee Birthday and Joining Date Report"/>	<input type="button" value="Preview Employee Service Year Grouping Report"/>
<input type="button" value="Preview Employee Extension Report"/>	<input type="button" value="Preview Employees Personal Contact Info Report"/>	<input type="button" value="Preview Expatriate Completed Years of Service Report"/>
<input type="button" value="Preview Employee Office Info Report"/>	<input type="button" value="Preview Whole Employee Contact Info Report"/>	
<input type="button" value="Preview Employee Retirement Grouping Report"/>	<input type="button" value="Preview Whole Employee Details Report"/>	
		<input type="button" value="Back to Front End"/>

Fig. 5.8 Preview report form

After clicking at the Want to Mail Report button the user can view

The screenshot shows a green background with a grid of buttons. The buttons are arranged in two columns. The first column contains: 'Mail Employee Age Grouping Report' (highlighted with a dashed border), 'Mail Employee Birthday Report', 'Mail Employee Extension Report', 'Mail Employee Office Info Report', and 'Mail Employee Retirement Grouping Report'. The second column contains: 'Mail Employee Service Info Report', 'Mail Employee Service Year Grouping Report', 'Mail Employee Personal Contact Info Report', 'Mail Whole Employee Contact Info Report', and 'Mail whole Employee details Report'. At the bottom center is a button labeled 'Back to Front End' in red text.

Fig. 5.9 Mail report form

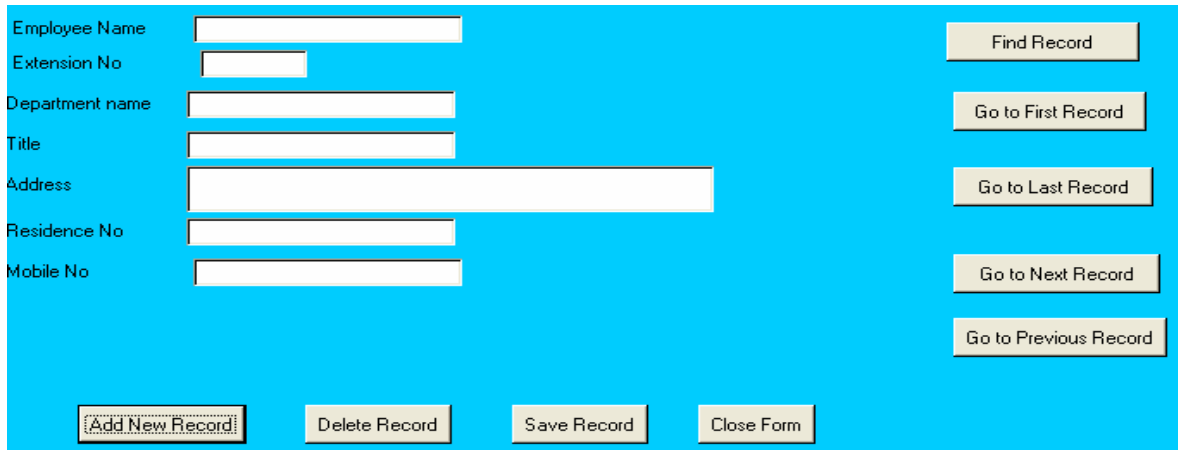
After clicking at the Want to Send Report to File button the user can view

The screenshot shows a yellow background with a grid of buttons. The buttons are arranged in two columns. The first column contains: 'Send Employee Age Grouping Report to File', 'Send Employee Birthday Report to File', 'Send Employee Extension Report to File', 'Send Employee Office Info Report to File', and 'Send Employee Retirement Grouping Report to File'. The second column contains: 'Send Employee Service Info Report to File' (highlighted with a dashed border), 'Send Employee Service Year Grouping Report to File', 'Send Employees Personal Contact Info Report to File', 'Send Whole Employees Contact Info Report to File', and 'Send Whole Employee Details Report to File'. At the bottom center is a button labeled 'Back to Front End' in red text.

Fig. 5.10 Report to file form

5.7.4 Form operations

After clicking at the Add New Record button the user can view blank text box to give user input



The screenshot shows a form with the following fields and buttons:

- Employee Name:
- Extension No:
- Department name:
- Title:
- Address:
- Residence No:
- Mobile No:
- Buttons: Find Record, Go to First Record, Go to Last Record, Go to Next Record, Go to Previous Record, Add New Record, Delete Record, Save Record, Close Form.

Fig. 5.11 Add operation form

After clicking at the Delete Record button the user can view following warning



The screenshot shows the same form as in Fig. 5.11, but with a warning dialog box open. The dialog box is titled "Microsoft Access" and contains the following text:

You are about to delete 1 record(s).
 If you click Yes, you won't be able to undo this Delete operation.
 Are you sure you want to delete these records?

The dialog box has "Yes" and "No" buttons.

Fig. 5.12 Delete operation form

By clicking Yes the data will be deleted and selecting No the option will be cancelled.

After clicking at the Find Record button the user can view following warning

The image shows a data entry form with the following fields and values:

Employee Name	A.H.M. Shamsuddin	Find Record
Extension No	210	
Department name	GeoScience & Exploration	Go to First Record
Title	Chief Geologist	
Address	House -5, Road - 112, Flat B/2, Gulshan	Go to Last Record
Residence No	8811170	
Mobile No	0171-538019	Go to Next Record
		Go to Previous Record

At the bottom left, there are buttons for "Add New Record" and "Delete". A "Find and Replace" dialog box is open in the foreground, showing the "Find" tab. The "Find What" field contains "210". The "Look In" dropdown is set to "Extension No". The "Match" dropdown is set to "Whole Field". The "Search" dropdown is set to "All". There are checkboxes for "Match Case" (unchecked) and "Search Fields As Formatted" (checked). Buttons for "Find Next" and "Cancel" are also visible.

Fig. 5.13 Find operation form

In look in field the user has to mention a field or a whole table to search. The easier way to search is - click at the field that the user want to search then it will be automatically selected in the look in field. The Match field contains three options: Whole field, any part of field and start of field. Any part of field is recommended as it requires writing only a small part of the data. The search field has three options: up, down and all. All is recommended as it will cause search all field. By selecting Find Next the desired data will be found.

The image shows a data entry form with the following fields and values:

Employee Name	Wade Davis(Wade)	Find Record
Extension No	107	
Department name	Drilling	Go to First Record
Title	Drilling Manager	
Address	House-5, Road-4, Baridhara, Dhaka	Go to Last Record
Residence No	8814802	
Mobile No	0171-590310	Go to Next Record
		Go to Previous Record

Buttons: Add New Record, Delete

Find and Replace dialog box:

- Find What: ddfdgfg
- Replace With: samina
- Look In: Employee Name
- Match: Whole Field
- Search: All
- Match Case Search Fields As Formatted
- Buttons: Find Next, Cancel, Replace, Replace All

Fig. 5.14 Replace operation

Replace is used to simultaneously search data. Lastly user can quit from search by clicking cancel.

User has the option to go to First, Last, Next and Previous record by selecting corresponding buttons. By clicking Save button the data will be automatically saved and by clicking Close Form he/she can quit from form operations.

After clicking the Open MS-Excel Button the following will be viewed

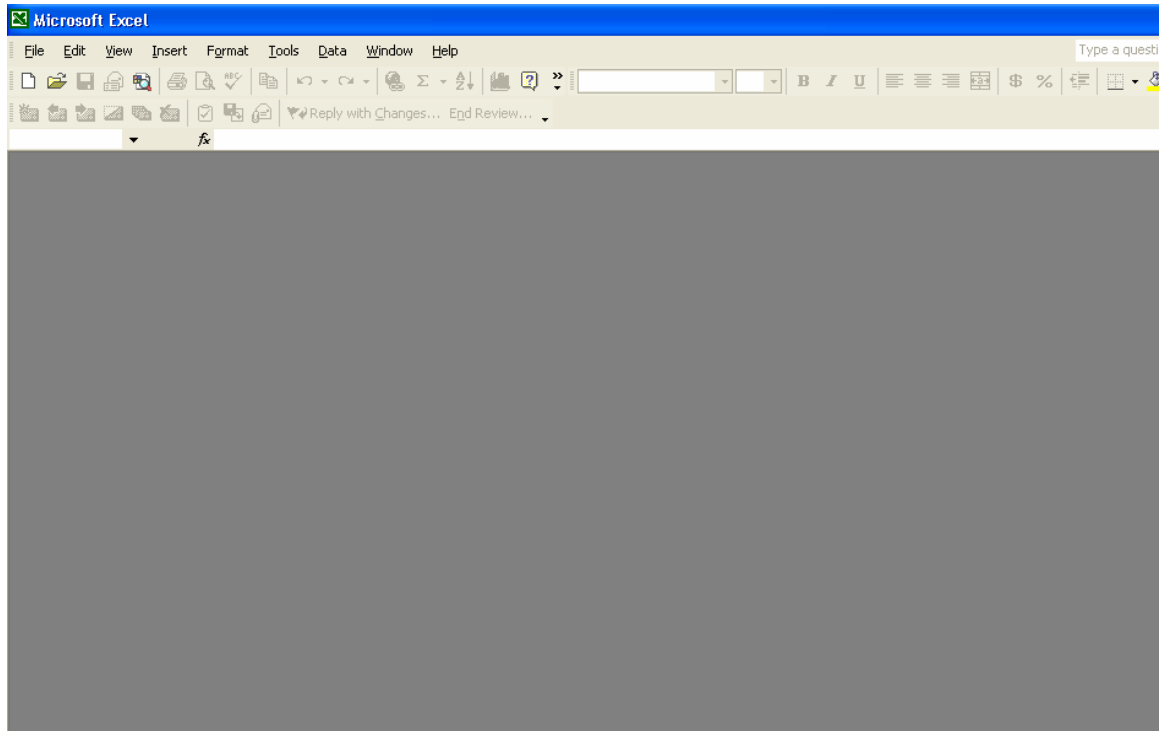


Fig. 5.15 MS-Excel window

5.7.5 Validations in forms

To ensure error free data entry and data retrieval, validations are necessary. Forms that I have used for entering data for the system have some validations. Most of the validations are used to avoid duplicate data entry. Those validations are stated below:

- User can not leave the primary key field Employee Name field blank while saving any record.
- User can not enter same employee name twice.
- User can not save any data with text entry for the fields that use currency values or date or numbers.
- Other department user can not add any information

- Only HR user/ Admin can add and delete user. Also can give permission to users

5.7.6 Report operation

5.7.6.1 Preview report

After clicking at Preview Employee Age grouping Report user can view the following report

Employee Age Grouping					
DepartmentName	Age	Employee Name	Title	Office Location	Date of Birth
Contract, Procurement and Protocol	30.44	Toufiq Ahmed	Contract Administrator	Dhaka	11/1/1974
	36.23	Md. Saiful Alam	Contracts Administrator	Dhaka	12/31/1968
Drilling & Exploration	25.55	Dhee Fakunda Rahma	Team Assistant	Dhaka	9/8/1979
Drilling & Logistics	24.28	Sharifur Rahman	Drilling Engineering Technician	Dhaka	12/9/1980
	30.91	Md. Ehamur Rahim	Logistics Coordinator	Dhaka	4/25/1974

Fig. 5.16 Employee age grouping report

After clicking at Preview Employees Birthday Report user can view the following

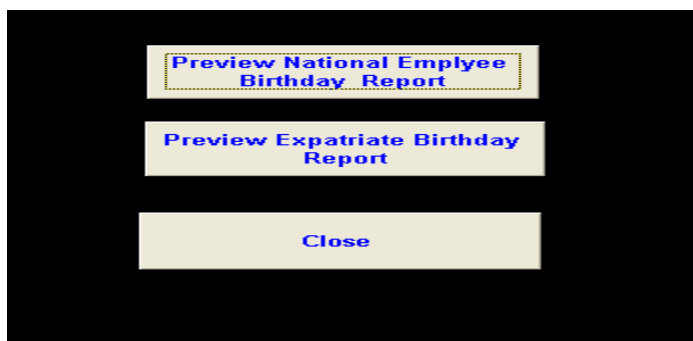


Fig. 5.17 Employee birthday report form

After clicking at Preview National Employee Birthday Report user can view the following

National Employee Birthday Report							
Birthday Month	Date of Birth by Month	Employee Name	Title	Department Name	Office Location	Date of Age Birth	
May	18, 1936	Mugumana Choudhury	Plant Operator	Production Operation	Ona Plant	21/3/1950	54/93
April	02, 1936	Kawa Charya	Comp. Secy	Production Operation	Sylhet	4/2/1956	49/02
	14, 1960	Delwa Hasan	Team Assistant	Operation	Dhaka	4/14/1960	44/95
	22, 1963	Shahid Choudhury	Senior Driver	Operation (Production)	Sylhet	4/22/1963	41/96
	02, 1964	Md. Omar Uddin	Mechanic	Production Operation	Ona Plant	4/2/1964	41/02
	04, 1965	Masuda Saikat	Secretary	Engineering, Maintenance & Production	Dhaka	4/4/1965	59/98
	29, 1967	Md. Nabil Uddin	Senior Secy	ICT	Dhaka	4/29/1967	57/91
	02, 1968	Ali Hassan	Senior Driver	HR & Administration	Dhaka	4/2/1968	56/98
	10, 1969	Jayed Akbar	Senior Driver	Operation (Production)	Sylhet	4/10/1969	55/99
	01, 1970	Md. Saadul Siddique	Senior Driver	HR & Administration	Dhaka	4/1/1970	49/82
	15, 1974	Mohammad Al Faruk	Electrical Technician	Production Operation	Ona Plant	4/15/1974	50/98
	25, 1974	Md. Easwar Rahman	Logistics Coordinator	Shipping & Logistics	Dhaka	4/25/1974	50/91

Fig. 5.18 National employee birthday report

Other buttons can also similarly view reports.

5.7.6.2 Mail Report

In order to mail a report user need to click on the desired report button and the following will be viewed

After clicking at Mail Employee Retirement grouping Report user can view the following

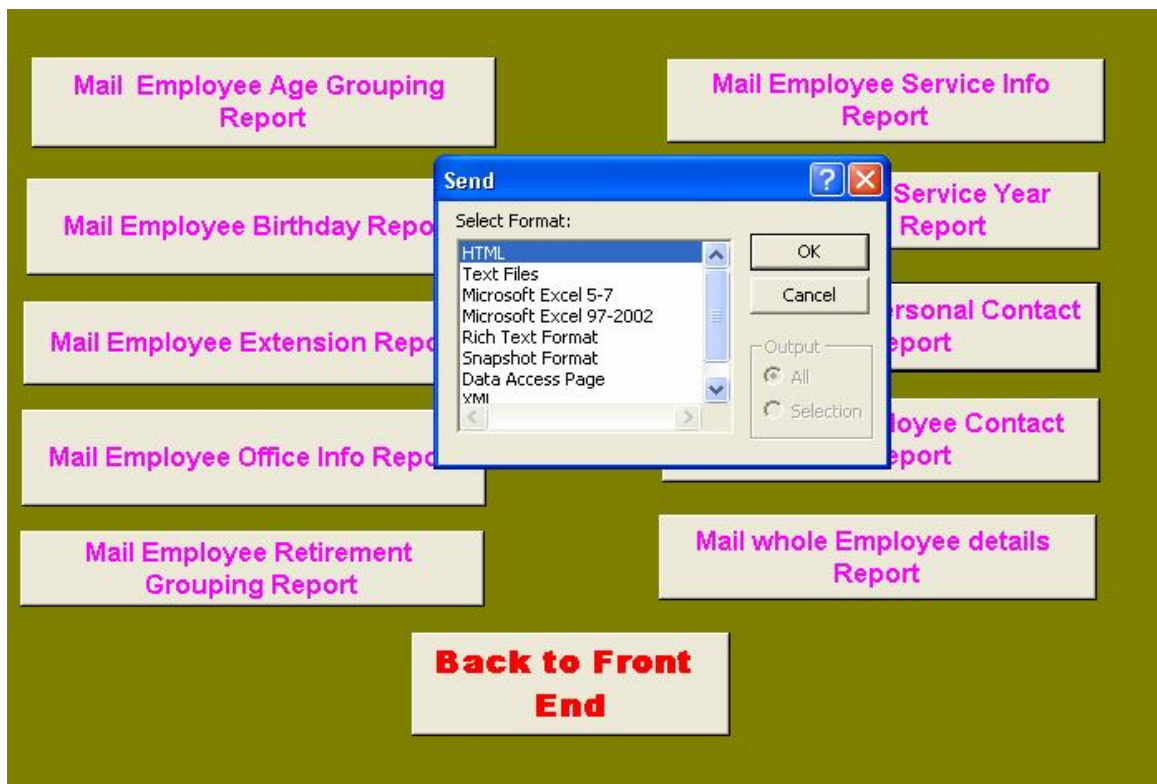


Fig. 5.19 Employee retirement grouping report mailing option

After selecting any one of the format option an outlook email message window will appear. An example is given below

