ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

SCHOOL OF INFORMATION STUDIES FOR AFRICA

A PROTOTYPE MULTIMEDIA DATABASE SYSTEM FOR POTENTIAL INVESTMENT PROJECTS IN ETHIOPIA: AN OBJECT-ORIENTED APPROACH

A Thesis

submitted in partial fulfilment of the requirements

for the degree of

Master of Science in Information Science.

By

WORKU GEDLIE

May, 1998

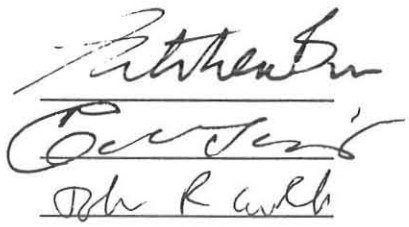
ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
SCHOOL OF INFORMATION STUDIES FOR AFRICA

A PROTOTYPE MULTIMEDIA DATABASE SYSTEM FOR POTENTIAL INVESTMENT PROJECTS IN ETHIOPIA: AN OBJECT-ORIENTED APPROACH

By
Worku Gedlie Alemie

Name and Signature of Members of the Examining Board

Ato Getachew Birru, Chairman, Examining Board
Ato Tesfaye Biru, Advisor
Dr. J. Cowell, External Examiner



ACKNOWLEDGMENT

I am heavily indebted to my advisor, Ato Tesfaye Birru, for his invaluable guidance, contribution, and friendly co-operation throughout the pursuit of the study. I would also like to thank Ato Benti Tolessa, employee at the Ethiopian Investment Authority, for his kind assistance in providing materials and arranging facilities required for the study and Ato Sisay Fisha for his technical assistance and comments in the prototype part of the study.

Finally, special thanks go to Deutscher Akademischer Austauschdienst (DAAD) for their financial assistance in doing the study, my mother W/o Emebet Dessie, my wife w/o Eleni W/Silassie, my brothers Asmamaw Yitayal, Reta Shite, Getnet Assefa, Teshome Debella, Seife B/Tsion, and Asresie Ayalew.

ABSTRACT

Ethiopia is now running to make itself a destination of investors. To make investment decision, however, investors require quality information on the main parameters of the country, including investment opportunities and costs, legal framework for investment, and available infrastructures. To provide for such requirements, among other things, detail and continuos studies for the development of appropriate information systems that generate quality information on potential investment projects of the country are essential.

This study was an attempt to develop a multimedia database for potential investment projects with the aim of upgrading the existing data management system at the Ethiopian Investment Authority. Investors and direct investment officers in the country were surveyed through mail questionnaire, personal interview, literature review, document searching, and observation. On the basis of the analysis of the facts gathered, information requirements of potential investors, and existing data management problems at the Authority were identified. An attempt was made to identify the causes of problems and their remedies. The necessity of maintaining different forms or types of data on potential investment projects that meet the identified requirements was also explored.

A prototype multimedia database was developed as a solution in tackling the existing problems. The project subsystem part of the design was implemented and tested. The study established that the existing data management system at the Authority has serious problems in meeting the information requirements of potential investors. During investment decision, investors require quality information on investment opportunities, investment climate, and spatial entity. The potential investment projects database, proposed as a solution, should integrate different forms of data, such as text, image, video, and audio.

Further, recommendations were made for considerations by the Authority to fully benefit from the solutions suggested by way of identifying major activities to be carried out to develop and implement the prototype database into a fully operational database.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1 Background

Data are resources of any modern enterprise, similar to other more familiar resources (personnel, materials, and capital). Like other resources, data have both costs and benefits - they are time consuming and expensive to acquire but play important role in an organization's operation, management, product quality, and delivery (Kroenke, 1992). Thus, they are subject to sound management principles.

Data management is much concerned with adding value to data resources. It includes all the activities that ensure high quality data are available to produce required information and knowledge. According to Loomis (1987), data management responsibilities include:

- The presentation, storage, and organization of data so that they can be selectively and efficiently accessed;
- The manipulation and presentation of data so that they can effectively support the user environment; and
- The protection of data so that they can retain their value.

A self-describing collection of integrated data records within organizations is often referred to as a database. Recent developments in multimedia and object-orientation technologies are bringing about dramatic changes in the way we store and retrieve (access) data. Multimedia

databases greatly improve the quality of information because they combine textual, graphic, audio, and video representations (still and moving). In object-oriented technology, binary large objects (BLOBs) are stored, representing images, video, speech, unformatted text, or other long bit streams (Martin, 1993).

Currently, there is an upward trend in the interest for the object-oriented approach as a way for overcoming drawbacks in traditional data models (Clmmwntini and Felice, 1994). Because object-oriented approach tries to model the real world as closely as possible, databases built on the basis of this methodology avoid system complexities due to better understanding of requirement analysis. Such capacity to model the real world in a closer way has the advantage of manipulating links and relationships among entities in a direct way.

1.2 Statement of the Problem

Although not exhaustive, at the Ethiopian Investment Authority, attempts are being made to gather data on potential investment projects from different sources. However, there seems to be difficulty at present to meet the information requirements of potential investors. A study on investment climate in Ethiopia explained that information important to investors and businesspersons are not adequately available. In many cases the data that are available are old or may not be too reliable (Schewarz, Pawlos, and Kifle-Mariam, 1968).[1]

[1]Although these problems were indicated before 30 years, facts gathered from different sources through different techniques reflected that they are not yet solved.

A preliminary investigation made to assess the current situation in this connection revealed the following major problems:

- **Availability of Required Information**: The Authority has no complete, integrated, and readily available data on potential investment projects. It simply maintains and disseminates general information on potential investment projects. For instance, although there is general information on hydroelectric and thermal energy potential resources of the country, there are no details that describe specific attributes of each potential investment project in this sector. Under the circumstances, investors themselves are forced to search specific potential investment project and apply for investment permission. This is observed to be irritating particularly for foreign investors. Because of this, there were cases where foreign investors withdrew themselves from investment activities.

- **Smooth Flow of Information**: Information flow patterns from the point of generation to the relevant users are observed to be inadequate. Currently, regions such as Tigray, Amhara, and Oromia have shown tremendous improvements on data collection and resource inventory on potential investment projects. According to Negarit Gazeta, Proclamation No. 37/1996, each regional investment office should transmit to the Ethiopian Investment Authority information compiled with respect to the resource potential and investment opportunities of the region. Despite this, only some of the data that are maintained at the regional levels are available at the Ethiopian Investment Authority. Also, there is no formal documented guideline that shows the sources, processes, storage of data, and dissemination of information on potential investment projects.

- **Provision of Relevant Information**: The Ethiopian Investment Authority renders services to potential investors on the basis of own judgment and available data resources without heed to users' information requirements. For this reason, most of the time, it is unable to satisfy specific information requirements of potential investors.

- **Provision of Efficient Service**: Although, there is a growth in the volume of data on potential investment projects, the Authority is committed to data resource management, and there are computer resources at the Authority, currently no database is maintained in this connection. The available data on potential investment projects are processed manually - the Authority is not in a position to exploit its computers and available personnel resources in this regard. This has made it extremely difficult to provide even available information within reasonable times.

This study is, therefore, an attempt to investigate the above mentioned problems, paying respect to relevancy, by way of trying to give answers to the following basic questions:

- What types of information do potential investors require to invest their capital in Ethiopia?
- Does the existing data management system at the Ethiopian Investment Authority satisfy the information requirements of potential investors?
- Is there a means to upgrade the existing data management system at the Ethiopian Investment Authority?

1.3 Justification

Since recent times, Ethiopia has been looking towards increasing the level of investment, both foreign and local. There are various indicators. For instance, on the Addis Forum on Trade and Investment in Africa dated March 8-9, 1998, the Ethiopian Prime Minister, Meles Zenawi, stressed that there is no doubt that foreign investment is critical if Africa is to attain fast economic growth, which is so much needed to combat its extreme poverty. Moreover, industrial countries recognize the increasing importance of international investment to be competitive in the international economy. It is for these reasons that the Ethiopian Investment Authority has given priority for investment data compilation and considered it as one of its primary responsibilities. Similarly, different organizations in many countries have developed investment opportunities or resource endowments databases as the core of investment promotion efforts.

The purpose of potential investment projects' information system is to ensure that proper information is available when needed so that investors do not have to rely on chance or guesswork. Investors make investment decisions on the basis of their expectations for the future. They would require basic information and quantitative data on various matters for carrying out pre-investment studies. Most likely, entrepreneurs require information on attributes of potential investment projects (risk, cost, benefit, location, etc.), environmental conditions (political, social, regulatory, economic and business, and technology), and what competitors are doing (Neelameghan, 1992). Investors acquire information on potential investment projects because it is exclusive and predictive, the first being information tailored

to their requirements, and the second enabling them to select a particular project out of a whole range of investment opportunities.

When quality information on potential investment projects is generated, it notifies, stimulates, reveals additional alternatives, reduces the perception of risk, and influences investors to make decision.

> *"By providing accurate information on the main parameters of the less developing economy, cost factors in the country, the legal framework for investment, and the bureaucratic process required, it is possible to greatly reduce the perception of risk in the minds of potential investors, at least in those countries where there is, in fact, a good story to tell. Even in less favorable circumstances, the perception of having accurate information will prevent decision makers from over estimating the risks." (Belot and Weigel, 1992)*

By providing quality information, therefore, it is believed that the level of investment will be increased which in turn improves the population's standard of living and well-being by creating productive jobs and reducing poverty (Negarit Gazeta, Proclamation No. 37/1996). And under the circumstances both potential investors as well as planners and managers would benefit from such information system.

Information on potential investment projects is considered in all policy discussions and strategic planning as an agent of development. It improves the capabilities of national planners to design development plans that are suitable to the country and to formulate strategies that are relevant to the national needs. Similarly, information is the managers' main tool and managers' decisions are only as good as the information on which they are based. Their

collective thinking is shaped or more forwarded as a result of the information being fed into the decision making process.