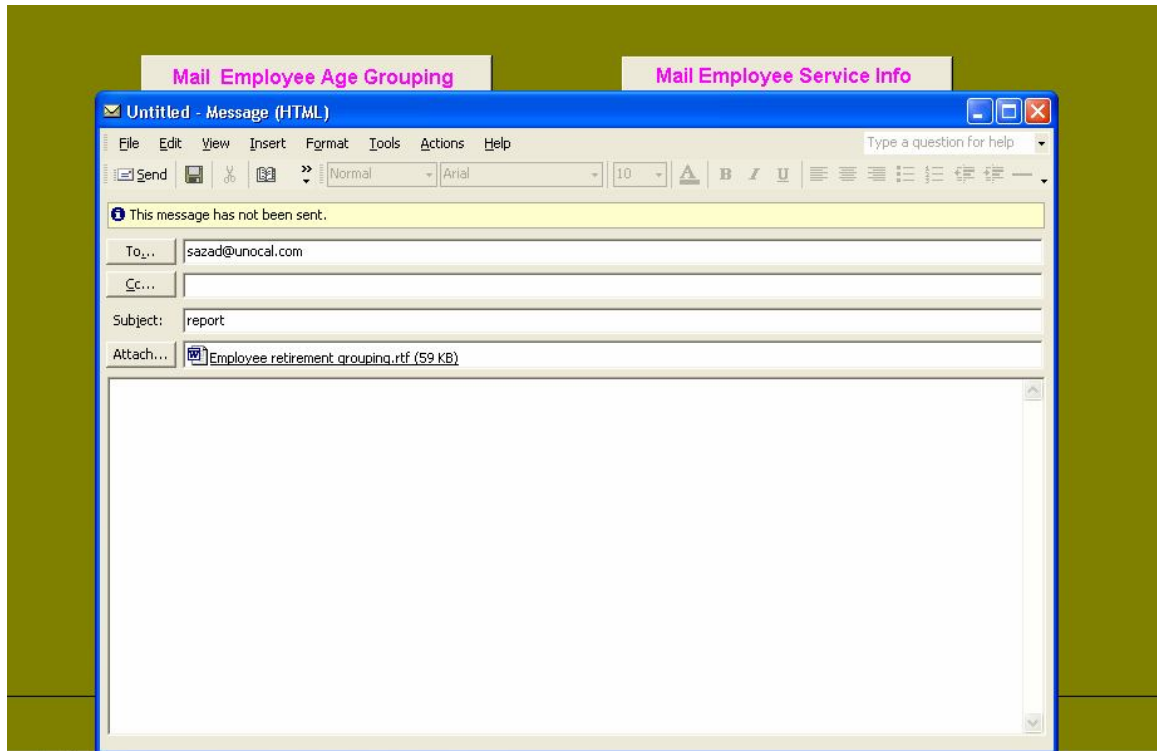
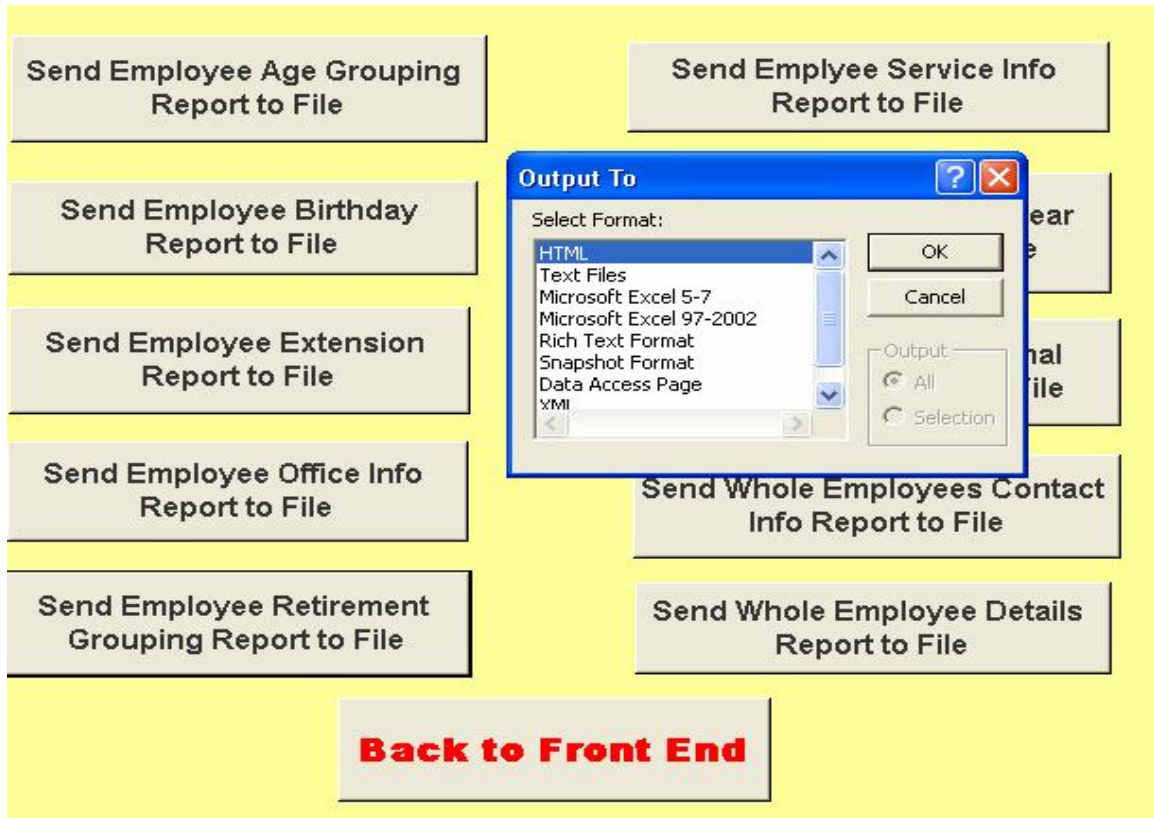


Fig. 5.20 Outlook message window

5.7.6.3 Send report to file

In order to send a report user need to click on the desired report button and the next page contents will be viewed

After clicking at Send Employee Service info Report to file user can view the following



5.21 Send employee service info report to file options

After selecting any one of the format option an window with option to to select desired destination will appear. An example is given in next page.

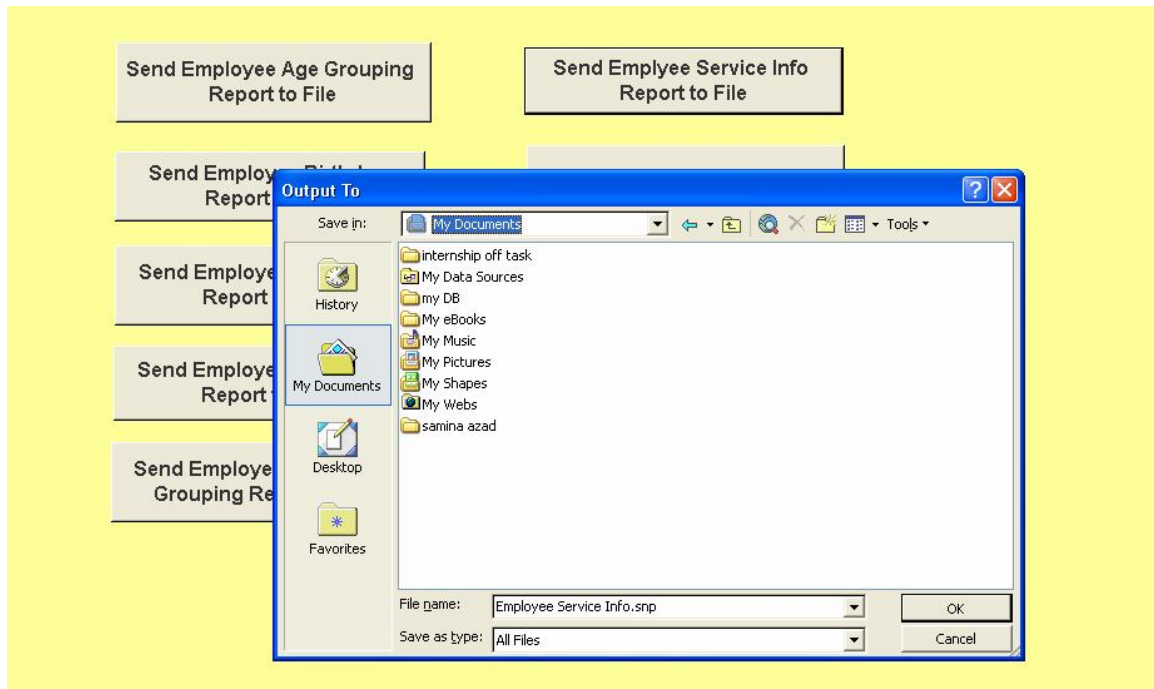


Fig. 5.22 Destination of file options

5.7.7 Quit from data base

By clicking the button want to Quit From database will make a user exit from the database.

5.7.8 Other forms for HR department

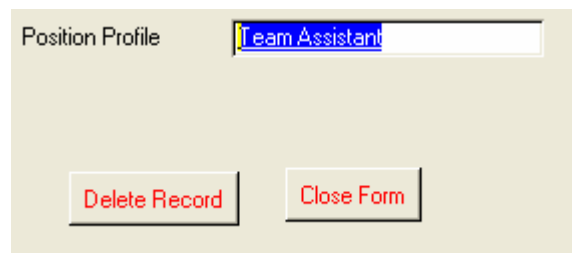


Fig. 5.23 Position profile form

Global ID	5465		
Employee Name	Hasnaine feroze	Photograph	
Position	Team Assistant	See Position Profile	
Salary Grade	B	Bibliography	
Language	Hindi	Introduction	
Department Name	Legal	INVOICE	
		References	
		Team Assistant	Training Education
Date of Joining	1/1/2005	Training Education1	bdjgsk,smx,siopsk;lz,x';ld[p
LAST THREE YEARS PERFORMANCE RATINGS		Training Education2	
Performance Rating1	10	Training Education3	
Performance Rating2	23.3	Training Education4	
Performance Rating3	10.78	Training Education5	
Unocal Career		Unocal Career	
Position1	it:	Position3	
Duration1	ajkhslk	Duration3	
Location1	kk	Location3	
Position2		Position4	
Duration2		Duration4	
Location2		Location4	
Unocal Career		Unocal Career	
Position5		Duration5	
Duration5		Location5	
		Add Record	Delete Record
		Save Record	
		Find Record	First Record
		Last Record	
		Next Record	Previous Record
		Close Form	

Fig. 5.24 Person profile form

After selecting a position profile from the Position Profile combo box the user can view it directly in the Person Profile Form.

Outside Career			
Outside Position1	gjiowi	Outside Position4	
Outside Duration1	4790238-02	Outside Duration4	
Outside Location1	hksjhouosp;	Outside Location4	
Outside Position2	6uihilwi[w[w	Outside Position5	
Outside Duration2	63hj7i8	Outside Duration5	
Outside Location2	xbjkhkks	Outside Location5	
Outside Position3		Outside Position6	
Outside Duration3		Outside Duration6	
Outside Location3		Outside Location6	
Outside Position7			
Outside Duration7			
Outside Location7			
Outside Position8			
Outside Duration8			
Outside Location8			
Outside Position9			
Outside Duration9			
Outside Location9			
Outside Position10			
Outside Duration10			
Outside Location10			

Fig. 5.25 Outside career portion of person profile form

5.7.9 Accessibility of users

HR Admin assigns accessibility of other department users. Other department user can view very few reports and access only contact info form to view. If a other department user tries to view inaccessible reports or add data then message will be provided. Some examples are given in next page-

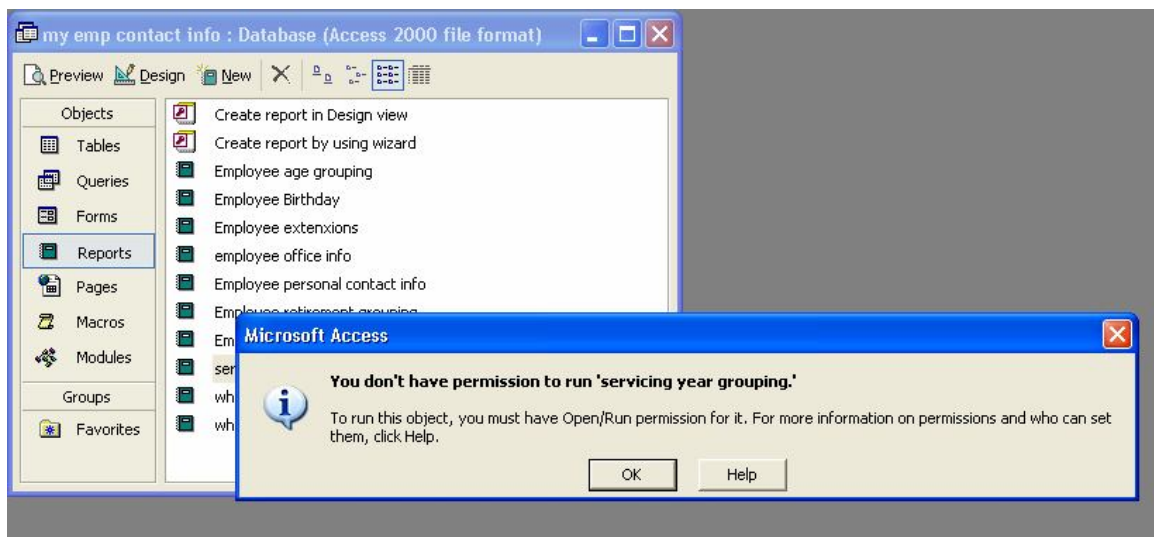
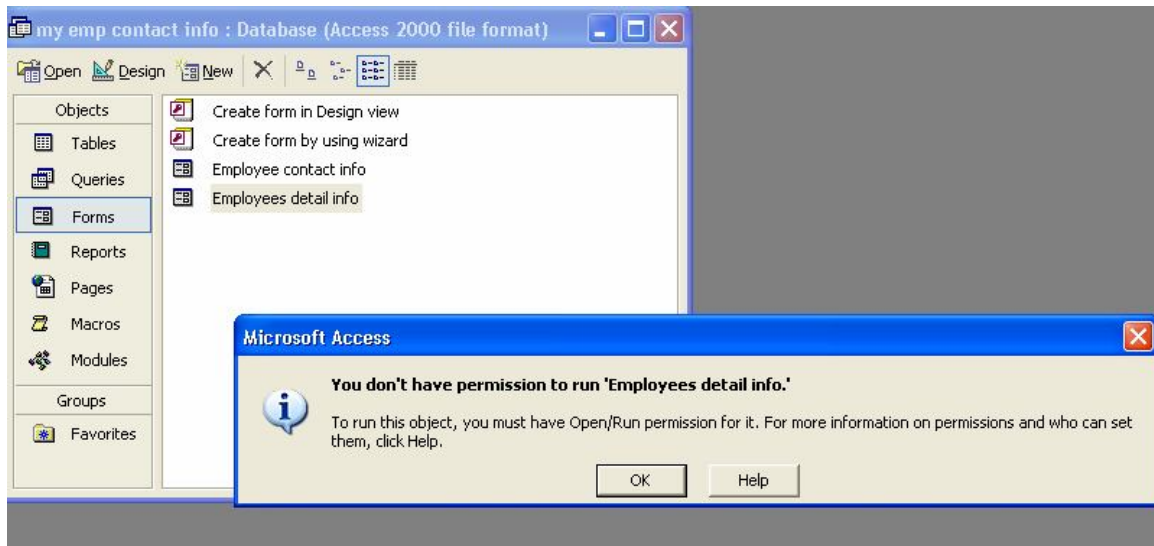


Fig. 5.26 Permission denied for unauthorized user



Fig. 5.27 Permission denied for viewing record

5.7.10 Authentication right

HR/Admin has the following authentication right

- Set database password
- create or modify a work group
- give user/ group permission
- create user and group accounts
- change log-on password
- delete existing user

Some screen shots are given below:

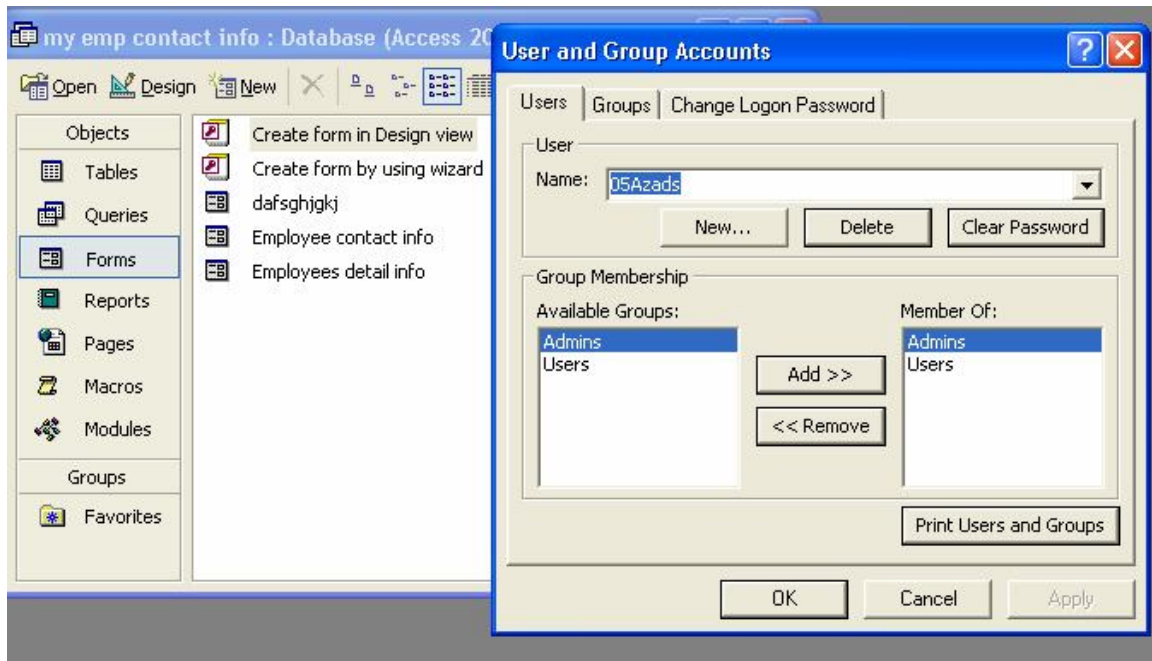


Fig. 5.28 Creation and deletion of user accounts

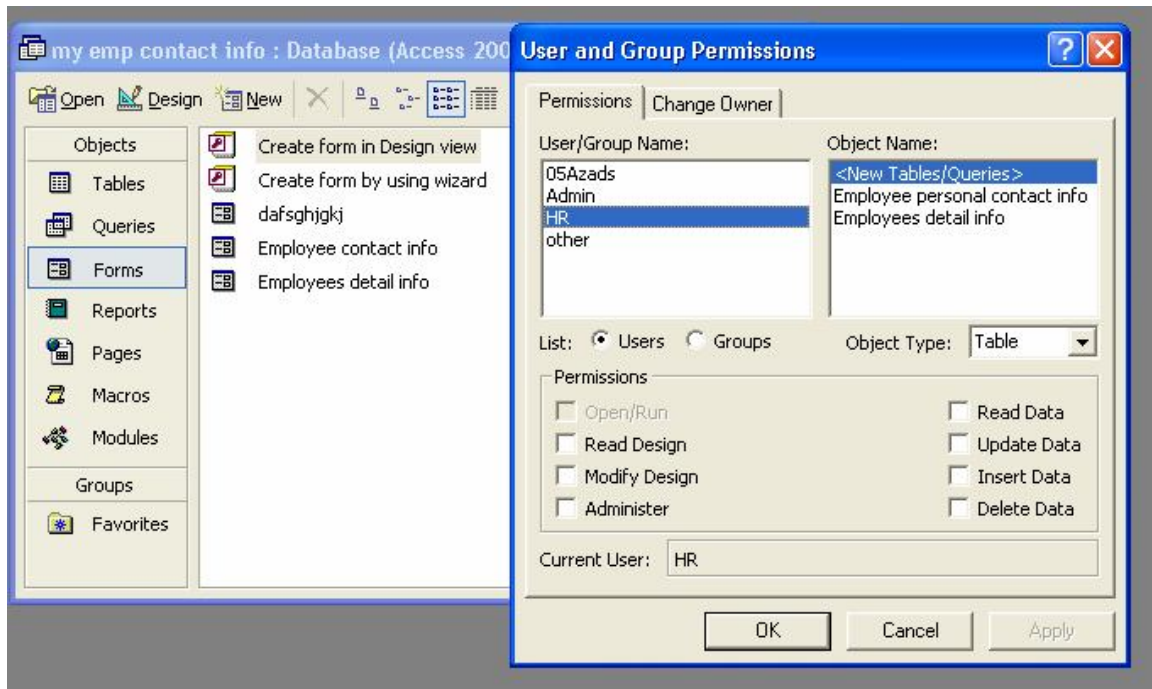


Fig. 5.29 Permission for user and group accounts

5.8 Implementation Phase

5.8.1 Coding and testing

The database design and interface design specification of the to-be system were turned into workable computer code. Both the GUI and the coding will be completed using Microsoft® Visual Basic 6.0 or PHP, dream weaver and mySQL in future. The testing requirements were collected during the analysis phase. At the primary level user testing of the completed system was done by fake data. Later the system testing was carried out using real data. Some inputs, expected outputs and system outputs are shown in next page:

Table 5.12
Testing

Form Name	Text/Numeric Field	Input	Expected Output/Response	System Output/Response
Log-In	User name And Password	HR And hrdept	Successfully enter into the system	Successfully enter into the system
Log-In	User name And Password	HRM And hrdept	Error message about wrong user name	Error message about wrong user name
Log-In	User name And Password	HR And other	Error message about wrong password	Error message about wrong password
Employee Detail Info	Employee Name	Sayeeda Salam	Sayeeda Salam	Sayeeda Salam
Employee Detail Info	Employee Name	Sayeeda Salam (Double entry)	Error message	Error message
Employee Detail Info	Date of Birth	03/01/05	3/1/2005	3/1/2005
Employee Contact Info	Extension No.	Abcd (Text data)	Error message	Error message

5.8.2 Error messages



Fig. 5.30 Error message for wrong user name or password

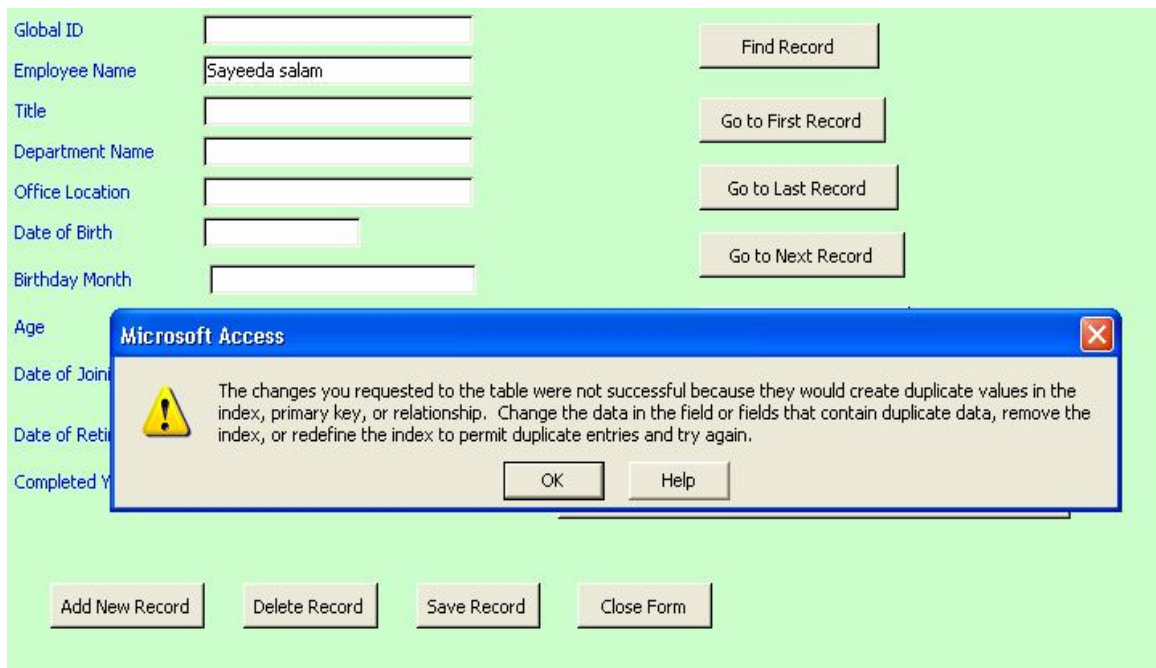


Fig. 5.31 Error message for duplicate entry

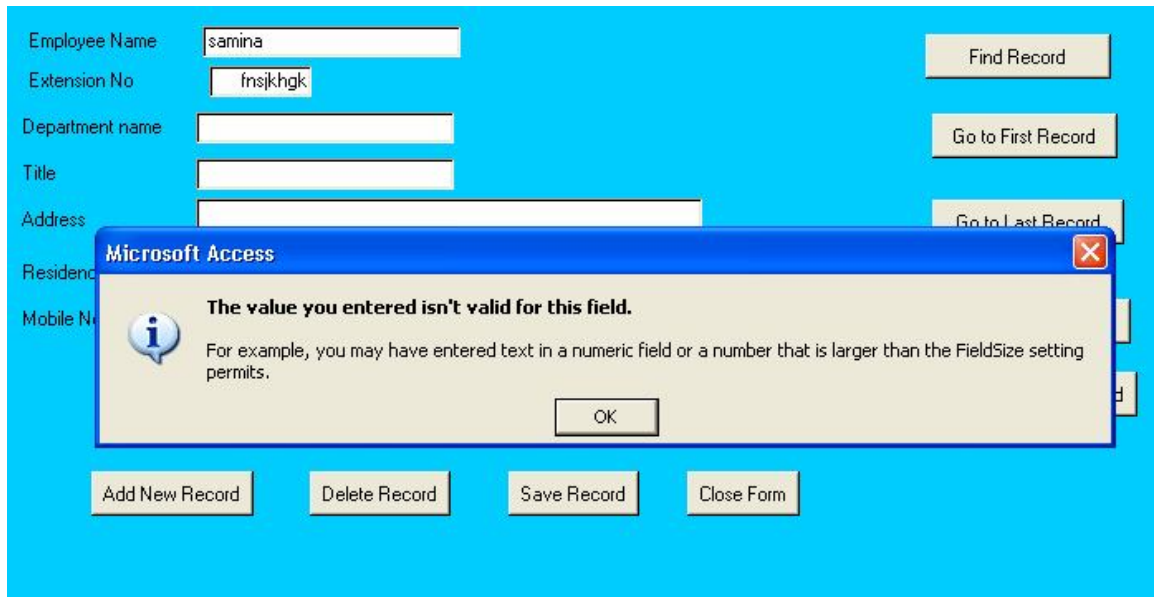


Fig. 5.32 Error message for wrong input that is text input in numeric field

5.9 Strong and Weak Areas of the Demo system

It is really very difficult to implement a System Development Life Cycle and propose a To-Be system within such a short span of time. The demo proposed for Unocal Bangladesh has both strong and weak areas. The strong points of the system are:

- The back-end database stores most of the information that are needed for an employee information system.
- The database is developed using Microsoft® Access which can easily be converted into a SQL or Oracle DBMS.
- HR Intranet based website is in progress so by creating web based forms and SQL or Oracle Database it can be converted in a web based system.
- The software has a login system
 - ✓ This will further improve the security level of the software.

The system has some weak areas also. They are:

- Unwillingness of user to use ORACLE or SQL database.

- Hard to get approvals about bringing a change in technology that are using in the organization.
- The demo databases are created for individual users. So multiple users can not access the system at a time. If a shared drive access can be given then it could be possible.

5.10 End Notes about the Prototype

My prototype ends with a result that better matches actual user needs. The prototype was always a medium of interaction between the users and my understanding about user requirements. This approach made it possible to keep the user requirements stable while the actual implementation of the real system. The prototype also gave users a familiarity about to be interface of the system. It was better that the first effort was a prototype rather than a final deliverable until user requirements become stable. Otherwise the attempt of developing a system will fail to meet user needs probably.

CHAPTER VI

6. RECOMMENDATIONS

6.1 For the Recruitment Process

- ✚ HR department should try to use some web based forms now to make their recruitment process faster.
- ✚ The existing system basically depends on e-mail. To make the process faster they can use the technique like a reminder that they have in Unocal Bangladesh for Town Hall Program
- ✚ Also they can automate the appointment taking procedure by implementing a web based form. That can reduce the burden to go personally or make a phone call to get an appointment. Thus can make the process faster.
- ✚ Performance matrix calculation can be automated also.

6.2 For the Training Process

- ✚ HR department estimate budget first and then go for vendor sourcing. But they should do vendor sourcing first to make their estimation of budget more accurate.

- ✚ Vendor sourcing procedure is a manual process and time consuming. So they can request bids for a particular program. Then based on bids they can select a vendor thus can make the process faster.

6.3 For Workflow Engine

- ✚ Unocal Bangladesh should try first open source Workflow engines as it can be used without any cost.
- ✚ Unocal Bangladesh should apply workflow engine in a small departmental task and then gradually go for whole departmental implementation.
- ✚ To get better maintenance and support Unocal Bangladesh can also select a commercial vendor for workflow engine. As it is an American multinational there standard should be an example for others. SO, they can try for commercial workflow engine
- ✚ Unocal Bangladesh can also use their existing ORACLE application to build a workflow engine. They can implement it by hiring a software firm or by their own IT employees.

6.4 For the Prototype

- ✚ Joint Application Design (JAD) is the most effective technique that should be used in the system development of HR Department as in this process users, managers and analysts work together to specify or review system requirements. The active involvement and participation of the users and managers encourages them to take “ownership” in the project.

- ✚ JAD is also important for the system analyst as the users get the opportunity to interact with the prototype and they feel themselves as a part of the whole development process. Also users get an idea of the to-be system and can understand it much better.

- ✚ In future the Employee Information System can be implemented in a network model by making it web based with a separate backup database server.

- ✚ Also can be able to maintain database log file to recover data loss from any kind of system failure.

- ✚ The coding of the software can be done in a platform free programming language so that it can be run on any operating system.

CHAPTER VII

7. CONCLUSION

7.1 Concluding Remarks

Workflow is an intuitive and powerful paradigm for capturing business processes, reasoning about them, and using process specifications to produce corresponding implementations that are supported by the information systems. However, the scope of solutions provided by WFMS is limited, e.g., they only support document/form/image centered processes and office automation applications. Furthermore, many WFMS products do not support workflows that need functionality and data in different shared systems, do not address efficient system integration and interoperability, and do not ensure the correctness and reliability of workflow execution in the presence of concurrency and failures. Workflow research is also fragmented across multiple disciplines, such as computer-human interaction, imaging, and databases. The lack of interdisciplinary workflow research has delayed establishing a common understanding of different perspectives. For example, database researchers view workflows as information processes and do not consider the human aspects of the business process implementation. On the other hand computer human interaction supports the combination of both to successfully complete a workflow. Since the vision of WFMSs is to support business processes that span entire organizations or multiple organizations, and involve tasks that are performed by human as well as information systems, workflow requires technology involving the integration of technology from all these research areas.

The introduction of workflow management systems delivers return on investment, both at the technical and the business level. The workflow market is still very young. Mature integration platforms such as J2EE and .NET are

available now. Running a WFMS on such a platform really boosts their added value. That is why only recently the workflow systems have been rediscovered. The list of [open source workflow engines](#) and also list of [commercial vendor list for workflow engine](#) indicates variety of tools that are available to bring all the benefits of workflow and business process management. Comparing workflow tools is the hardest challenge today as specifications are not yet mature and no standards have been adopted on a broad scale. But still there are some good workflow management system exists in the market. The companies associated with WFMS concerns about their client. So, open source materials and commercial vendor assistance both are available to clients.

Lastly, I hope I have make people understand at least to some extent about workflow and workflow management system and also tried to provide potential sources to gather these workflow tools. Thus, may be able to stimulate interest of people about workflow.

LIST OF REFERENCES

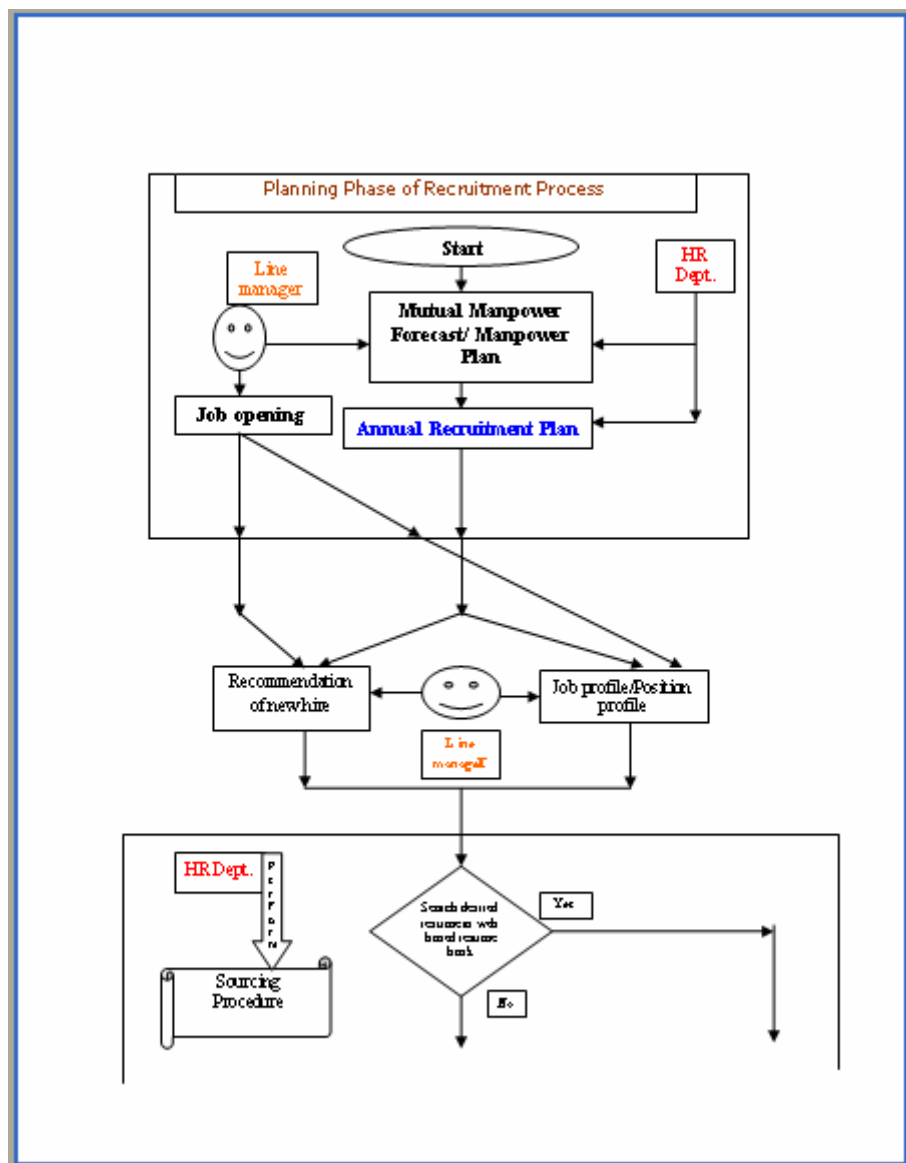
- [1] <http://dhaka/internet/ubl.htm>
- [2] R. Medina-Mora, T. Winograd, and R. Flores, "Action Workflow as the Enterprise Integration Technology," Bulletin of the Technical Committee on Data Engineering, IEEE Computer Society, Vol. 16, No.2, June,1993.
- [3] <http://www.theserverside.com/articles/article.tss?l=Workflow>
- [4] P. Korzeniowski, "Workflow Software Automates Processes," Software Magazine, February, 1993.
- [5] [D. Black, "Workflow Software: A Layman's Handbook, Part I," INFORM, April 1994
- [6] T. Schael and B. Zeller, "Design Principles for Cooperative Office Support Systems in Distributed Process Management," in Support Functionality in the Office Environment, A. Verrijn-Stuart (ed), North Holland,1991.
- [7] R. Alsop, "Workflow Automation Integration Requires A Large Technology Toolkit and A Structured Approach," Computer Technology Review, 1994.
- [8] C. Frye, "Move to Workflow Provokes Business Process Scrutiny," Software Magazine, April, 1994.
- [9] D. Georgakopoulos and M. Hornick, A. Sheth, "An Overview of Workflow Management: From Process Modeling to Workflow Automation Infrastructure", GTE Laboratories Incorporated, 40 Sylvan Road, Waltham, MA 02254, University of Georgia, LSDIS Lab, Department of C.S., 415 GSRC, Athens, GA 30602,Kluwer Academic Publishers, 1995.
- [10] <http://www.mydotweb.com/workflow-software.html>
- [11] <http://www.daimi.au.dk/PetriNets/>
- [12] http://tmitwww.tm.tue.nl/research/patterns/main_conclusions.htm