All these necessitates the maintenance of full-fledged integrated database on potential investment projects at least at the central level. The availability of such a resource would give the Ethiopian Investment Authority some competitive advantage in its attempts to market the country as a destination for investment.

For investment decision, the need for an integrated information is apparent. In the context of investment, such integrated information includes text, image, video, and audio. Cognizant of this, an Audiovisual Division has been established at the Ethiopian Investment Authority.

The capabilities of object-oriented systems to deal with non-homogenous data make them an appropriate choice for the multimedia type of data such as data on potential investment projects. Complex objects can be represented in various ways in the sense of a structured-object orientation. This feature combined with other aspects has proven to handle better information types such as geographic, environmental, and engineering (Gunther and Lmbarts, 1994). These capacities make object-oriented approaches more appropriate in the management of data on potential investment projects in the case of the Ethiopian Investment Authority.

In view of the forgoing arguments the study tries to explore the features of object-oriented database technology praised elsewhere in modeling databases for handling multimedia information in an integrated manner in the context of data management for potential investment projects.

1.4 Objectives of the Study

The general objective of the study is to develop a prototype multimedia database system for potential investment projects in Ethiopia by identifying the basic information requirements of potential investors with the aim of upgrading the existing data management system at the Ethiopian Investment Authority.

The specific objectives of the study are:

- To identify information requirements of potential investors;
- To assess the extent to which the existing data management system at the Ethiopian Investment Authority meets these information requirements;
- To explore the possibility of maintaining a multimedia database by applying object-oriented approach that meet the identified requirements;
- To develop a prototype multimedia database;
- To present the prototype database to users and gather their comments and reactions; and
- To make recommendations on the basis of findings to improve the existing situation.

1.5 Scope and Limitation

Although this study tried to identify the information requirements of potential investors to propose appropriate multimedia database that meet their requirements, only the project subsystem with special emphasis on certain investment sectors was implemented due to the

size and complexity of the system and constraints of time and other resources. Except potential investors, other users' information requirements have not been addressed.

The development of the prototype has not been done in a truly object-oriented DBMS environment because of the unavailability of such a software locally. dBASE V for Windows, which is used for this purpose, is primarily a relational system although it provides features of object-orientation for data manipulation in the volatile memory and interfacing routines. For instance, the selected software does not provide facilities for persistent class.

1.6 Methodology

The Population of this study includes potential investors in Ethiopia, employees in the area of investment data management system at the Ethiopian Investment Authority and regional investment offices, and other users and sources of the system. The target population or interest groups of the study are:

- **Users**: 4026 investors in the country.
- **Management and Operation Staff**: 30 direct investment officers at the Authority and regional investment offices.

Though it was possible to go for complete enumeration of the target population, concerning investors, sampling was preferred because:

- There were budget constraints;
- Processing time would have taken longer; and
- Based on a pilot survey, it was assumed that information obtained from sampled respondents would be enough.

Considering the above mentioned factors, the optimal sample rate of investor was decided to be 5%, that is, the total sample size of investors was 200 (0.05 X4026). Once the total sample size was determined, stratified random sampling was applied to include sample size proportionally from different investment sectors as follows:

Agriculture.....	1077/4026 X 200	= 54
Mining.....	23/4026 X 200	= 1
Manufacturing.....	1715/4026 X 200	= 84
Construction.....	126/4026 X 200	= 6
Real estate.....	337/4026 X 200	= 17
Trade.....	137/4026 X 200	= 7
Hotel and Tourism.....	316/4026 X 200	= 16
Transport.....	32/4026 X 200	= 2
Education.....	89/4026 X 200	= 4
Finance.....	11/4026 X 200	= 1
Health.....	81/4026 X 200	= 4
Others.....	..82/4026 X 200	= 4
Total.....		= 200

The reason for selecting sample from each investment sector instead of selecting from investors as a whole is to insure that samples of adequate size are obtained from each investment sector that improve sample estimates of a target population because it is assumed that the difference between sectors are greater than the difference within a sector.

1.6.1 Data Collection Technique

The following data collection techniques were employed in this study:

Mailed Questionnaire: The original version of the questionnaires was designed based on consultation with the methods documented in literature. The content was built in order to meet the objectives of the study and to collect data mainly on information requirements of potential investors, existing data management system of the Authority, and the necessity of different forms or types of data. Before coming up with the final questionnaires, a pilot survey was conducted to test the validity of questions. Considering the results of the pilot survey and amending the contents of the original version of the questionnaires, the final questionnaires were prepared.

A questionnaire that included 25 items (both closed and open) divided into 5 sections was prepared and distributed to 200 investors (Appendix I-B). Another questionnaire that included 38 items (both closed and open) divided into 6 sections was prepared and distributed to all 30 direct investment officers at the Authority and regional investment offices (Appendix I-A).

This technique was used to identify information requirements of potential investors, to assess the extent to which the existing data management system of the Authority meets these information requirements, to explore the possibility of maintaining a multimedia database that meets the identified requirements, to make recommendations on the basis of findings to improve the existing situation, and to collect other basic data that are relevant to the study.

Personal Interview: Semi-structured discussion guide was prepared and interview schedules were arranged to conduct face-to-face interviews and discussions at the Ethiopian Investment Authority (Appendix II). In particular, interviews were made with six key officers at the Authority and it was used as a supplementary to the questionnaire technique.

Literature Review: To widen understanding and to share the results of other studies and developments, relevant materials were searched from the libraries of the Addis Ababa University, the Ethiopian Investment Authority, and the British Council. Particularly, this technique was used to digest object-orientation approach, to review investment information system, and to develop a prototype multimedia database.

Document Review: Reports, files, incoming and outgoing letters, minutes, etc. of the Authority were examined to identify information requirements of potential investors and to assess the extent to which the existing data management system at the Authority meets these requirements.

Observation: To assess the procedures followed and some of the operations of the data management system for potential investment projects, a close on-site observation was also made at the Ethiopian Investment Authority.

To analyze the collected data through the above mentioned techniques, statistical tables, percentage, and chi-square test were applied.

1.6.2 System Development Methodology

In the course of developing a multimedia database for potential investment projects, various techniques suggested in the literature under object-oriented approaches were employed. However, more emphasis was given to the techniques suggested by Lorenz (1993) and Martin (1993). To implement the prototype multimedia database system, dBASE for Windows, version 5.0, database management system was employed.

1.7 Organization of the Thesis

The study is divided into five chapters. The first chapter is the introduction that contains background, statement of the problem, justification, objective, scope and limitation, methodology, and organization of the thesis. The second chapter presents further background on investment, multimedia database, object-orientation, and managing data as a resource. The third chapter reviews the existing situation in the country and at the Authority with special emphasis on the investment sectors and investment climates of the country, level of investment in the country, potential investors' information requirements, data management system, and analysis of existing problems at the Authority. Chapter four presents the object-oriented analysis and design of the proposed database solution, prototype development, and testing and discussion of results. The last chapter is left for conclusion and recommendation.

2. FURTHER BACKGROUND

2.1 Investment and Information

Investment is generally defined as expenditure of capital by an investor to establish a new enterprise or to extend or upgrade one that already exists. Similarly, Jones (1991) defined investments as the productive commitment of funds to one or more assets that will be held over some future time period. In the present day Ethiopia, investment is considered as one of the productive basis for economic development of the country to improve the population's standard of living and well-being, to create productive jobs, and to reduce poverty (Negarit Gazeta, Proclamation No. 37/1996).

In most developing countries, it is now becoming well recognized that foreign investors may bring benefits, although not guaranteed, which may be vital in helping them meet the challenges of integration into the competitive global economy. The major potential benefits associated with foreign investment, among others, are the following (Zemco, 1992):

- **Technology Transfer:** Host countries that are successful in attracting multinational corporations will gain exposure and access to this corporate know-how, which will prove invaluable to the development of their industrial base.

- **Job creation**: Direct investment by multinational corporations creates jobs. Moreover, through the learning process described above, these jobs will provide important benefits for the local economy.

- **Export Development**: Foreign investment often leads to exports from the recipient country to nearly markets, or even to the home country of investors. These exports provide hard currency that is vital to sustained economic growth. Moreover, foreign investment helps countries to diversify their exports.

Investment on the other hand is an information-oriented subject because investors make their decisions on the basis of their expectations for the future. In economics in general, and investment in particular, the standard assumption is that investors are rational. And, rational investors prefer certainty to uncertainty (Jones, 1991). For this reason, they would require quite detailed information and quantitative data on various matters for carrying out pre-investment studies to determine the type of production unit appropriate for producing and marketing the product(s) and suitable to the environment context.

To meet such requirements, it is now commonplace to maintain computer based databases. Below are examples of such databases established for the purpose of providing investment related information in the context of developing countries.

(i) United Nations Industrial Development Organization's Investment Promotion Service/ IPS (UNIDO): It is one of the first to develop programs to promote foreign direct

investment in developing countries. IPS (UNIDO) has made the maintenance of an investment opportunities database the core of its investment promotion efforts. Information contained in such database includes (Belot and Weigel, 1992):

- Potential foreign partners file consisting of information on enterprises interested in business cooperation in developing countries.
- Investment project file consisting of information on investment projects identified by IPS (UNIDO) staff members and consultants during missions to developing countries or submitted by local project sponsors.
- Financial facilities/institutions and the counterpart databases of subscribers. Institution file containing information on institutions promoting investment projects in developing countries.
- Developing country investors file consisting of records of less developing country investors, obtained as part of the process of project identification and formulation.

(ii) The Investment Promotion Network/IPAnet: This network consists of investment databases that provide for efficient global investment particularly aiming at promoting foreign investment in emerging markets and offering information sharing and marketing opportunities to the international business community. In particular, IPAnet databases contain information on the following categories (Users Guide to IPAnet 1996):

- Global market conditions and opportunities for foreign direct investment in general and on a sectoral basis;
- Project-specific investments;

- Financing and contracting opportunities;
- Existing and prospective investors;
- Partners and financiers; and
- Business operating conditions in host countries.