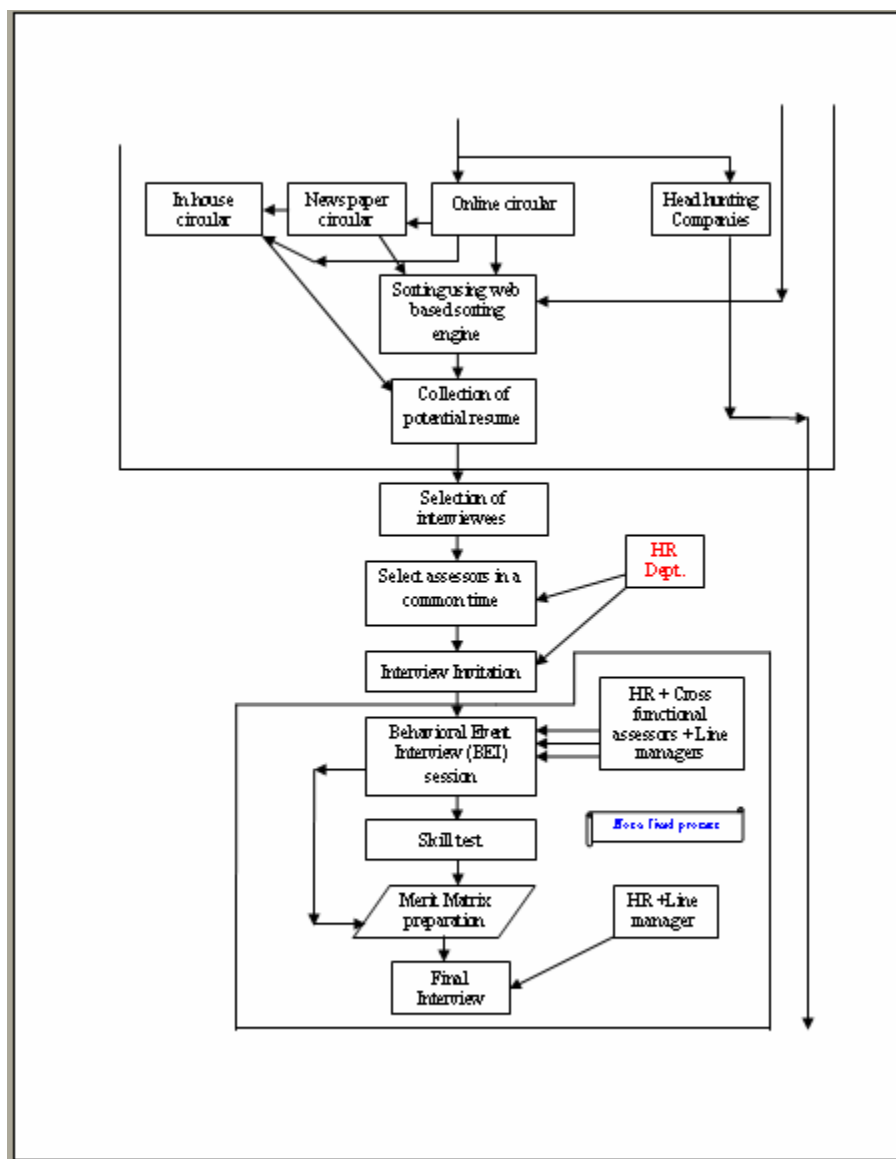
- [13] <http://tmitwww.tn.tue.nl/research/patterns>
- [14] <http://jbpm.org/article.html>
- [15] http://www.manageability.org/blog/stuff/workflow_in_java/view
- [16] <http://www.topicus.nl/topwfm/Tooloverzicht.htm>
- [17] <http://www.jbpm.org/>
- [18] <http://openebxml.sourceforge.net/>
- [19] <http://werkflow.codehaus.org/>
- [20] <http://www.opensymphony.com/osworkflow>
- [21] <http://wfmopen.sourceforge.net/>
- [22] <http://www.ofbiz.org/docs/workflow.html>
- [23] <http://bonita.forge.objectweb.org/>
- [24] <http://www.bigbross.com/bossa/>
- [25] <http://xflow.sourceforge.net/>
- [26] <http://taverna.sourceforge.net/>
- [27] <http://shark.enhydra.org/>
- [28] <http://www.powerfolder.org/>
- [29] <http://www.dstc.edu.au/Research/Projects/Pegamento/Breeze/breeze.html>
- [30] <http://www.openbusinessengine.org/index.html>
- [31] <http://openwfe.sourceforge.net/>
- [32] <http://freefluo.sourceforge.net/>
- [33] <http://www.tripodsoft.com/products/intro.htm>
- [34] <http://www.smartcomps.org/twister/>

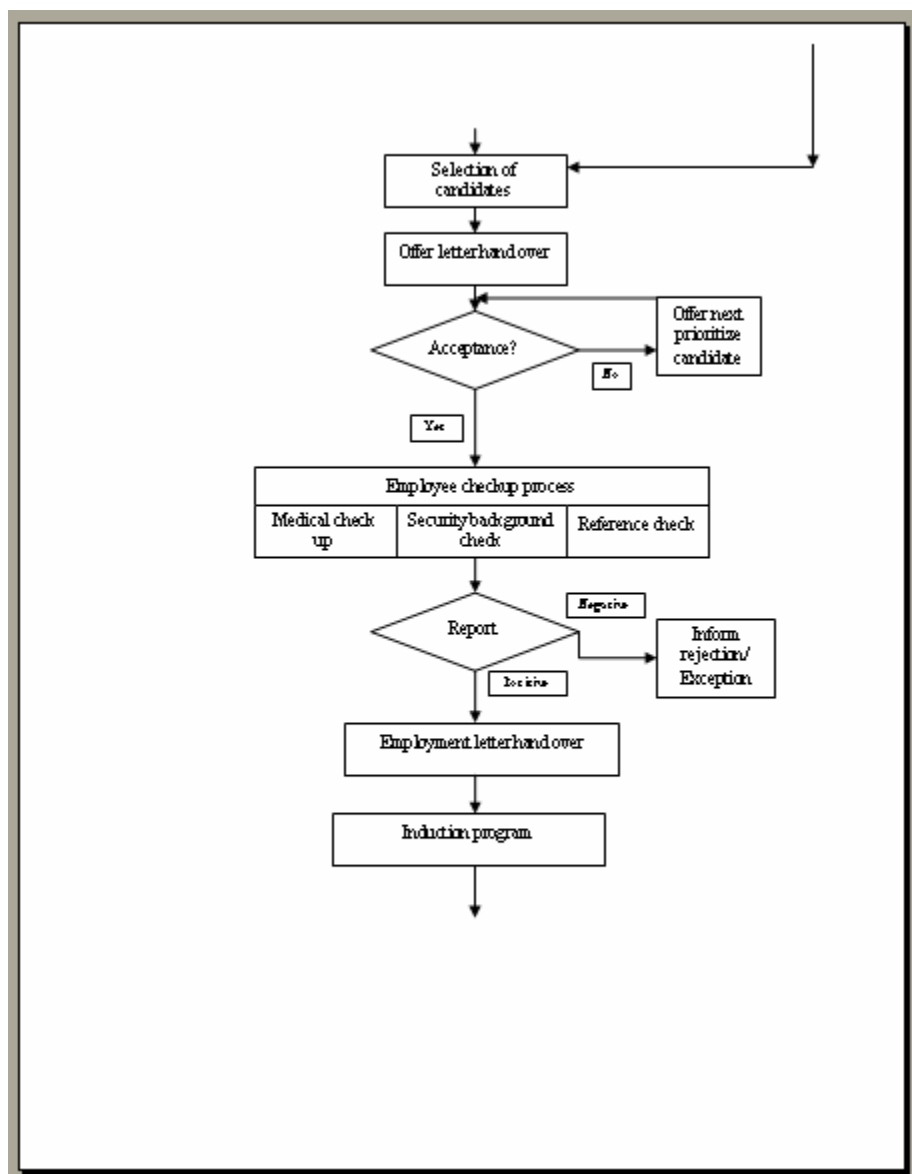
- [35] <http://con-cern.org/>
- [36] http://www.alaska.edu/hr/hractivities/acas/PDF/hr_acas_project_descriptions.pdf
- [37] <http://www.vicidocs.com/viciflow.asp>
- [38] <http://www.vicidocs.com/products.asp>
- [39] <http://www.vicidocs.com/vicierprise.asp>
- [40] <http://www.vicidocs.com/emailsafe.asp>
- [41] <http://www.vicidocs.com/vicivault.asp>
- [42] <http://www.vicidocs.com/vicidocsforms.asp>
- [43] <http://www.vicidocs.com/vicipronto.asp>
- [44] <http://www.vicidocs.com/docretriever.asp>
- [45] http://edocs.bea.com/wlintegration/v2_1/interm/bpmhome.htm
- [46] <http://www.carnot-usa.com/>
- [47] <http://www.dralasoft.com/products/workflow/>
- [48] <http://www.filenet.com/>
- [49] <http://www.fsw.fujitsu.com/products/InterstageSuite/BPM/overview.html>
- [50] <http://www-106.ibm.com/developerworks/ibm/library/i-holo/>
- [51] <http://www.intalio.com/products/index.html>
- [52] <http://www.lombardisoftware.com/>
- [53] <http://oakgrovesystems.com/>
- [54] <http://www.oracle.com/ip/deploy/ias/integration/>
- [55] <http://www.qlinktech.com/>
- [56] <http://www.sap.com/solutions/netweaver/>

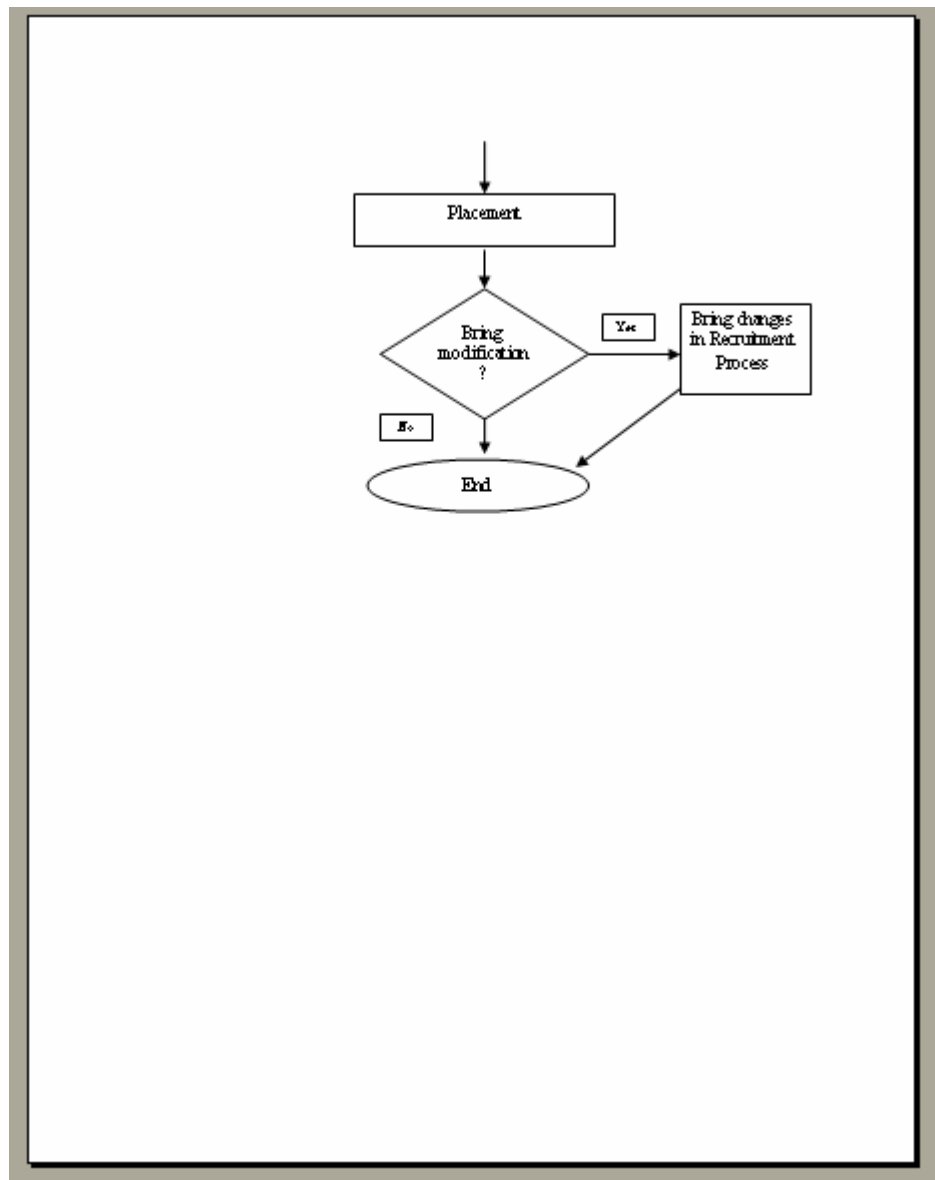
- [57] <http://www.savvion.com/products/>
- [58] http://www.seebeyond.com/products/ICAN_productsEinsight.asp
- [59] http://www.sonicsoftware.com/products/sonic_orchestration_server
- [60] <http://www.staffware.com/products/>
- [61] <http://www.ultimus.com/>
- [62] <http://www.versata.com/products/inSuite/products.html>
- [63] <http://www.webmethods.com/content/1,1107,Model,FF.html>
- [64] [http://sroaug.oaug.org/News/0301/articles/CustomWorkflow.doc.](http://sroaug.oaug.org/News/0301/articles/CustomWorkflow.doc)
- [65] S M Mahbubuzzaman, *System Analysis and Design of Sales Monitoring System, Pathfinder Ltd.*, Undergrade Thesis, Department of Computer science and Engineering, BRAC University, 2005
- [66] Jeffrey A. Hoffer, Joey F. George, Joseph S. Valacich : Modern Systems Analysis & Design, 3rd Edition, 2002.
- [67] Alan Dennis, Barbara Haley Wixom, David Tegarden, *Systems Analysis and Design An Object-Oriented Approach with UML*
- [68] Craig Larman, *Applying UML and Patterns* (2nd Edition)