(iii) Multilateral Investment Guarantee Agency's Investment Promotion Software (MIGA): MIGA has developed investment promotion software that is called the Business Operating Conditions Database System.

(iv) Uganda's Resource Endowment Database: This database was developed on the basis of a study commissioned by the Uganda Investment Authority with the aim of identifying its potential investment opportunities. The content of the database includes:

- Message from the chairman of board of director, Uganda Investment Authority;
- Pictures;
- Political commitment;
- Economic policy;
- Facilities and incentives;
- Investment Protection; and
- Labor force.

2.2 Enabling Technologies

2.2.1 Multimedia Database: Features and Capabilities

A database is a self-describing collection of integrated records (Kroenke, 1992). A database is self describing because it contains, in addition to user's source data, a description or data dictionary of its own structure. And it is a collection of integrated records because in the hierarchy of data structure bits are aggregated into bytes or characters, characters are aggregated into fields, fields are aggregated into records, records are aggregated into files, and files are aggregated into databases. However, a database is more than a collection of files because it includes files of source data plus a description of the relationships among the records in the files.

The advantages of a database comes from its layered approach and consolidated data system. The image of data given to end user is produced by the application software and the actual manipulation of the database is accomplished by another software package called the database management system/DBMS. This approach simplifies the design process, improves data control and independency, and increases accessibility. All access to the database is performed by central DBMS. It reduces data duplication/redundancy and improves data shareability.

The late 1980s saw new interest in multimedia databases from the database community (Goble, 1997). Multimedia is so different from traditional system development. Traditional systems simply do not (usually) handle audio, video, or animation. And these are the key

components of multimedia (Keyes, 1997). Where traditional systems present one view of the information, multimedia systems are alive with many views of the system - its sight as well as its sound. No longer are we confined to a rather one-sighted and very flat view of information. With multimedia we can look at information from all sides.

What is more, multimedia is active rather than passive because in multimedia environment the user has the opportunity to access a great deal of varied information that is linked to a great deal of other information. Users have the ability to select any or all forms of data, manipulate them into meaningful information, and effectively integrate that information into a solution that solves a problem and results in more efficient decision making. As such, its use enhances presentation that lets users communicate faster and still produce better retention of communicated information.

Recent advances in storage technologies have also made the creation of multimedia databases both feasible and cost-effective. Wide band communications also greatly facilitate the distribution of multimedia information across communication networks. Parallel computers lead to faster voice, image, and video processing systems. High-resolution graphics and dedicated co-processors enable the presentation of visual information with superior image quality (Chang and Costabile, 1997).

Major characteristics, among others, that justify the use of multimedia as points of leverage for the new technology are (Schlusselberg and Harward, 1992):

- We look for subjects that are more immediately understandable through video and animation than through text or diagrams.
- We look for subjects that are more complex in a way that visual reference can simplify.
- We look for applications that present an experience that the user is unlikely to have had but which we can simulate.
- We cherish applications that make the abstract real and the distant immediate.
- We look for applications where multimedia techniques can make the user more efficient at a task.

To effectively and efficiently access information from multimedia databases, we can identify the following design criteria for the user interface (Chang and Costabile, 1997):

- Various query mechanisms need to be combined seamlessly;
- The user interface should be visual as much as possible;
- The user interface should enable visual relevance feedback; and
- The user interface should support user-guided navigation.

2.2.2 Object-Oriented Approach: An Overview

In the field of software engineering, object-orientation is a principle used to create a representation of the real-world problem domain and to map it into a software solution domain (Eckrt and Golder, 1994). Classes, objects, inheritance, polymorphism, encapsulation, etc. are

used to model problem domains in developing solutions, where as binary large objects (BLOBs) are stored, representing images, video, speech, unformatted text, or other long bit streams.

2.2.2.1 Object-Oriented viz. Conventional Data Models

Much work has been done in developing and improving DBMSs so as to make them more flexible and suiting to various data type requirements. Hierarchical, network, relational, and object-oriented are well-known data models. They are briefly discussed below.

Hierarchical Model: In this model, data and relationships among data are presented by records and links, respectively. Records are broken into logically related segments, or fields, which are connected to other segments by pointers in a tree (parent-child) like arrangements, where access to information about a child can be made only through the parent records. The model uses such data manipulation commands as get unique, get next, get next within parent, and insert. All of these are provided as program modules of the database management systems.

Network Model: In this model, as with the hierarichical model, data and relationships among data are represented by collections of records and links, respectively. Three fundamental building blocks of data definitions in the network model are data items (fields), records (collection of data items), and sets (one-to-many relationships between records). Sets have owners and members, where the owner of a set is the parent and the members of a set are the children. The members of the set (children) are attached to the owner via a linkage system.

Operations such as find-next and find-owner are provided as part of a network DBMS in the form of subprograms that can be called by the application software when needed.

Relational Model: In this model, data and relationships among data are represented by a collection of relations (tables made up rows and columns). The row in a relation is called a tuple and the columns are called attributes. The design of a database in terms of the relational model centers around the design of the relations/tables making up the database. The DBMS using the relational model would include routines to perform the select (extracts rows), project (extracts attributes in each tuples throughout the system of relations), and join (combine different relations into one to produce new relations) operations.

While relational data models are commonly used to support all types of databases applications, including operational transaction systems, decision support and other ad hoc processing systems, and personal database systems, the hierarchical and network data models are used primarily for transaction processing applications (Kroenke, 1992).

Notwithstanding their popularity in conventional applications, all the above stated models, including relational, have problems in so far as providing the fundamental components required to support integrated applications that use multimedia data types such as long texts, image, and voice data (khoshafian, 1993). The models and their applications tend to have structured data records table-oriented or hierarchical, each record usually being assigned a few bytes of memory (Gunther and Lambarts, 1994). Even relational systems which are well known for their simplicity and mathematical foundation require that data be at least in first

normal form which leads to an awkward decomposition of data and thus poor performance (Hurson and Pakzad, 1993).

Hence, the application of these models in the design and development of information system that manage complex data is having problems which calls for an alternative and better model. This has resulted in the emergence of object-oriented models.

Object-Oriented Model: Object-oriented model based DBMSs are basically similar to previous generations of DBMSs; they have mechanisms for storing and retrieving information, handling concurrent access, securing information, backing up and restoring data, and performing other traditional DBMS services. What makes object model based DBMSs different is that they store objects rather than hierarchies, networks, or tables; that is, they provide natural mapping. An object-oriented database stores data along with the methods that process those data. Complex problems that involve many different ways, are easily modeled when the object-oriented approach is used. In a truly object-oriented environment, all information regardless of its format, type, or location, is accessed by the user in the same manner.

What is more, object DBMSs combine the best of all the preceding generations of data management technology (Taylor, 1992):

(1) As with flat files, object DBMSs give you the freedom to store any kind of data you like, but with all the structure and access controls that DBMSs offer, that is, they are ideal for multimedia. Flat files are inadequate for multi-user access. The object-

oriented DBMS are considered as a candidate for constructing multimedia information systems for several reasons, including their modeling power (describing the structure and semantics of multimedia) and encapsulation capacity.

(2) As with hierarchical and network DBMSs, object DBMSs provide rich data structures with fast access, but without rigidity of these early DBMSs.

(3) Object DBMSs provide all the flexibility of relational DBMSs together with their powerful capacity for multiple views of the same information. The flexibility is the product of encapsulation and multiple views are made possible by composite objects. Object-oriented databases support diverse data types rather than only the simple tables, columns, and rows of relational databases.

2.2.2.2 Object-Orientation: Basic Concepts

Different authors have expressed different views regarding the major elements of an object-orientation. The following major concepts and basic terms of object-orientation are obtained from Coad and Yourdon (1991); Martin (1993); Lorenz (1993); and Sodhi and Prince (1996):

Object: An object is the basis for all object-oriented concepts. An object is anything that models or represents the real-world entity that needs a computer system to store information. These things may be physical entities or abstractions that exit uniquely in time and space. As in conventional methods, functionality and data are not separated into programs and database,

but are encapsulated in a single unit called objects. An actual object waiting to perform services and holding some state data is called an instance. The structure and capabilities of an object instance are defined by a class. Thus, a class is a set of similar objects. The object-oriented approach creates models that attempt to build complex systems by using classes and objects as building blocks.

Encapsulation: Packaging data and operation together is called encapsulation. It is the result of hiding the implementation details of an object from its users (other objects). The data can only be employed with the methods that are part of a class. This restriction to access data protects it from arbitrary and unintended use.

Inheritance: Inheritance is a way of reusing services and data. It portrays generalization and specialization, making common attributes and services explicit within a class hierarchy or lattice. It allows to specify common attributes and services once, as well as specialize and extend those attributes and services into specific cases. Inheriting the operations from a super class enables code sharing rather than code redefinition among classes. Inhering the data structure enables structure reuse. Inheritance can have two forms: single inheritance (one class shares the structure and behavior of one super class) and multiple inheritance (a single class inherits structure and behavior of more than one class).

Massage: Objects communicate via message. In order to request a service from another object, an object sends it a message. This is the only means to get information from an object, since its data are not directly accessible. Whenever an object receives a message, methods are executed. Messages, therefore, constitute an object's window to the outside world.

Polymorphism: Polymorphism means that objects in a hierarchy can share the same subroutine by name, but the subroutine can take a different shape within each object. It means that the same request could be sent to different classes and they would implement it in a slightly different way, that is, a method call can cause different results depending on the type of objects that is receiving the call. So when an operation is performed on an object, it is determined by the type of object the operation addresses. With polymorphism a subclass can modify or add to the attributes that it inherits and enhances reusability of codes.

Responsibility: It is a service that has been assigned to a class. A method is an implementation of a responsibility. A class can be thought of as having responsibilities. It can respond to only a specific group of requests and must respond to each of those requests correctly. When a class has a responsibility for acting on a request, it may do so in one of two ways: it may either use a method of its own or transfer the task to another class-referred to as a collaborator. Responsibilities should be defined with a short phrase using active verbs such as display the source menu, update source data, etc.

Contract: A contract is a set of requests (grouping of responsibilities) that a client class can make of a server class. Contracts group public services that are available to other classes and/or subsystems. They identify how the classes and subsystems will work together (collaborate) to provide a function and they are identified by the services requested by clients outside the subsystem. A public responsibility is part of a contract but a private responsibility cannot be part of a contract because it is part of the internal workings of the class.

2.2.3 Object-Oriented System Development Process

In order to model the real world as directly as possible, object-oriented methodologies employ phased approach. Martin (1993) refers to the whole development process as "object-oriented information engineering", that is, the application of an interlocking set of techniques for the planning, analysis, design, construction, and maintenance of information system. Lorenz (1993) identifies four phases: business phase, analysis phase, design and test phase, and packaging phase. The iterative development process, with repeating periods of types of efforts, defines steps to manage the development effort within the analysis, design and test phases. Although there are variations in naming and some conceptual contents, the aims of each phases suggested by the different writers more or less address similar issues.

The major phases adopted, from the various suggestions, for the purpose of the current work are described below.

The Business Phase

This is the first phase that involves an initial survey of user requirements. It is at this level that high-level requirement specification is identified. It is done once, and has the following activities (Lorenz, 1993):

- Identification and documentation of types of users;
- Contacting users who will involve themselves in the development process; and
- Identification and documentation of initial user requirements.

The initial discussions with the customers involved in the development should be documented in notes and/or use cases. In the process of documenting user requirements, focus is on the functions of the system, the paradigm (type of interaction of the system provides), the environment (system and platforms that support the system), and the interfaces (Khoshafian, 1993).

The Analysis Phase

Analysis relates to the process of breaking down a complex problem into its component parts, examining those parts and reconstituting them into a more efficient, effective whole. Thus, this phase is concerned with decomposing the application area into its components and understanding it. It focuses on learning the problem and the user's requirements, identifying all possible constraints on a solution, and organizing the over abundance of assembled information. In other words, the focus during the analysis phase is on what is needed, and not how the needs are met. It attempts to bridge the initial gap between the users and the developers of the information system.

Although materials introducing new object-oriented analysis methods are being published, most of the methods they describe are quite immature both theoretically and empirically. Their theoretical underpinnings are usually weakly documented (Ivari, 1995). Hence, choosing which one to use becomes difficult. The notions and documentation tools also vary greatly complicating the situation further. The methods used in this work are those suggested by Lorenz (1993) and Martin (1993). According to Lorenz (1993), the major activities of analysis

phase are: (i) write, verify, and update use cases and (ii) document detailed customer requirements.

The Design Phase

Design is the portion of the development effort that focuses on the solution domain, that is, the targeted implementation hardware and software platforms (Lorenz, 1993). Object-oriented techniques are used to design the classes and methods for a system. To model the system, this phase provides detailed specifications for the classes of the solution domain.

Like the analysis, design methods still lack uniformity and standardization. For the purpose of this work, the method proposed by Lorenz (1993) and Martin (1993) are followed. According to Lorenz (1993), the major activities of the design phase are:

- Review the analysis phase deliverables;
- Document final design;
- Develop collaboration diagram; and
- Place classes in the inheritance hierarchy.

The Implementation Phase

According to Martin (1993), construction or implementation phase implements the designed system. In other words, implementation is the transformation of design features into selected language code. The final product code is the major content of this phase.

The Testing Phase

In object-oriented approach, classes, functions, subsystems, and complete system can be tested. The goal of testing is to verify that the requirements are being met. Following testing, system problems are identified, if any. Suggested testing strategies for an object-oriented system, among others, are (Lorenz, 1993):

- Focus your testing on one class at a time.
- Test super classes before subclasses, since the subclasses inherit behavior up the hierarchy.

2.3 Managing Data as a Resource

To manage data as a valuable resource, the following steps are recommended by Garland (1986) and Wang (1993):

(1) **Establish Data Administration Office:** The purpose of data administration office is to guard and protect the data and also to ensure that the data is utilized effectively. The data administration must take steps to increase the utility the organization receives from its data. In other words, data administration deals with the establishment of policies and procedures to protect and share data. Thus, getting a competent data administrator to develop a set of data management policies and procedures to guide development and operations is a key first step.

(2) **Data Identification, Organization, and Processing:** The data needed to support the specific business objectives should be identified. Once this is done, then data must be organized in order for processing to be feasible and efficient. There are four major levels of data organization: item, record, file and database. The basic aims of data processing are the retention of information, the updating of information, and the summarization of the data. Usually, data processing requires the employment of data process manager, system analysts, programmers, computer operators, and data preparation personnel.

(3) **Map Current Data and Proposed Data Flows:** Flow chart techniques are important to trace data back to their institutional sources, whether created inside the business or acquired from an external supplier. Analysis of these flows simplifies database development.

(4) **Develop a Data Management Strategic Plan:** Strategic planning deals with the implementation of long-term goals. The aim of strategic planning is to create a viable link between the organization's objectives and the resources and its environmental opportunities. Data management calls for the development of a strategy within the organization that will encompass the user, the data resources, and the appropriate technology.

(5) **Measure User Satisfaction**: Effective data management is driven by user requirements. The quality of data can be quantified and their value to end users can be confirmed through user satisfaction surveys. This also helps to measure and monitor the progress of work in relation to the plan and taking corrective action when required.

Three major components for achieving quality data are (Wang, 1993):

- **Measurement of Data Quality**: Consumers have multiple dimensions when they think about data quality, such as accuracy, believability, relevance, timeliness, and completeness.
- **Analysis of Data Quality Impact on Business:** This component addresses the value chain relationship between high quality data and the successful operation of the business, alternatively, how low quality data affects the business.
- **Improvement of Data Quality:** This component addresses various methods for improving data quality. These methods can be grouped into three interrelated categories:

  (i) **Business Redesign:** Attempting to simplify and streamline the operation to minimize the opportunity for data errors to occur.

  (ii) **Data Quality Motivation:** Focusing on how rewards, benefits and perceptions may encourage improved data handling by members of the organization.

  (iii) **The Use of New Technologies:** Focusing on improving procedures for data capture and processing through techniques such as data entry in remote or mobile situations, direct inter-computer communications, and computer assisted quality control.

3. THE EXISTING SITUATION: A SURVEY

3.1 Background

3.1.1 General

In Ethiopia, major investment opportunities are said to exist in most sectors of the economy, including agriculture, mining, and several fields of manufacturing. Some of the identified potential investment sectors are (Ethiopian Investment Authority, 1997):

- **Agriculture**: The potential for irrigated agriculture is estimated at 3.5 million hectares. Of the total arable land area, only about 15-20 percent is currently under cultivation.
- **Livestock**: Livestock population in Ethiopia is more than 130 million. Ethiopia stands first in Africa and tenth in the world in the size of its animal resources.
- **Water Resources**: Ethiopia has big and medium sized river basis. From the potentially irrigable land of the country, only about its 3 percent is cultivated through irrigation.
- **Industry**: Industrial development is in its early stages and it annually contributes around 10 percent of gross domestic product of the country. The volume of production in most of the field is fairly limited and covers only a small portion of domestic demand.
- **Mining:** Possibilities exist for oil and gas deposits particularly in the south eastern and south western regions. Traces of several minerals have been found in many parts of the country. However, exploitation of gold, platinum, tantalum, salt, marble and other

industrial minerals is undertaken on a very limited scale as compared to the immense potential.

- **Energy:** Ethiopia is endowed with substantial hydroelectric and thermal power resources. At present, the aggregate hydroelectricity generated is less than 2 percent of the potential that ranges of 100-105 billion kwh/a. In view of topographic features of the country, much of this can be developed at low cost.

Although the country possessed the above mentioned potential investment sectors, the level of investment in the country is relatively insignificant. One of the reasons may be lack of proper data management for potential investment projects. Moreover, investors make investment decision by analyzing not only investment opportunities but also investment climates, that are, environmental factors that positively or adversely affect the investment activities in the country.

The Ethiopian Investment Authority (1997) views the investment climates of Ethiopia as follows:

- **Market:** Ethiopia has followed a market oriented economic development strategy since 1990. Its population is about 57 million. Ethiopia, among others, is a member of the following markets: (1) Common market for Eastern and Southern Africa (COMESA), (2) ACP/ Lome Convention (European Union), and (3) Generalized system of preference. However, the percapita of the country is one of the lowest in the world.

- **Taxation Measures**: The principal types of taxes are profit tax on business, sales tax, excise tax, customs duties, income tax from employment and others. There are conditional exemptions from custom duty and profit tax on business. However, entrepreneurs have regularly explained through most media that the bureaucratic process at the Ethiopian Customs Authority has created difficulties to run their business efficiently.

- **Education and Health**: The country's universities, colleges, and technical institutions provide reasonable number of professional, semi-professional, and technical skills necessary for the business and other sectors. Most urban centers have reasonable numbers of hospitals, health centers, and clinics.

- **Investment Guarantee**: Foreign investors are offered 100% guarantee and protection on non-commercial risks. Ethiopia is a full member of the World Bank Affiliated Multilateral Investment Guarantee Agency (MIGA) which issues guarantees against non commercial risks and also signed the World Bank Treaty and is signatory to the convention on settlement of investment disputes between states and nationals of other states.

- **Infrastructures**: Transport, telecommunications, power supply, and banking and insurance available in the country are briefly described below:

Both asphalt and gravel roads radiate from Addis Ababa to important cities and neighboring countries. A railway system links Addis Ababa with the port city of Djibouti. Ethiopian Airlines is one of the world's better known carriers. Its international flights link

the country with 42 cities in three continents, that are, Africa, Asia, and Europe. Moreover, ocean transport is provided through Ethiopian Shipping Lines.

Telecommunications facilities in Ethiopia are relatively efficient by Sub-Sahara African standards. Direct microwave links connect all regional cities, and a number of smaller towns have automate telephone services. International telecommunications links are maintained through two satellite earth stations, providing telephone, telex, fax, and television services. Recently, digital telephone exchanges have been installed and the country has joined the Internet society.