A.RECRUITMENT PROCESS FLOWCHART

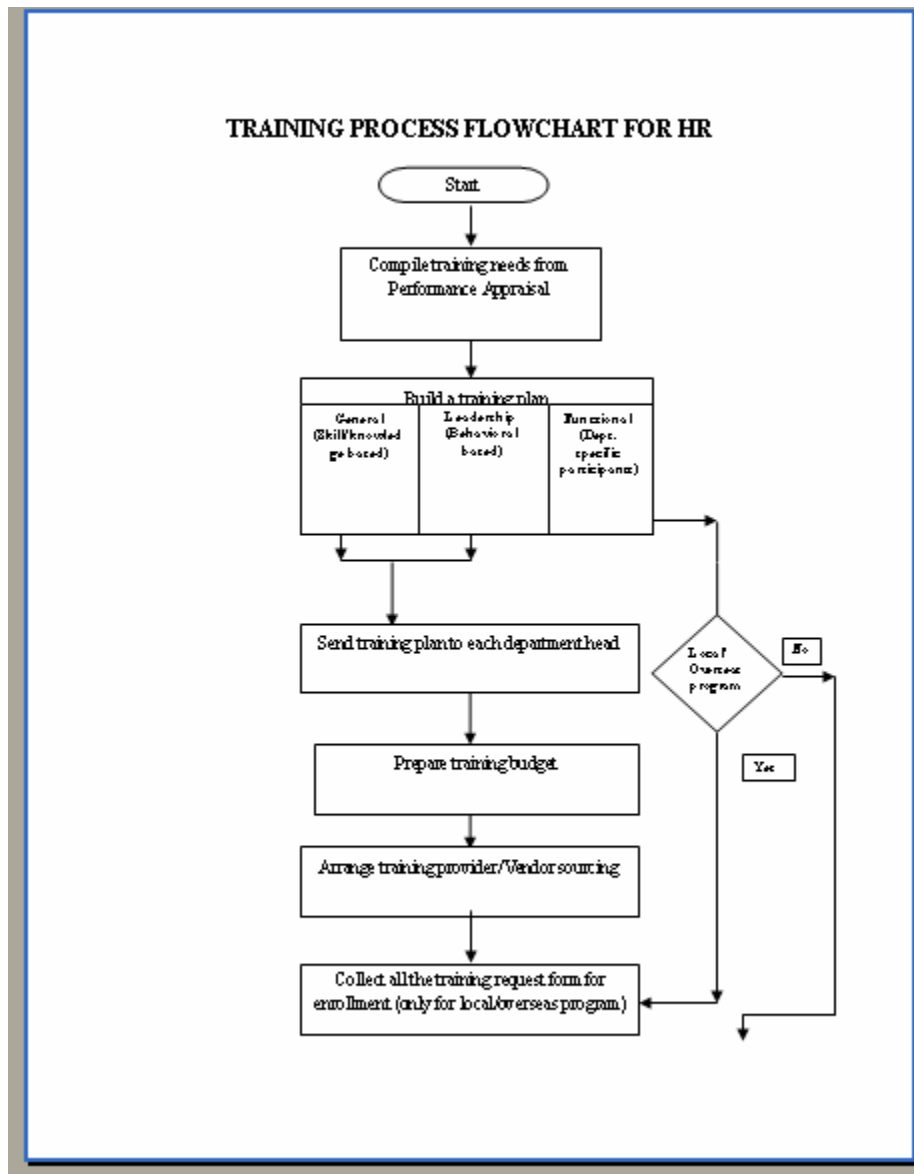


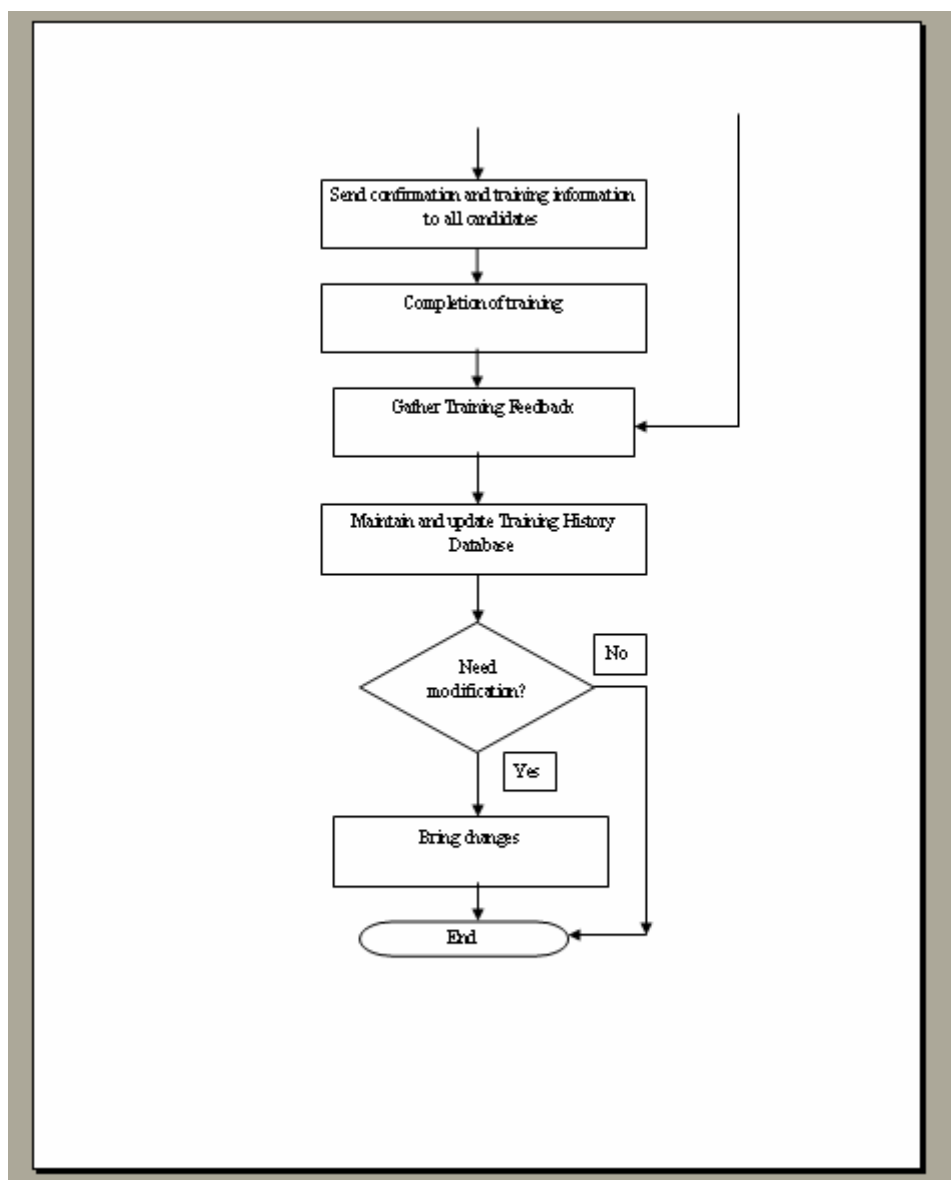






B. TRAINING PROCESS FLOWCHART





C. BUILDING CUSTOM WORKFLOW PROCESSES FOR ORACLE APPLICATIONS 11i

*By Jennifer L. Howard
CIBER Enterprise Solutions*

Introduction

Oracle Applications 11i contains numerous standard workflow processes within various application modules. When a company's specific business needs are not met through these standard workflow processes, a custom solution must be delivered. This paper will document the various steps taken in designing, developing and implementing a custom workflow solution within the Oracle Applications Human Resources module. This includes a Solution Design Phase, Solution Development Phase and a Solution Testing Phase.

Workflow Builder Overview

Oracle's Workflow Builder provides the ability to automate business processes and route information to individuals based on defined rules. Standard Oracle Workflow APIs must be called upon to initiate a workflow process and further workflow activities may be defined through custom PL/SQL stored procedures.

The Workflow Builder graphical tool is used to create new or modify existing workflow activities (see Figure 1.0). The various actions required in a custom workflow process must be dragged and dropped to the process window to create a workflow diagram. Once developed, this process can be saved directly to the database. The Workflow Builder environment is comprised of the following components:

+

Item Type: Grouping of a set of workflow processes and its objects.

Attributes: Components that form the item type (i.e. all data that will be needed throughout the process).

Functions: PL/SQL stored procedures that are either standard Oracle APIs or custom procedures. These procedures will determine the steps taken by the workflow based on user intervention.

Notifications: Activities that send messages within the workflow process.

Messages: Actual message text sent by the notification activities to the end users.

Lookup Types: List of values provided within the messages to enable the user to accept/reject a specified action.

Processes: Diagram of all workflow activities and the relationship/flow between each activity.



Figure 1.0 – Oracle Workflow Builder 2.5 Graphical Tool

Solution Design Phase

Requirements Gathering

The key to a successful implementation is good design. A custom workflow solution must be designed from scratch and therefore, many factors must be considered during the design phase. A key component to the design phase is requirements gathering which will assist in the understanding of all business needs that must be met through the custom workflow process. The following questions may be used as a starting point for gathering workflow process requirements:

What action in the Application environment will trigger the workflow process?

Determine all user or system defined actions which will trigger the workflow process to begin. This will have a direct impact on the integration of a workflow process within the Oracle application module(s) and may require the modification of standard forms. Identify the order in which each activity will occur as well as their result.

What values will be used throughout the workflow process?

Determine all types of data that will be needed and/or manipulated by the workflow process. Once identified, these items will be created as workflow attributes. Examples of values used in typical processes include employee names, employee numbers, data being modified in the system to initiate the workflow, etc.

Are approvals necessary and if so, who will be the approvers?

Identify the approval hierarchy to be used by the workflow process if deemed necessary. Will the request for approval be directed according to the user's HR position hierarchy or will it be through another custom hierarchy? Will there be only one approval request in the workflow process or numerous requests depending on specific criteria? (ex: If the user is from a particular department, an additional salary approval may be necessary).

What form of notification is required?

Determine if the preferred form of notification throughout the workflow process will be email or web based (accessed from within the application). Further configuration and setup to the workflow notification mailer will be necessary if email notifications are required. If web based notifications will be used, determine if the standard Workflow User menu provides enough or too many options. If there are more options than desired, a new menu may have to be designed and assigned to a custom Workflow User responsibility.

What data will be contained within the notifications?

Identify the different types of notifications that will be required in the custom workflow along with all information that will be required in each of these notifications. Examples include notifications to supervisors indicating that their approval is required or notifications to employees to communicate vacation request approvals.

Will reminder notifications be required?

Establish whether reminders must be provided to those in the approval hierarchy if no action is taken on a notification within a certain period of time. If deemed necessary, this will require the addition of timeout values within the workflow process.

What will be the end result(s)?

Determine the result if approval is obtained by all parties involved in the approval hierarchy. Will a field value change in the database? Who will receive notifications that an approval was obtained? What will be the end result if a rejection occurs within the system? Will any of the parties involved receive a notification?

Solution Design

Upon the successful completion of requirements gathering, both a functional and technical design will need to be created. While the functional design will provide an

overview of the business process requirements and workflow capabilities, the technical design will focus on the specific workflow component and logic creation to meet these business needs.

The following sections on solution development and testing will include information that should be contained within the technical design. Identifying all components and their properties, how they relate to one another and the PL/SQL logic required in initiating each of these components is essential.

The custom workflow process outlined in this paper was designed and developed within the Oracle Human Resources module. The workflow process was initiated when a user's classification was changed. An approval for this change was required based on the HR position hierarchy.

Solution Development Phase

Workflow Component Development

After designing the custom workflow process, the many workflow components may be developed. Each event in the workflow process should be identified as a function or notification activity. Functions must then be broken down into those which are standard (may use code from pre-existing workflow processes) or those which are non-standard (requiring custom development).

The following provides examples of components used in the development of a custom Human Resources workflow process:

Item Type

The workflow item type is the top of the workflow builder hierarchy and will contain all components listed below.

Once the internal name of an item type is specified, it cannot be modified. All stored procedures throughout the custom workflow process will refer to this item type internal name.

Attributes

Attributes act as global variables and are created for each data item that will be used within the workflow process. Any information that will be needed for the activities to be processed as well as information that must be communicated to others (sent through the workflow process) should be designated as an attribute.

- Employee Name – The name of the individual to whom the change is made
- Forward to User Name – The name of the individual in the approval hierarchy receiving the notification
- Classification – What the approver needs to know in order to determine to approve/reject the employee's classification change
- Person ID – The ID for each individual involved in the process
- Notification ID – The ID for each notification activity
- Human Resources Department – The department involved in the approval process
- Payroll Department – The department receiving notification at the end of the workflow process
- Employee Number - The employee number of the individual to whom the change is made (used as reference)
- Sequence Value – The unique number identifying the workflow process

Functions

Each Workflow Function in the process represents a step in the workflow that requires source code. The 'Function' property will indicate where the custom code is stored so that it may be executed and the workflow process can continue according to logic contained within. The following stored procedures were developed for the various custom functions:

```

PACKAGE XX_WORKFLOW AUTHID CURRENT_USER IS
  PROCEDURE      StartProcess (ClassificationValue in varchar2,
                             Employee_Number in varchar2, SequenceVal in number,
                             ProcessOwner in varchar2, WorkflowProcess in varchar2
                             default null, itemtype in varchar2 default null);
  FUNCTION       Find_Sequence(itemtype in varchar2) return number;
  FUNCTION       Find_Person(v_employee in varchar2) return number;
  FUNCTION       Find_Employee(v_employee in varchar2) return varchar2;
  PROCEDURE      Get_Approver(itemtype in varchar2, itemkey in varchar2,
                             actid in number, funcmode in varchar2, resultout out
                             varchar2);
  FUNCTION       Get_Supervisor(v_forward_from_username in varchar2,
                             v_person_id in number) return varchar2;
  PROCEDURE      Approve_Classification_Change(itemtype in varchar2,
                             itemkey in varchar2, actid in number, funcmode in varchar2,
                             resultout out varchar2);
  PROCEDURE      Verify_Approval(itemtype in varchar2, itemkey in varchar2,
                             actid in number, funcmode in varchar2, resultout out
                             varchar2);
  PROCEDURE      Set_Flag(itemtype in varchar2, itemkey in varchar2, actid
                             in number, funcmode in varchar2, resultout out varchar2);
END;
```

Start Process – A combination of seeded and custom code to initiate the workflow process

Find Sequence – Custom function to retrieve the next sequence number from a custom sequence used to set the 'item key' which Oracle workflow APIs look to as a unique number to identify each new workflow process.

Find Person – Custom function to find the person id for the individual receiving the change in the system

Find Employee – Custom function to find employee number for the individual receiving the change in the system

Get Supervisor – Custom function to determine a supervisor based on the HR position hierarchy

Approve Classification Change – Custom function to change the value in a flexfield to 'Y' once approval is obtained.

Verify Approval – Custom function to determine if the supervisor is the only approval required (based on dept)

Set Flag – Custom function to set a value in a flexfield to 'N' indicating a workflow is in progress and has not yet obtained approval

The following StartProcess API is an example of code re-use, to ensure that the


```

wf_engine.SetItemAttrText (itemtype => itemtype,
                           itemkey  => itemkey,
                           aname    => 'HR_DEPT',
                           avalue   => 'HR_DEPT');

wf_engine.SetItemAttrText (itemtype => itemtype,
                           itemkey  => itemkey,
                           aname    => 'PAYROLL_DEPT',
                           avalue   => 'PAYROLL_DEPT');

wf_engine.SetItemAttrNumber (itemtype => itemtype,
                             itemkey  => itemkey,
                             aname    => 'PERSON_ID',
                             avalue   => v_person_id);

wf_engine.SetItemOwner    (itemtype => itemtype,
                           itemkey  => itemkey,
                           owner    => ProcessOwner);

wf_engine.StartProcess    (itemtype => itemtype,
                           itemkey  => itemkey);

EXCEPTION WHEN OTHERS THEN
    wf_core.context(xx_workflow, 'StartProcess', itemtype, ProcessOwner);
    RAISE;

END StartProcess;

```

Messages

Message components contain the text that will be sent to specified individuals during the workflow process. A message can prompt the recipient for a response and use the response within the workflow activities to determine the next course of action (see Figures 2.0, 3.0).

Approver Not Found – Indicates no approver found for the user receiving the change

Approve Change – Indicates that a change is awaiting approval

Change Approved – Indicates that the change was approved

Change Rejected – Indicates that the change was rejected

Navigator Control Properties

Message Body Roles Access Result

Internal Name: XX_APPROVE_CLASSIFICATION

Display Name: Approve Classification

Description: Approve Classification

Priority: High

OK Cancel Apply Help

Figure 2.0 – Message Activity

Once the message is defined as shown in Figure 2.0, the message text may be added as illustrated in Figure 3.0. Attribute variables may be added throughout the message body in order to provide adequate information.

Navigator Control Properties

Message Body Roles Access Result

Subject: Classification Change Approval Required

Text Body HTML Body

The following Classification Changes requires your approval:
 Employee Name: &EMPLOYEE_NAME
 New Classification : &CLASSIFICATION_VALUE
 Change input by: &REQUESTOR_USERNAME
 Please either approve or reject this change by selecting the appropriate option below. Thank you.

OK Cancel Apply Help

Figure 3.0 – Message Body

Notifications

Notification activities send messages during the workflow process. A notification activity should be created for each different type of message needed within the process (see Figure 4.0).

No Supervisor Found – Notifies requestor that no supervisor found in position hierarchy

Notify Approval Required – Notifies supervisor that a change requires their approval

Notify Approval Reminder – Notifies supervisor again if no action is taken on first notification within 24 hours

Notify Change Approved – Notifies specified departments that change was approved

Notify Change Rejected – Notifies specified departments that change was rejected

The screenshot shows the 'Navigator Control Properties' dialog box with the 'Activity' tab selected. The fields are as follows:

- Internal Name: NTF_APPROVE_CLASSIFICATION
- Display Name: Notify Classification Approval Required
- Description: Notify approver that classification change needs ap
- Icon: APPROVE.ICO (with a 'Browse' button and a small icon preview)
- Function Name: (empty)
- Function Type: PL/SQL
- Result Type: @@Approval (with an 'Edit' button)
- Message: Approve Classification (with an 'Edit' button)
- Expand Roles

At the bottom of the dialog are buttons for OK, Cancel, Apply, and Help.

Figure 4.0 – Notification Activity

If notification reminders are necessary, the frequency for receiving these notifications must be determined. There are two methods used to create a 'timeout' value that will determine the frequency by which a notification will be resent.