The main industrial towns are all connected through the inter-connected power supply system. Electric energy is supported at 380/220 volts. Its transmission facilities are 230, 132, 66, 45, 15, 5.5, and 3.2 kv lines.

Both government and private banks and insurance companies operate in Ethiopia. Their policy promotes viable development projects. The biggest bank in the country, Commercial Bank of Ethiopia, has 168 branches throughout the country with an asset of more than 21 billion Birr.

However, as frequently transmitted through the mass-media, there are serious problems to get telecommunications and electric services particularly for newly opened organizations. According to some sources, almost 80% of the roads are heavily damaged and require maintenance. Moreover, the railway system is old and inefficient. This was brought to the attention of officers at the Authority and they explained that in line with the new policies

arrangements are already being made to address these problems in order to create conducive environment for investors.

3.1.2 The Ethiopian Investment Authority

According to Negarit Gazeta, proclamation No. 242/ 1966, a permanent Investment Committee consisting of Ministry of Foreign Affairs, Ministry of Agriculture, Ministry of Industry, Ministry of Mining and Energy, and others was set up in 1966. The committee, however, became inactive due to unfavorable investment climates resulted from the command economy of the Derg regime. A similar Investment Committee was reestablished in 1990.

The Ethiopian Investment Office was organized in 1992. As stated on Negarit Gazeta, proclamation No. 37/1996, the Office was reorganized in 1996 as an autonomous pubic institution having legal personality and its name has been changed to Ethiopian Investment Authority. As explained on the proclamation, the overall objectives of the Authority are to accelerate the country's economic development and to exploit and develop the immense natural resources of the country.

The proclamation explained that the Authority, among others, has the following powers and duties:

- *To collect, compile, analyze, and disseminate information on the resource potential of the country and on the investment opportunities it offers; to promote concrete investment projects; to provide upon request, much-making service of possible joint investment partners;*

- *To initiate and submit to the board policy and implementation measures need to create a conducive investment climate for investors and to follow up the implementation of same upon approval;*
- *To organize, with a view to helping promote investment, such activities as exhibitions, conferences, training and seminars locally or abroad as may be appropriate; to give advisory service to investors; and*
- *To prepare and distribute pamphlets, brochures, films and other materials that help enhance investment.*

To discharge its duties and responsibilities the Authority is organized as shown in Figure 3.1 on the next page.

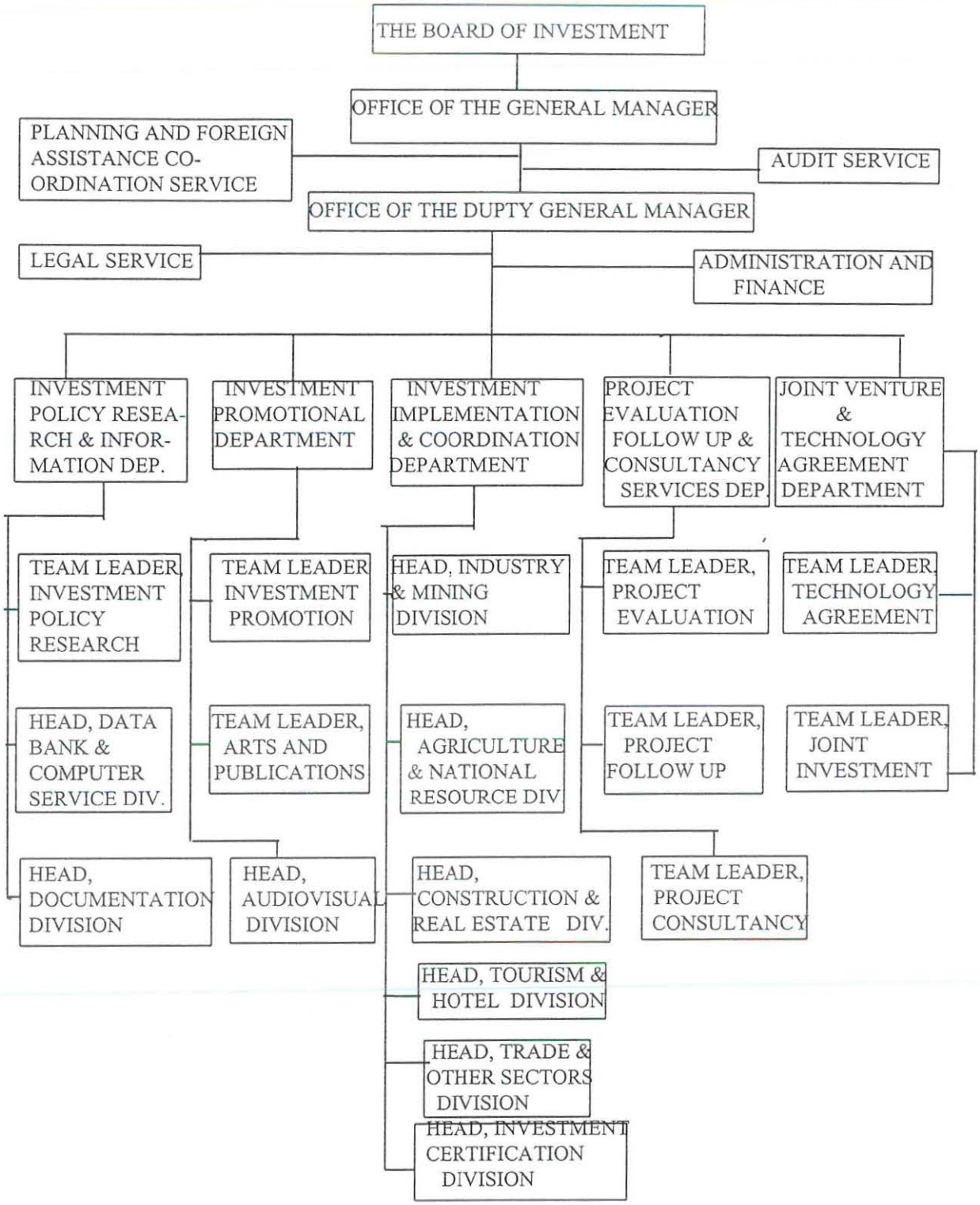


Figure 3.1 Ethiopian Investment Authority Organizational Structure

3.1.3 Level of Investment in Ethiopia

The level of investment of a country mainly depends on the country's resource allocation and the net flow of foreign investors' capital to that country. A certain proportion of the gross domestic product of a country can be used for consumption and the remaining, if any, can be allotted for investment. Positive net foreign direct investment flow maximizes the level of investment of a country. Net foreign direct investment flows within a certain period of time are important to apply time-series and cross-country comparisons.

According to the Ethiopian Investment Authority (1997), approved foreign investment capital, approved total investment capital, and gross fixed investment over gross domestic product of the country over the last five consecutive years are summarized in table below:

Year	1992/93	1993/94	1994/95	1995/96	1996/97
Approved foreign investment capital in million Birr	232.58	443.31	576.07	438.26	2512.51
Approved total investment capital in million Birr	3939.97	3912.98	4712.26	6908.81	7623.56
Gross fixed investment over gross domestic product	12.7%	15.1%	15.6%	16.5%	17.2%

Table 3.1 Approved Foreign Investment Capital, Approved Total Investment Capital, and Gross Fixed Investment Over Gross Domestic Product

The above table shows that there is a positive trend to allocate the gross domestic product of the country for the purpose of investment and to attract foreign investment capital.

The net foreign direct investment flows to Ethiopia, in 1996 US $ million, covering from the time of 1970 to 1995, are shown in a table as follows (IFC, 1997):

Year	1970	1971	1972	1973	1974	1975	1976	1977	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
NFDIF*	15	21	34	87	58	36	8	10	2	-3	6	0	-1	-4	2	0	13	1	7	7	8	7

* Net Foreign Direct Investment Flows

Table 3.2 Net Foreign Direct Investment Flows to Ethiopia

Comparing the first 5 years of 1970's and 1990's net foreign direct investment flows to Ethiopia clearly shows that there is a big deterioration, that is, decrease from $ 251 million to $43 million. For unknown reason, the data were not shown in 1978-1981. From 1982 to 1989, net foreign direct investment flows were amounting to only $ 2 million. During discussions respondents replied that the main reason was the unfavorable investment climate of the country, that is, command economy during the Derg regime. Within the whole 26 consecutive years, Ethiopian share was amounting to $304 million. It is only 0.3% of the total amount of $95370 million net foreign direct investment flows to 144 developing countries. Even comparing with other sub-Saharan African countries, it is relatively insignificant.

3.2 Potential Investors' Information Requirements

A potential investor is a promising person that can become an actual investor. As it is explained in Chapter 1, one of the objectives of this study is to identify information requirements of potential investors because the success of this study, similar to other information systems development, hinges on the accurate and complete determination of users' information requirements.

Actual investors in the country are considered as representatives of potential investors because it is expected that they are more experienced in the area and had to invest more. Moreover, direct investment officers are included in the study. According to the statistical unit of the Authority, 4026 investors have been investing in different investment sectors of the country. There are 30 officers who are directly working in the investment data management systems at the Authority and regional investment offices.

Information requirements of potential investors are identified mainly using questionnaires. However, getting responses particularly from investors through mailed questionnaire was extremely difficult. To minimize the problem, questionnaires were distributed ahead of time and the worker continuously reminded and requested them through telephone and in person.

Out of 200 investors and 30 investment officers to whom questionnaires were distributed, 116 and 24 of them responded, that is, there were 58% and 80% response rates, respectively. On the bases of the facts gathered from them, information requirements of potential investors are summarized in the following table (question No. 3 of the questionnaire: Category of information):

Category of Information	Information is Required at the Level of:				
	National	Regional	Zone	Woreda	project
1. Project-Specific: Cost, title, benefit, size, sector, risk, and resources required, etc.	---	-----	-----	-----	139
2. Social Conditions: Size of Population, number of telephone per people, health, social customs and traditions, cultural practice, etc.	122	58	----	----	----
3. Regulatory Measures: Licensing policy, import and export policy, taxation measures, incentives, restrictions, antitrust law, foreign exchange, price controls, sector priority, and labor legislation	136	13	----	----	----
4. Economic and business conditions, such as level of sectoral production, availability of market, nature of competition, changes in GDP, government expenditure, etc.	131	42	----	----	----
5. Availability of resources, including capital, personnel, materials, etc.	138	73	28	----	---
6. Infrastructures, such as power, telephone, transport, banking and insurance, etc.	126	98	76	68	28
7. Professional services, such as accounting and auditing, legal, management constancy, etc.	83	----	----	----	----
8. Political Conditions: Sustainability of existing regime and its attitude towards investment, armed conflict and internal rebellion for political power, etc.	133	82	-----	-----	----
9.Geographic: - Location: latitude, longitude, etc. - Climate : rain fall, temperature, elevation, etc.	 5 62	 115 51	 129 ----	 127 ----	 135 ----

Table 3.3 Potential Investors Information Requirements: Categories and Levels

The above table depicts that potential investors required information on project opportunities and costs, investment climate, and spatial entity. Since the responses of the two groups, investors and investment officers, are almost similar, they are analyzed together.

The result observed from the table can be summarized as follows:

- Almost all of the respondents required project-specific information at the project level.
- Information on social conditions, regulatory measures, climate, economic and business, and political conditions is required at the national and regional levels.
- Information on professional services is required only at the national level.
- Information on infrastructures and location is required at all levels.
- Information on resources availability is required at the national, regional, and zone levels.

To explore the possibility of maintaining multimedia database for potential investment projects that meet identified requirements, users were made their opinions (questions No. 5 and 6). Their responses are summarized in table as follows:

Responses \ Data	Text only	Text and picture only	Text, picture, and audio only	Both text, picture, audio, and video
Number of respondents	48	26	32	34

Table 3.4 The Necessity of Multimedia for Potential Investment Projects' Data Management System

Most of the respondents, 92 out of 140, preferred to have a multimedia database system that integrates text and other forms of data. The Authority and the regional investment offices have a plan to automate the potential investment projects' data management system that integrates different types of data. Moreover, they have expressed the need to use Internet to advertise investment opportunities, to access practices of other countries, and to do collaborative research.

To verify the completeness and accuracy of the potential investors' information requirements identified by the questionnaires, discussions were held with officers at the Authority.

Moreover, documents available at the Authority were reviewed. According to the findings, in addition to the above mentioned information requirements, potential investors require information on:

- Potential investment projects' classified by sector, sub-sector, and project-specific;
- Technical know-how required by the potential investment project;
- Life of the potential investment project and its capacity; and
- Available study on the potential investment project.

3.3 Data Management System

The Investment Policy Research and Information Department and the Investment Promotion Department of the Authority are the ones mainly responsible to manage investment data. Both are organized under the office of the Deputy General Manager. As shown in Figure 3.1, the first Department consists of Documentation Division, Data Bank and Computer Service Division, and Investment Policy and Research Section. Under the Investment Promotion Department, there are Investment promotion, Arts and publications, and Audiovisual Divisions.

The data flow diagram that shows the potential investment projects' data management system at the Authority, considering major sources and users of the system, is given below.

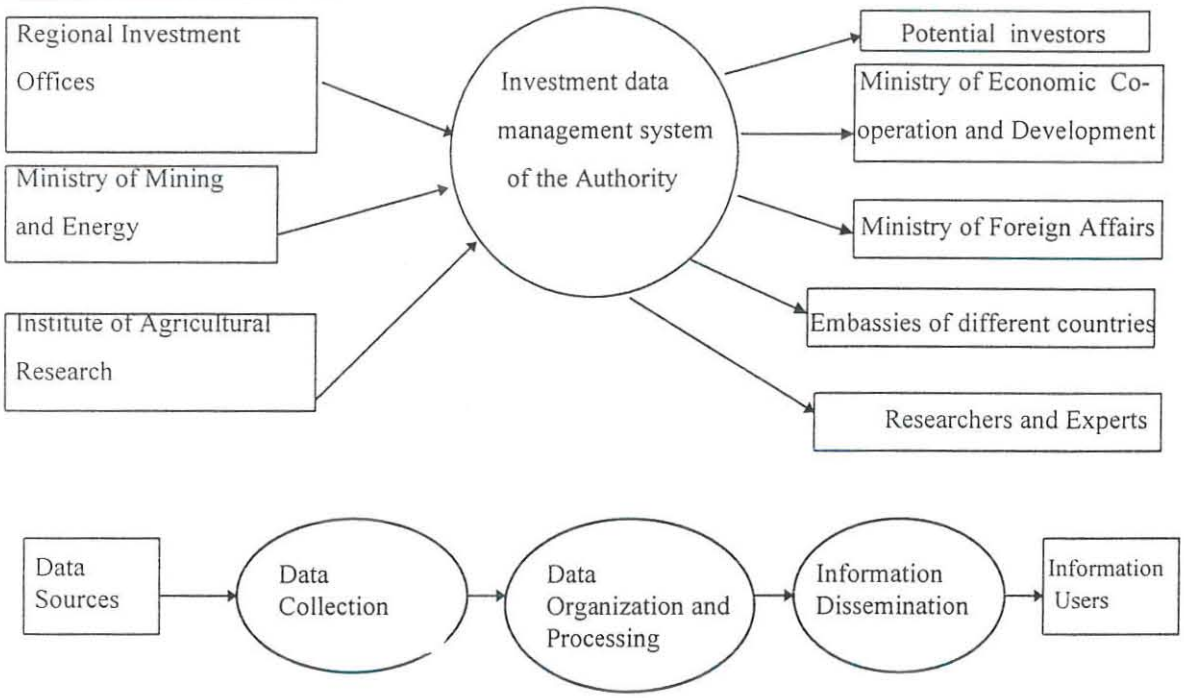


Figure 3.2 The Data Flow Diagram of the Potential Investment Projects' Data Management System

The various related activities (data collection, processing and organization, and dissemination) in place are described in detail in the following subsections.

Data Acquisition

As shown in Figure 3.2 above, the major sources of data within the system under reference are Regional Investment Offices, Ministry of Mining and Energy, and Institute of Agricultural Research. Although not exhaustive, data on potential investment projects have been collected by the Authority from these and other sources. Data are collected mainly through letters in the form of documents, video cassettes, and pictures. But most of them are general, that is, they do not contain specific and complete data on potential investment projects.

Hardware and software type	Quantity	Standard or description
Computer	12	386,486, pentium
Printer	4	Dot matrix and leserjet
CD-ROM	7	2 and 4 speed
Video camera	1	JVC
Steel (photograph) camera	1	Minolta 7000
Software		dBASE IV, Access 2.0, Excel 5.0, Lotus 1,2,3, Foxpro, dBASE for Windows, etc.

Table 3.6 Available Hardware and Software Resources

Information Dissemination

This refers to the distribution or diffusion of information processed to reach its users through appropriate forms and channels. The Investment Promotion Department is responsible, among others, to promote investment activities by disseminating information on potential investment projects to users. The major users of the system include potential investors (foreign and local), Ministry of Economic Cooperation and Development, Ministry of Foreign Affairs, Embassies of other countries, experts and researchers.

For information dissemination, the following methods (formats and channels) are currently in use by the Authority.

- **Brochures, pamphlets, and investment guide** are prepared and distributed. These materials while mainly used to promote potential investment projects, they are also used to describe the investment climates.

- **Conferences, exhibitions, seminars, and forums** are organized in and outside the country. These methods are mainly employed to market investment opportunities, to make participants understand the investment climates, and to obtain feedback from them.
- **Branches** of the Ethiopian Investment Authority are opened in foreign countries. The main objective of establishing branch investment offices in foreign countries is to create strong investment relationships with foreign investors, that is, to inform them about investment opportunities and investment climates and to facilitate joint-venture formulation.
- **Video cassettes** are used to disseminate active information.
- **Mass-media** (radio, TV, and newspapers) are used to transmit or broadcast.
- In addition, users are entitled to request and receive information through face-to-face communication, telephone, fax, e-mail, and post office.

3.4 Analysis of Existing Problems

As stated in Chapter 1, one of the objectives of the study is to assess the extent to which the existing data management system at the Authority meets the information requirements of potential investors. To this end, an attempt is made to test the following hypothesis:

> *"There are serious problems in the existing potential investment projects' data management system at the Authority."*

This hypothesis is tested against there are no serious problems. The analysis of responses regarding existing data management problems is divided into availability, accessibility, consistency, accuracy, timelines, relevancy, and utilization.

Chi-square tests have been applied only for under-utilization problem because it was difficult to arrive at a conclusion, that is, in favor of or against the hypothesis. But regarding other factors, the percentage itself clearly indicates that there are serious problems in the existing data management system for potential investment projects at the Authority.

The assessment of the existing data management system for potential investment projects at the Authority is summarized in Table 3.7 on the next page (Part IV of the questionnaire: Quality or Characteristics of Information).

Regarding information utilization, the frequencies of respondents indicate that 11 out of 24 responded that information is highly utilized or partially utilized (Group 1: above average) and the remaining 13 responded that information is rarely utilized or unutilized (Group 2: below average). The chi-square test for the two groups is shown in the table below.

Category	Cases Observed	Expected	Difference
Group 1	11	12	1
Group 2	13	12	-1
Total	24	24	0

Table 3.8 Chi-square Test for Two Groups

Actual or calculated Chi-square value is 0.16. But, table or theoretical value of chi-square at 5% significant level at 1 degree of freedom is 3.84. As such, the chi-square result indicates that there was no significance difference (the actual value is less than the table value) between the two groups. Thus, it is hard to say whether there is a serious problem regarding information under-utilization problem.