The first involves creating an additional attribute of type Number with a value specified in minutes that will determine how often the notification should be resent. Once this attribute has been created, select the notification in the process diagram and open its property sheet. Choose the Node tab and set the Timeout Type to 'Item Attribute' and the value to the name of the additional attribute created for this purpose (see Figure 5.0).

The second method does not require an additional attribute. Select the notification in the process diagram and open its property sheet. Choose the Node tab and set the Timeout

The screenshot shows the 'Navigator Control Properties' dialog box with the 'Node' tab selected. The 'Label' field contains 'NTF_APPROVE_CLASSIFICATION'. The 'Start/End' dropdown is set to 'Normal'. The 'Comment' field is empty. In the 'Timeout' section, the 'Type' dropdown is set to 'Item Attribute' and the 'Value' dropdown is set to 'Timeout value'. The 'Priority' section has 'Type' set to 'Constant' and 'Value' set to 'High'. The 'Performer' section has 'Type' set to 'Item Attribute' and 'Value' set to 'Forward To Display Name'. At the bottom are buttons for 'OK', 'Cancel', 'Apply', and 'Help'.

Type to 'Relative Time' and the value to the hours, minutes or seconds desired (see Figure 6.0).

Figure 5.0 - Timeout Value for Notification Activity set to Item Attribute

Setting a timeout value will cause the workflow process to keep sending reminder notifications to the approver if they do not respond within the amount of time specified. (**exist in the organization**)

The screenshot shows the 'Navigator Control Properties' dialog box with the 'Node' tab selected. The 'Label' field contains 'NTF_APPROVE_CLASSIFICATION'. The 'Start/End' dropdown is set to 'Normal'. The 'Comment' field is empty. In the 'Timeout' section, the 'Type' dropdown is set to 'Relative Time' and the 'Value' field is set to '1 days', '0 hours', and '0 Minutes'. The 'Priority' section has 'Type' set to 'Constant' and 'Value' set to 'High'. The 'Performer' section has 'Type' set to 'Item Attribute' and 'Value' set to 'Forward To Display Name'. At the bottom are buttons for 'OK', 'Cancel', 'Apply', and 'Help'.

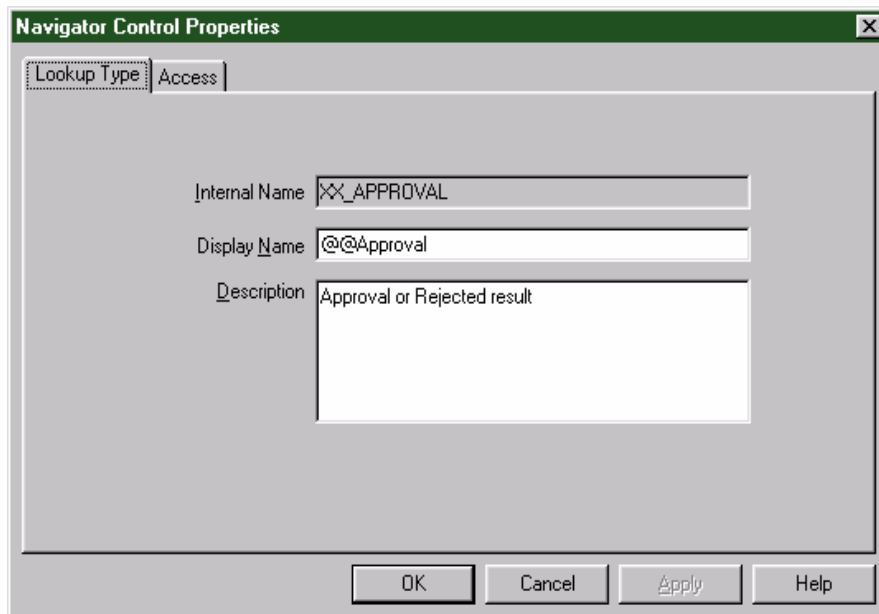
Figure 6.0 – Timeout Value for Notification Activity set to Relative Time

Lookup Types

A Lookup type contains a list of values that may be used by workflow activities. Lookup types are commonly used within message to provide the recipient a list of values from which to choose when prompted for a response (see Figure 7.0). Each value from the list of values will be created as a *lookup code* (see Figure 8.0).

Approval Lookup Type – Provides the user with the following choices in the notification from which to choose:

- a. Approve
- b. Reject



The screenshot shows a dialog box titled "Navigator Control Properties" with a close button in the top right corner. The dialog has two tabs: "Lookup Type" (selected) and "Access". The "Lookup Type" tab contains three text input fields: "Internal Name" with the value "XX_APPROVAL", "Display Name" with the value "@@Approval", and "Description" with the value "Approval or Rejected result". At the bottom of the dialog are four buttons: "OK", "Cancel", "Apply", and "Help".

Figure 7.0 – Lookup Type

To create a lookup code for the lookup type above, right-click on the *Approval* lookup type and select *New Lookup Code* from the options.

The image shows a dialog box titled "Navigator Control Properties". At the top left, there is a field labeled "Lookup Code". Below this, there are four rows of input fields:

- Lookup Type: @@Approval
- Internal Name: REJECTED
- Display Name: Rejected
- Description: Rejected result

At the bottom of the dialog, there are four buttons: OK, Cancel, Apply, and Help.

Figure 8.0 – Lookup Code Value

Processes

The workflow process provides a visual representation of all activities needed for a workflow to complete and the order in which they must occur. The process diagram may be completed by simply dragging and dropping the various Workflow Builder components in the Navigator Window (attributes, notifications, messages, functions, etc.) or by using the Quick Start Wizard tool (see Figure 9.0).

Each seeded workflow process is initiated with a call to the standard Oracle API entitled 'StartProcess'. When developing custom workflow solutions, this standard API should be copied and used in a new package with additional logic. The API uses calls to the seeded wf_engine and wf_directory packages and procedures to initiate the process and all attributes. For these reasons, it is essential to keep the seeded logic in this procedure. An example of a customized 'StartProcess' PL/SQL stored procedure is provided under the *Functions* section of this paper.

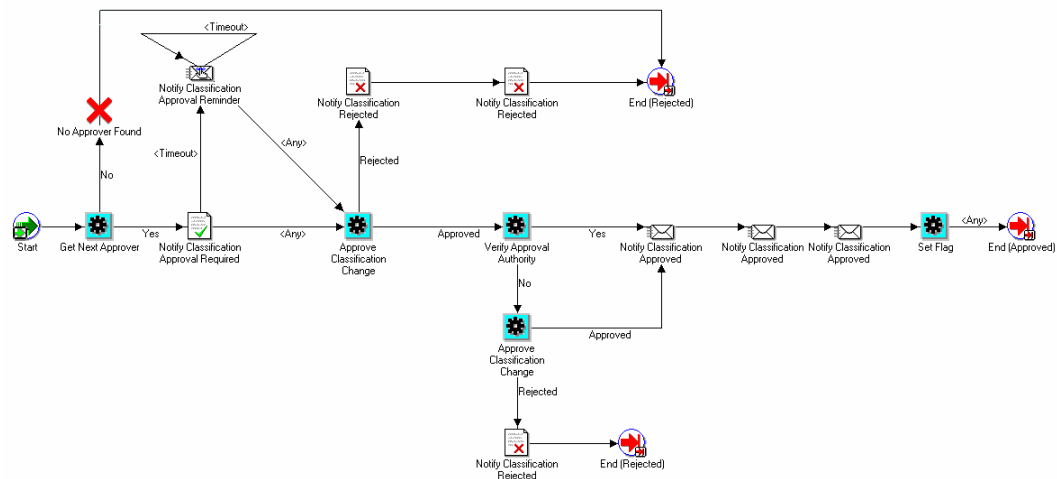


Figure 9.0 – Workflow Process

Key Workflow Tables/Views

Numerous Oracle tables and views are accessed during a workflow process and a full listing may be found in the *Workflow Technical Reference Guide*. Key Oracle Workflow tables and views have been listed below along with a description of the data stored within each object.

WF_ACTIVITIES - Activities (processes, notifications, functions) which are included in a workflow process

WF_ITEMS - Workflow processes

WF_ITEM_ACTIVITY_STATUSES - Workflow process activity results and error information

WF_ITEM_ATTRIBUTES - Item attribute definitions

WF_LOOKUPS - Workflow lookups

WF_LOOKUP_TYPES - Workflow lookup types

WF_MESSAGES - Messages which are sent as notifications

WF_MESSAGE_ATTRIBUTES - Message attributes (additional information to be sent to or received from an individual via notifications)

WF_NOTIFICATIONS - Sent messages

WF_NOTIFICATION_ATTRIBUTES - Sent message attributes

WF_ROLES - Roles of users from HR tables

WF_USERS - Users from HR tables

WF_USER_ROLES - Users and their corresponding roles from HR tables

Solution Integration

Once developed, the custom workflow process may be integrated into the Oracle Applications 11i environment. Based on information received during the design phase, the workflow process will begin when specific actions occur. The Oracle forms that enable this user action must be identified to allow for insertion of custom code to call the workflow process.

The custom workflow outlined in this paper was triggered upon entering a new value in the employee classification field on the People – Enter and Maintain form in the HRMS module. The form was identified and the call to a custom launch_workflow procedure was called from an item level trigger. This procedure was used to initialize variables and call the StartProcess workflow API.

The following is the Form Trigger Source Code:

```
xx_workflow.launch_workflow('WHEN-VALIDATE-ITEM',
:ctl_assgt.employee_number, :assgt.employment_category_meaning);
```

Below is the actual Program Unit Source Code for the package:

```
PACKAGE BODY xx_workflow IS

PROCEDURE launch_workflow(event VARCHAR2, v_employee_number VARCHAR2, v
      v_classification VARCHAR2) IS
sequenceval    NUMBER(15)    := 0;
owner          VARCHAR2(30)  := '';
proc          VARCHAR2(30)   := 'WorkflowProcess';
v_type        VARCHAR2(30)   := 'XXWF';

BEGIN
  IF event = 'WHEN-VALIDATE-ITEM' THEN
      xx_workflow.StartProcess(v_classification, v_employee_number,
          sequenceval, owner, proc, v_type);
  END IF;
END launch_workflow;

END;
```

Solution Testing Phase

Workflow Process Testing

Upon launching the custom workflow process, it is necessary to test the entire process to ensure that it runs without error. The appropriate individuals will need to be given Workflow Administrator responsibility in the system to monitor all workflow processes. However, during development, the seeded Workflow Administrator responsibility should be assigned to all involved in developing custom workflow processes. In addition, the Workflow Administrator setting under the Workflow – Global Preferences tab should be set to * to allow all those using this responsibility to perform any tasks from the menu options. This setting may be updated by logging into the Application as SYSADMIN and then selecting the Workflow – Global Preferences options from the main menu.

Once this has been set and the Workflow Administrator responsibility has been assigned, the user may log in as the Administrator and choose the 'Launch Processes' option from the menu. A list of all workflow processes stored in the database will be displayed (see Figure 10.0). Upon selecting the appropriate process, the user will be prompted to enter all data required in order to launch the workflow process. This data will eventually be passed programmatically to the workflow process from within the application (through Oracle Forms variables). However, for testing purposes, the information can be manually entered from the Launch Workflow screen in order to start the desired process and test the various components prior to embedding the workflow process within the Oracle Applications 11i environment.

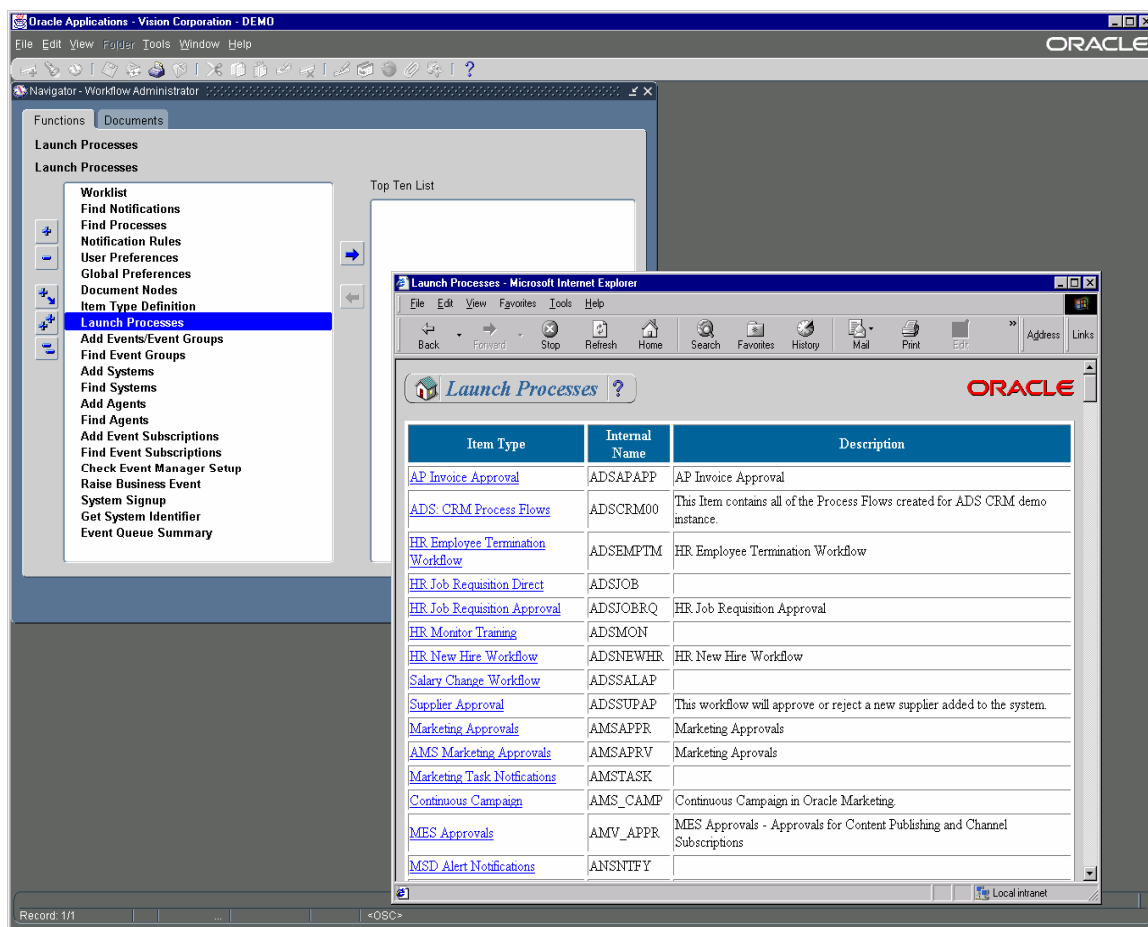


Figure 10.0 – Workflow Administrator ‘Launch Processes’ Option

Once launched, the workflow process will enter the approval hierarchy according to the process diagram and the corresponding custom approval procedure(s). In order to ensure that notifications are reaching the correct approver(s), it may be necessary to create a user name for the approvers and assign the Workflow User responsibility so that the ‘Worklist’ may be viewed and appropriate action can be taken on the notification. If email notifications are to be used in place of web notifications, all email notifications during the testing phase may be sent to one account.

To troubleshoot problems, the launched workflow process diagram may be viewed. This diagram will indicate errors at any point in the process. To view a specific workflow process diagram, select the ‘Find Processes’ option from the Workflow Administrator responsibility. A listing of all processes with their corresponding status’ (active, completed, etc) will be displayed (see Figure 11.0).

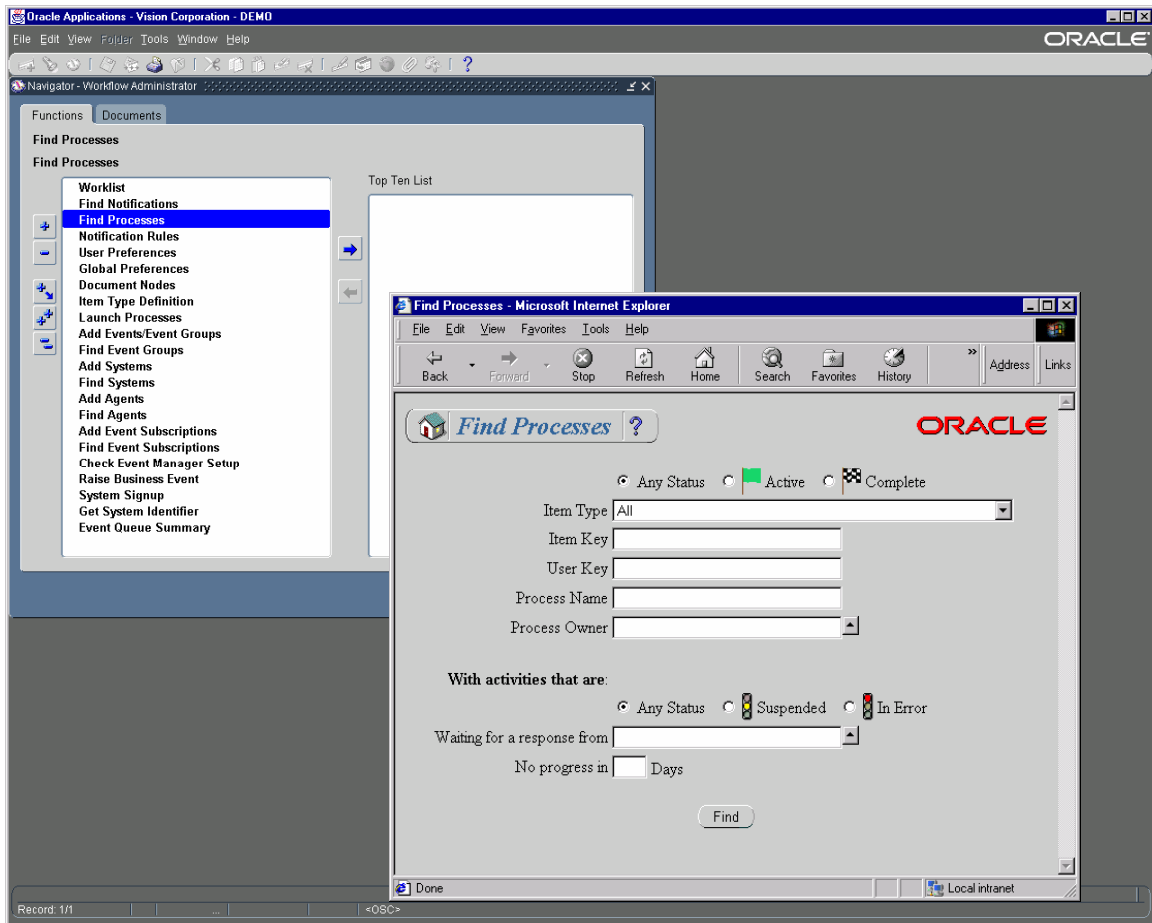


Figure 11.0 – Workflow Administrator ‘Find Processes’ Option

Conclusion

The Workflow Builder 2.5 tool is easy to use, and its graphical user interface makes development a more enjoyable experience. The power of this tool is immense and the customization opportunities are endless.

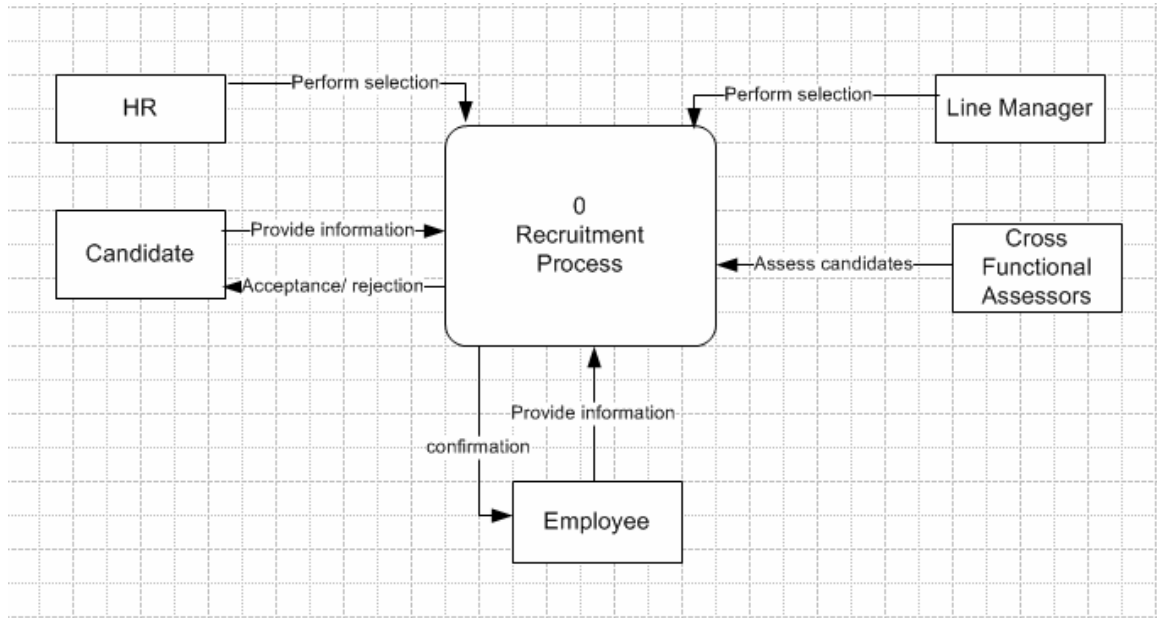
When modifying existing workflow processes, it is essential to read the Customization Guidelines in the *Workflow User’s Guide* to ensure that the workflow process will continue to be supported after all customizations are completed. Custom workflow processes should adhere to API format standards. The documentation on these standards can also be found within the User’s Guide.

Further details on customizing and modifying existing workflow processes may also be found in the *Workflow Technical Reference Guide*.

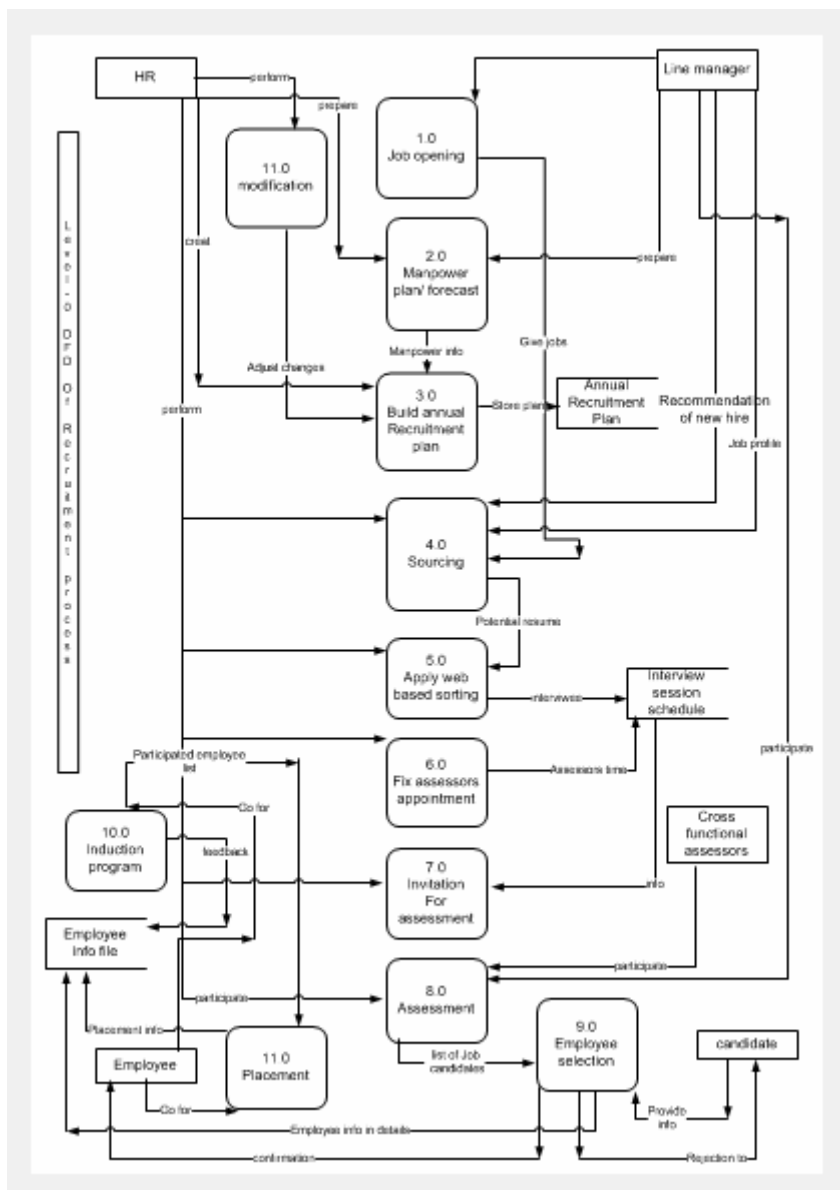
About the Author

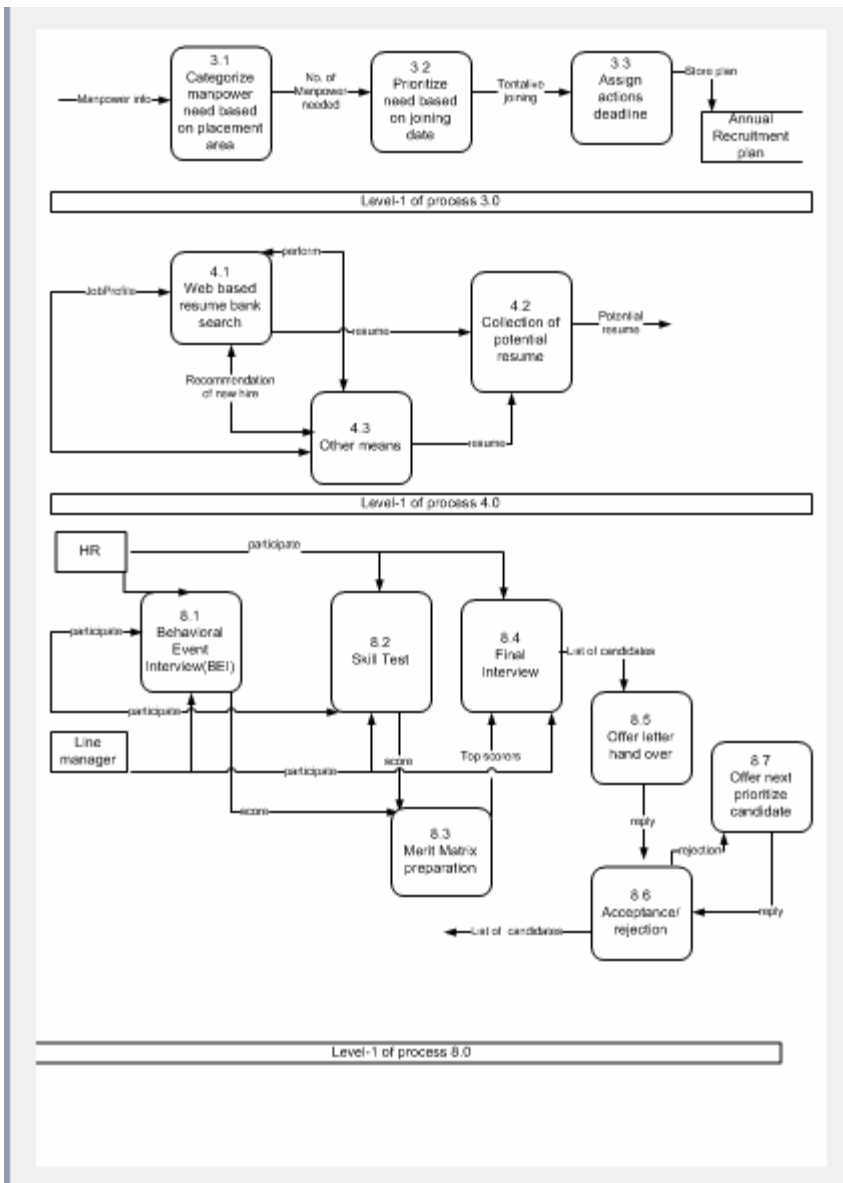
Jennifer Howard is a Senior Consultant for CIBER Enterprise Solutions. She specializes in the development of end-user specified customizations to Oracle's eBusiness Suite. She has been working with Oracle tools and PL/SQL for over two years. She can be reached at jhoward@ciber.com.

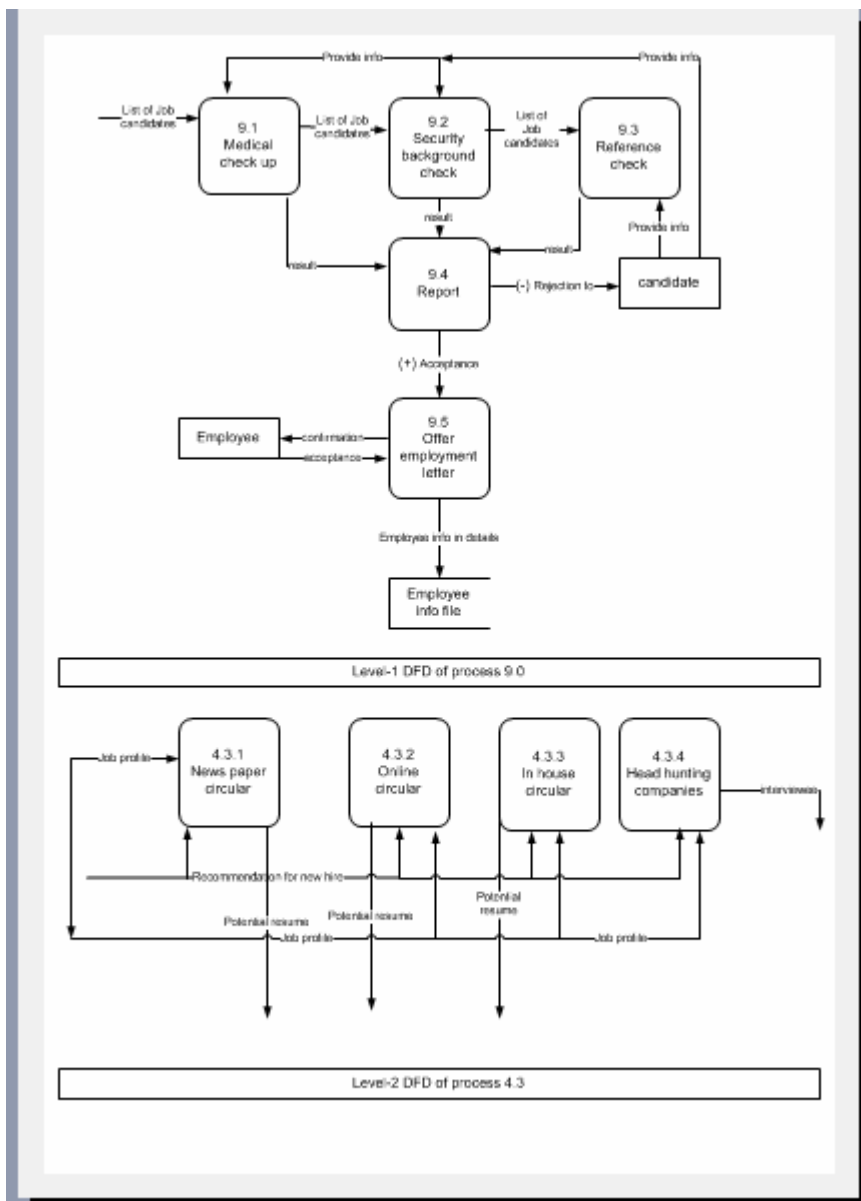
D.CONTEXT DIAGRAM OF RECRUITMENT PROCESS



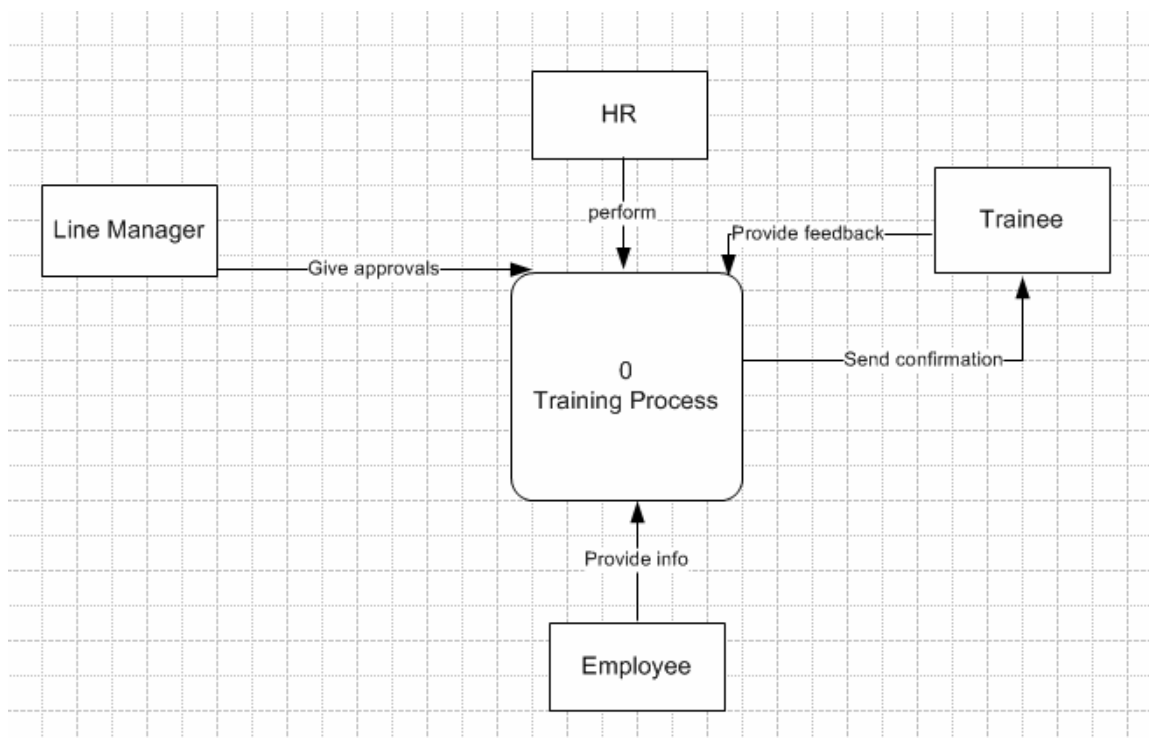
E. DATA FLOW DIAGRAM OF RECRUITMENT PROCESS