Characteristics	Rating	Frequency	Percent (%)
Availability and completeness	Exhaustively Available	3	2
	Mostly available	8	6
	Rarely available	122	87
	Unavailable	7	5
	Total	140	100
Accessibility	Easily accessible	12	9
	Moderately accessible	21	16
	Poorly accessible	89	67
	Inaccessible	11	8
	Total	133	100
Consistency	Regularly consistent	8	6
	Always consistent	17	13
	Sometimes consistent	81	61
	Inconsistent	27	20
	Total	133	100
Accuracy or reliability	Completely accurate	12	9
	Always accurate	17	12
	Sometimes accurate	100	72
	Inaccurate	9	7
	Total	138	100
Timelines or recency	Most current (most recent)	15	11
	Moderately current	29	21
	Rarely current	53	38
	Outdated	42	30
	Total	139	100
Relevancy or confirms with demands	Perfectly relevant	17	12
	Always relevant	18	13
	Sometimes relevant	105	75
	Irrelevant	0	0
	Total	140	100
Utilization	Highly utilized	3	13
	Partially utilized	8	33
	Rarely utilized	13	54
	Unutilized	0	0
	Total	24	100

Table 3.7 The Assessment of Potential Investment Projects' Data Management System

Significant problems observed and their major causes are summarized in table on the next page.

Causes \ Problems	Unavailable or Rarely available	Inaccessible or poorly accessible	Inconsistent or sometimes consistent	Inaccurate or rarely accurate	outdated or rarely current	Irrelevant or rarely relevant
1. Lack of an organized system, such as absence of central database services and poor manual information systems	129	99	106	108	92	63
2. Low level utilization of information technology	97	91	88	59	89	28
3. Poor communication between the Authority and other organizations	71		76	41	81	23
4. Low level recognition for the role of information	21					18
5. Absence of finding or searching aids		78				39
6. Manual nature of information system		94	57	60	85	42
7. Lack of properly trained personnel	94	89				16
8. Unreliable external information sources			98	102		
9. Lack of study to identify potential investors' information requirements					48	102
10. Poor data selection						78
11. Lack of employees motivation	9	17				
12. Lack of potential investment projects identification	117				67	

Table 3.9 Significant Problems and Major Causes

The top major causes for each problem, referring their serial numbers, are ranked in ascending order as follows:

Unavailable or poorly available:	1, 12, 2, 7
Inaccessible or poorly accessible:	1, 6, 2, 7
Inconsistent or sometimes consistent:	1, 8, 2, 3
Inaccurate or sometimes accurate:	1, 8, 6, 2
Outdated or rarely current:	1, 2, 6, 3
Irrelevant or sometimes relevant:	9, 10, 1, 6

As shown, the lack of an organized system, such as absence of central database system and/or poor manual information system, is considered as the main cause of potential investment projects' data management problems at the Authority. The other major causes indicated are low level utilization of information technology, manual information system, unreliable external information sources, lack of properly trained, experienced and motivated personnel, poor communication between the Authority and other organizations, lack of study to identify information requirements of potential investors, lack of potential investment projects or resource endowments identification, and poor data selection. These findings and others are used as the basis for the proposed database solution in the next chapter

4. PROPOSED DATABASE SOLUTION

A multimedia database, an object-oriented system development, is considered a better alternative to potential investment projects' data management. The object-oriented development methodology helps to analyze the problem domain and create an application to meet the users' requirements. Method used in this study is largely dependent upon Lorenz's (1993) approach. The development strategies and tools for documentation have been adapted to a greater extent from the same book. It is more of a practical guide to apply object-oriented methods to real problems, that is, case studies, illustrations, and better design tools are included. However, consultations have also been made to Martin (1993), particularly in the analysis part of the study.

4.1 Analysis

Object-oriented analysis focuses on learning the problem and the user's requirements, identifying all possible constraints on a solution, and organizing the over abundance of assembled information. The major outputs of an object-oriented analysis is the object model of the application domain (Martin, 1993). According to Lorenz (1993), the major activities of analysis phase are: (i) write, verify, and update use cases and (ii) document detailed customer requirements. According to Martin (1993), the major activities of the analysis phase are representation of the object types and their associations, and what happens to the objects, that are, object structure and object behavior analysis.

The following strategies have been employed in the analysis phase of this study:

a) Document detailed potential investors' information requirements;

b) Develop object flow diagram;

c) Develop object relationship diagram;

d) Develop state transition diagram; and

e) Write, verify, and update use cases.

4.1.1 Detailed potential Investors' Information Requirements

The user requirements and the system descriptions are two different, yet related, models of the behavior of a system (Sodhi and Prince, 1996). The requirements should be met by the system description. System description covers all aspects of functionality, performance, interfaces, and deign constraints.

The basic areas that need to be addressed in tackling the problems of potential investment projects' data management system are:

- Creating multimedia database;
- Utilizing the existing information technology and upgrading them;
- Upgrading the investment officers' skill level and motivating them;
- Creating strong communications with other organizations, collecting data from reliable external sources, and select data appropriately;
- Identifying potential investment projects throughout the country;

- Identifying information requirements of potential investors; and
- Connecting the Authority to the Internet community to advertise investment opportunities, to access practices of other countries, and to do collaborative research.

However, most of the above mentioned areas of concern are long term undertakings requiring extra resources to look into in detail and thus beyond the scope of this study. It is felt that major existing problems can be minimized by identification of information requirements of potential investors and creation of multimedia database for potential investment projects.

According to the results obtained from the questionnaires collected, documents analyzed, and discussions made, potential investors required:

- Information by spatial aggregation, that is, by country, region, zone, and woreda;
- Information by investment sector, sub-sector, and project-specific classification;
- Information on investment climate, including social conditions, regulatory measures, resources availability, geographic, infrastructures, economic and business conditions, professional services, and political conditions;
- Information on investment opportunities and costs; and
- Integrated information, including textual other types of data.

To render such services, officers at the Authority have required the following facilities.

- Interfacing facilities, including combining query mechanisms and event driven information access;

- Maintenance requirements, such as data acquisition, modify, delete, browse, search, transfer, copy, save, and print;
- Information access protection; and
- Maintain records to potential investors that applied for investment permit and relate the data to corresponding project(s).

4.1.2 Object Flow Diagram (OFD)

OFD depicts activities interfacing with other activities. It indicates the objects that are produced and the activities that produce and exchange them. The product is the end result that fulfills the purpose of the activity. Products move to other activities that add value to the product, that is, to produce another more complex product (Martin, 1993).

To understand the related main data management activities of the Authority, its basic business cycle is examined. At its broadest level, it includes the following basic activities:

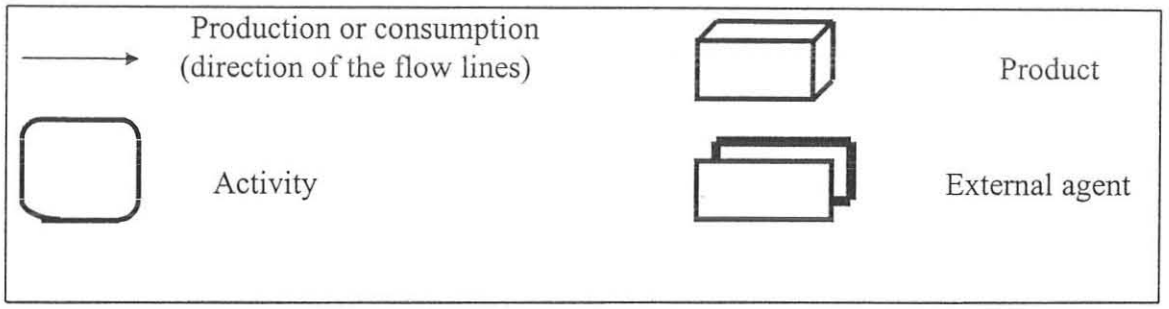
(1) Acquire data on potential investment projects from regions and other sources.

(2) Organize and process data on potential investment projects to meet anticipated users demands.

(3) Disseminate the information to potential investors and other users.

These functions are depicted using object flow diagram in Figure 4.1.

Symbols used:



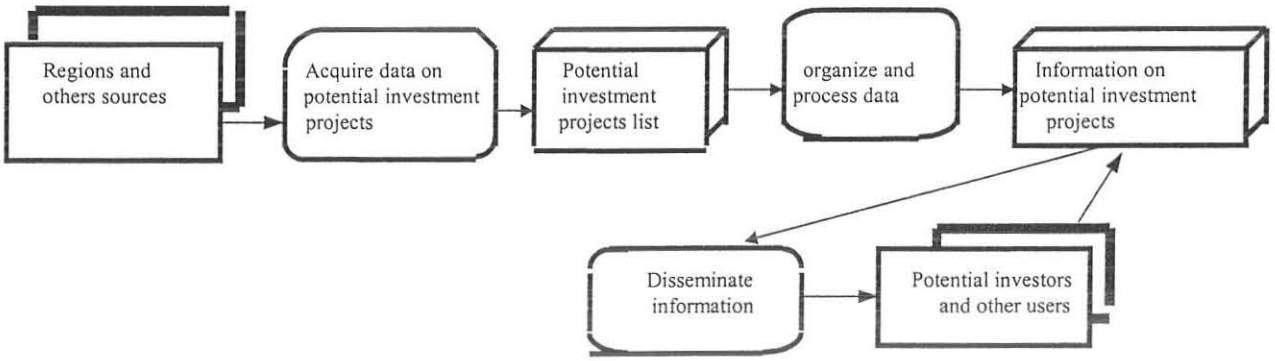


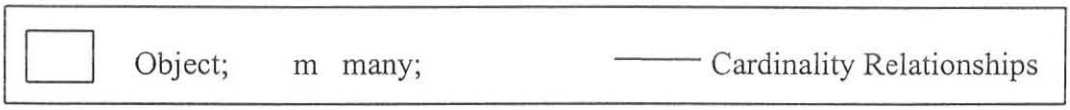
Figure 4.1 Object Flow Diagram for Basic Functions of the Authority

4.1.3 Object Relation Diagram

Object relation diagram maps the relationships among object types (Martin ,1993). This data model is implemented in a DBMS and becomes a foundation on which many applications are built.

Cardinality relationships to acquire data and disseminate information at the Authority is shown in figure 4.2.