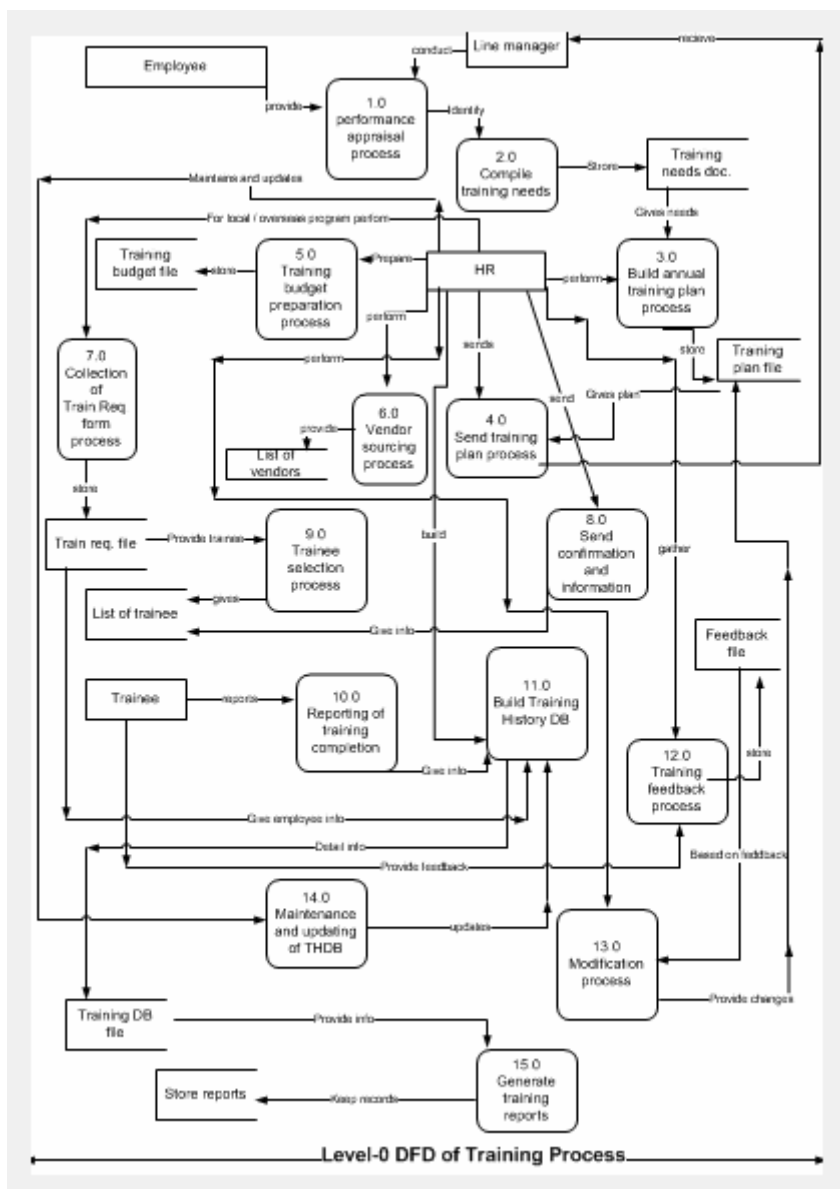


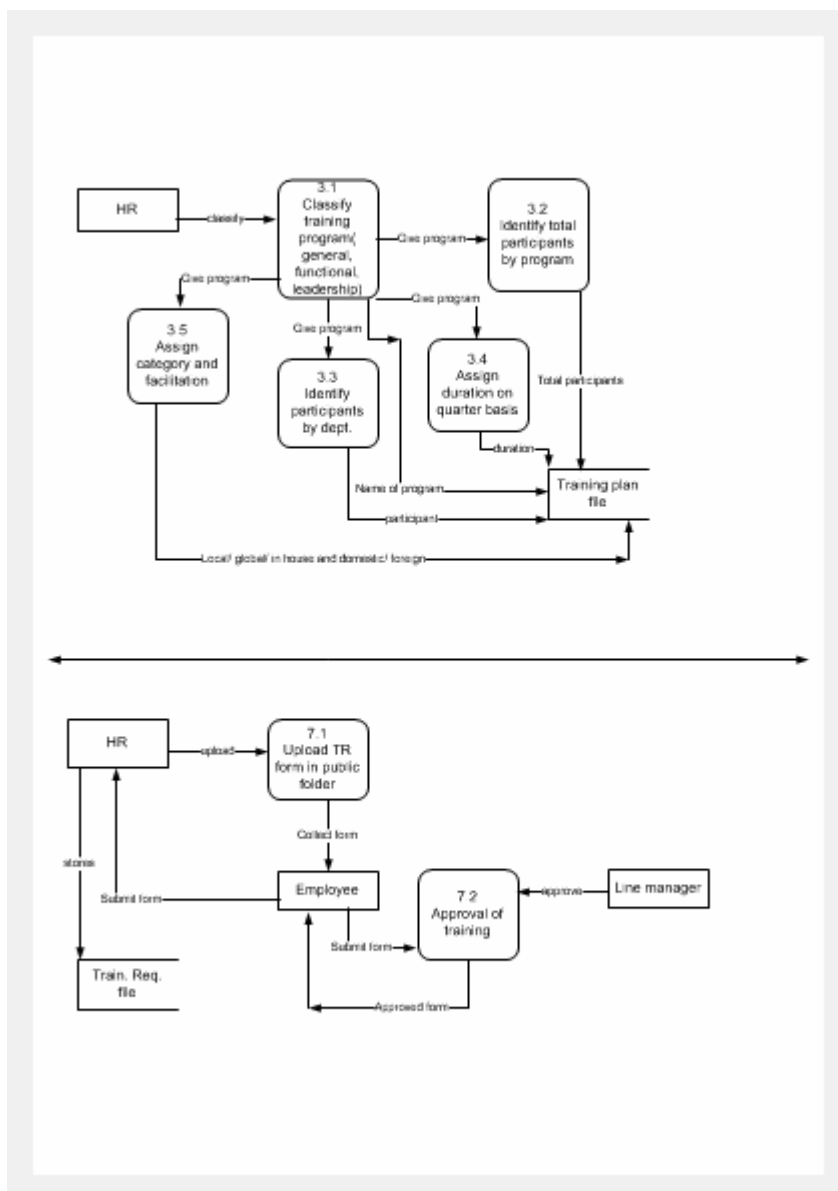


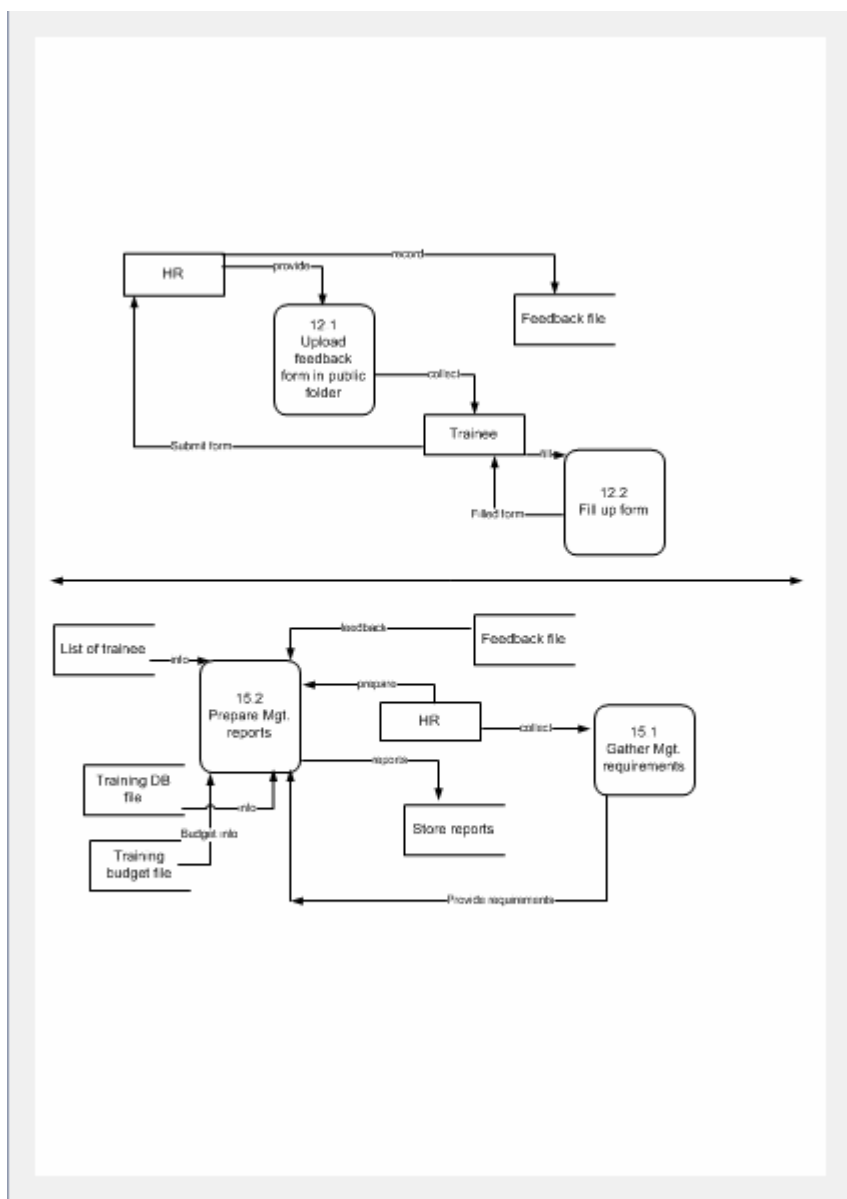
F. CONTEXT DIAGRAM OF TRAINING PROCESS



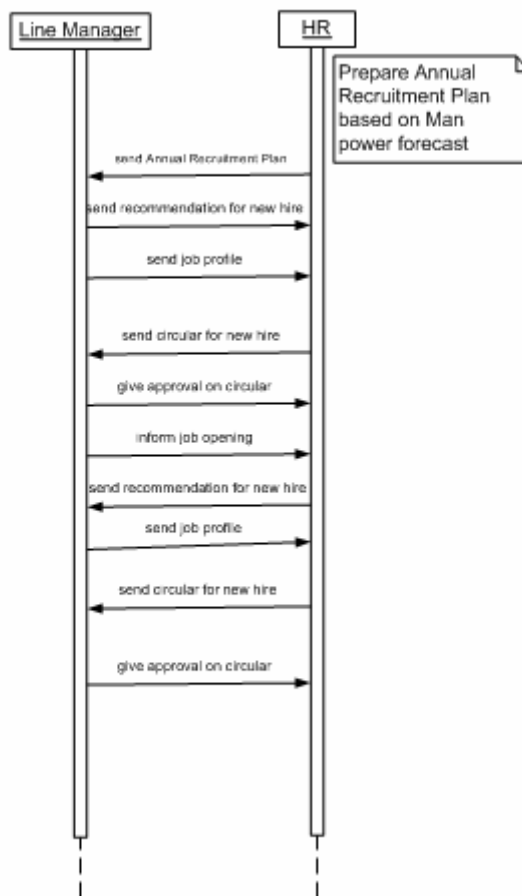
G. DATAFLOW DIAGRAMS OF TRAINING PROCESS

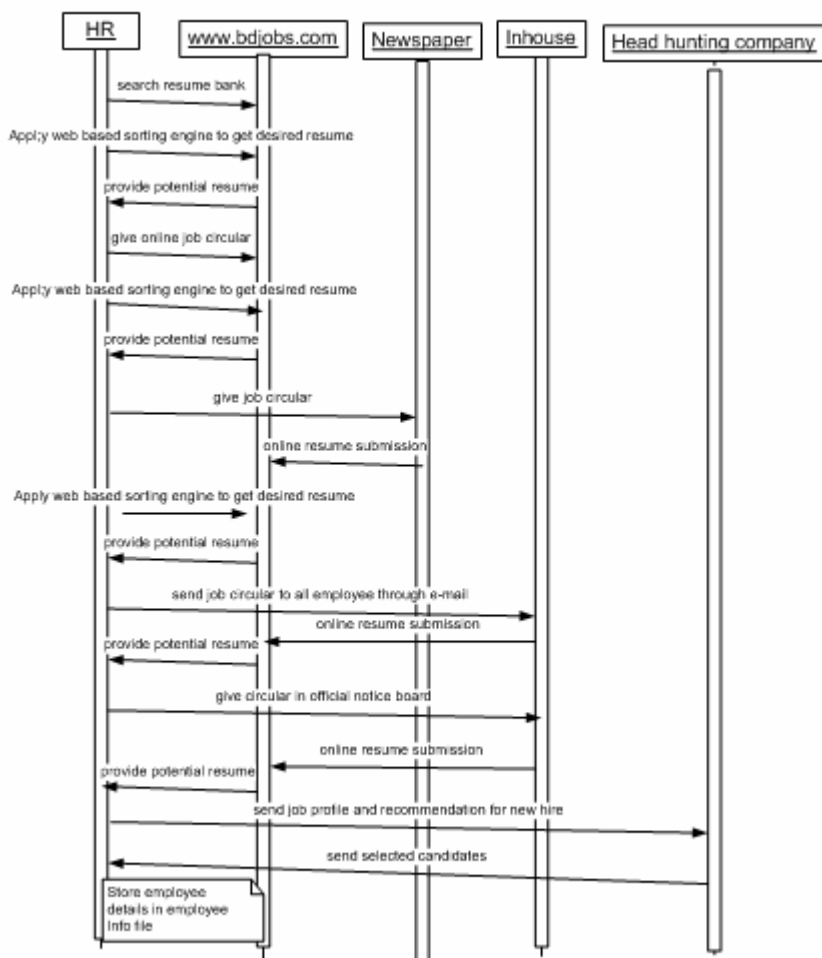


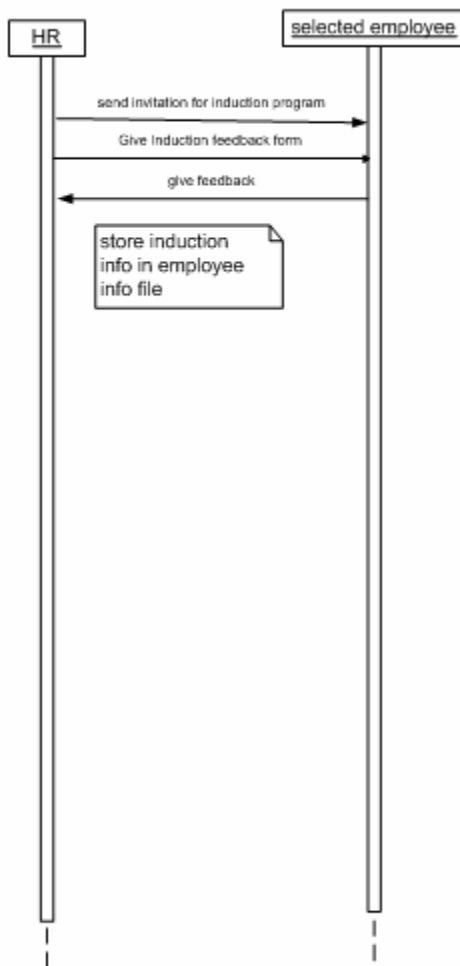


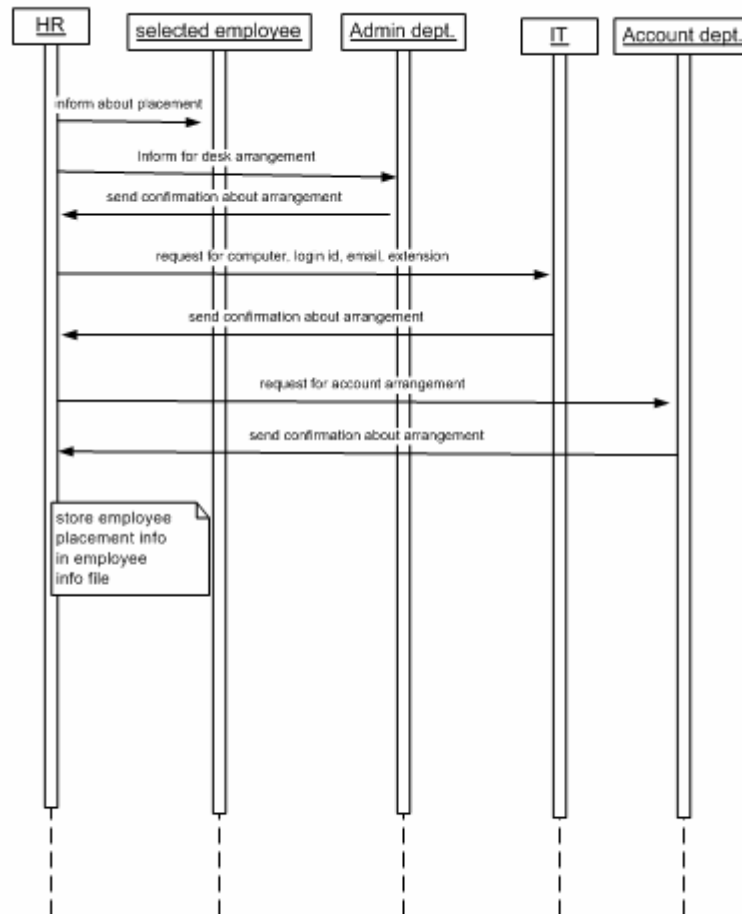


H. WORKFLOW DIAGRAM OF RECRUITMENT PROCESS IN MICROSOFT OFFICE VISIO-2003









I. WORKFLOW DIAGRAM OF TRAINING PROCESS IN MICROSOFT OFFICE VISIO-2003