Symbols used:



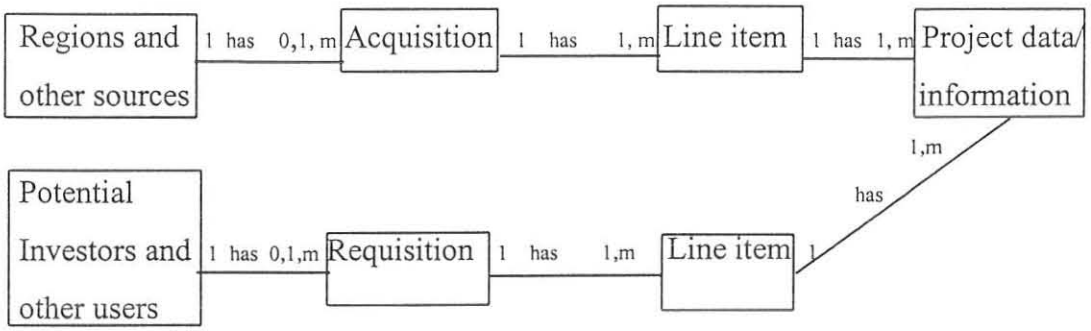


Figure 4.2 Seven Object Classes with Cardinality Relationship to Acquire Data and Disseminate Information

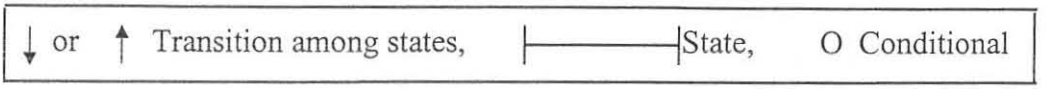
4.1.4 State Transition Diagram

In object-oriented analysis, the world is described in terms of objects and their states, as well as events the change those states (Martin, 1993). Object behavior analysis is concerned with what events occur, the corresponding state changes, and the operations resulting from these state changes. State changes trigger operations and operations result in state changes.

An object can exist in one of many states. It is created, may pass through various states, and may then be destroyed. In the language of object-orientation, requests are sent that cause methods to be activated. The methods in turn change the state of an object, which again is recorded in the object data.

The state transition diagram for potential investment project objects is shown below.

Symbols:



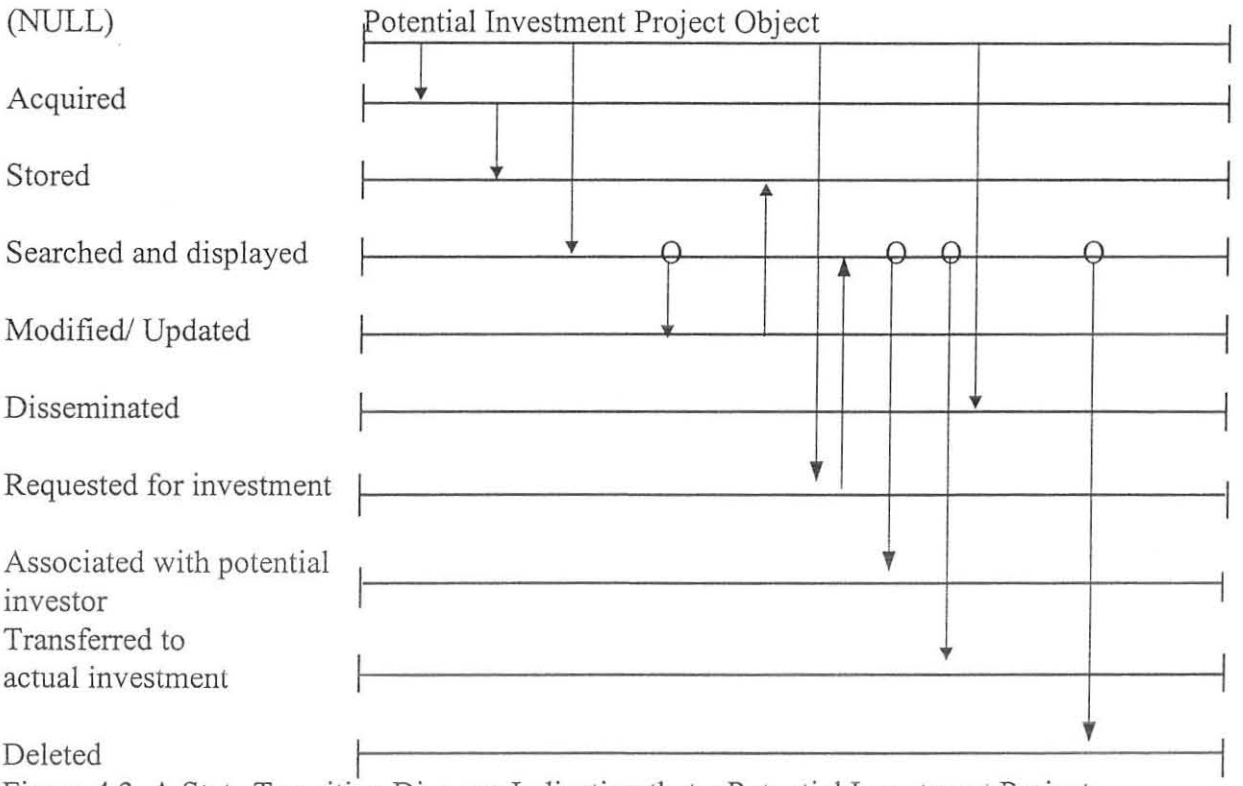


Figure 4.3 A State Transition Diagram Indicating that a Potential Investment Project Object Can Be in One of Above States, Each Displaying a Different Panel.

4.1.5 Write, Verify, and Update Use Cases

A use case is a special sequence of transactions performed by the system interacting with a user in dialogue (Sodhi and Prince, 1996). In other words, a use case is a mini-scenarios for the system in terms the user can understand. They are based on the tasks performed by the system users. A user can be an object which represents anyone that is external to the subsystem and interacts with it by exchanging information.

Use cases are important in that they provide basic groundwork for the requirements document, user manual, and test cases. Moreover, the collected description of use cases constitutes the total behavior of the system, and is the main part of the input that is designed.

Use cases for the proposed system were written and discussed with officers at the Authority, to make sure that they reflect their needs. The following use cases have been identified and verified with users:

(1) Potential investment projects' data access control;

(2) Maintenance of record:

- Acquire a record for a new potential investment project, investment climate, and spatial entity
- Modify the record
- Maintain records on potential investors
- Transfer the potential investment project to actual investment
- Browse the records on the screen from saved file
- Search a specific record from saved file and browse on the screen
- Delete the record; and

(3) Produce the output:

- Report the record on paper, on screen, or to a file.

Details of each use case are presented on the next pages.

USE CASE - ACCESS CONTROL

A machine is available at different offices of the Authority to perform record maintenance and inquiry functions. When the user needs to use the machine, he or she is prompt for his or her name and identification number or password.
If it matches with the secretly assigned value, a choice of actions on the screen appears. If the password does not match, the user is not allowed to run the application. The user can reenter the actual password or exit.

USE CASE - ACQUIRE DATA

<USE CASE - ACCESS CONTROL is prerequisite> The collected data on potential investment projects are verified for validity, including the available study on potential investment project (feasibility, technical, market, and detail). If they are valid, they are coded and classified into their appropriate category, otherwise they are rejected.

If the acquire button is pressed, the user is shown the record details to enter the data. If the record exists (identical project identification number), a message appears on the screen and the record will not be recorded. The user is then allowed to request another action or to exit.

USE CASE - BROWSE RECORD

<USE CASE - ACCESS CONTROL is prerequisite> The saved data on potential investment projects may be required to be browsed for different purposes, such as to examine and edit the available data and to satisfy users' information requirements.

If browse button is pressed, details of the current file record are displayed otherwise a message appears on the screen and the record will not be displayed. The user is then allowed to request another action or to exit.

USE CASE - SEARCH RECORD

<USE CASE - ACCESS CONTROL is prerequisite> The specific record on potential investment projects may be required to be searched for different purposes, such as to examine, to modify, to transfer, to delete, or to satisfy users specific information requirements.

If search button is pressed , the user is asked the identification number, title, location, or subsector of potential investment project to be searched. If it exists, details of that specific record are displayed otherwise a message appears on the screen and the record will not be displayed. The user is then allowed to request another action or to exit.

USE CASE - MODIFY RECORD

<USE CASE - ACCESS CONTROL and USE CASE - SEARCH RECORD or USE CASE BROWSE RECORD are prerequisites> The browsed or searched data may be decided to be changed or modified to make a correction or to include the newly acquired additional data.

If modify button is pressed, the user is asked the project identification number or project title. If the record exists, it is displayed and the user is allowed to change the details, otherwise a message appears on the screen. The user is then allowed to request another action or to exit.

USE CASE - MAINTAIN POTENTIAL INVESTOR RECORD

<USE CASE - ACCESS CONTROL is a prerequisite> To undertake investment, potential investor may select a particular potential investment project. However, the time lapsed from the project selection and investment application to the final decision to incur expenditure is relatively long because investors carry out their own pre-investment studies. Starting from the time of investment application, data on potential investors is maintained and associated with the corresponding potential investment project(s).

If the acquire button is pressed, the user is shown the record details to enter the data on potential investor. The user is then allowed to request another action or to exit.

USE CASE - TRANSFER RECORD

<USE CASE - ACCESS CONTROL and USE CASE - SEARCH RECORD or USE -CASE BROWSE RECORD are prerequisites> The browsed or searched data may be decided to be transferred to actual investment projects if the project becomes operational, that is, the life of the potential investment project object is lapsed.
If transfer button is pressed , the user is asked the project identification number. If the record exists, it is, displayed and the user is allowed to mark the record as it is transferred to actual investment, otherwise a message appears on the screen. The user is then allowed to request another action or to exit.

USE CASE - DELETE RECORD

<USE CASE - ACCESS CONTROL and USE - CASE SEARCH RECORD are prerequisites> When there is a need to remove the saved data on potential investment project permanently because of the discovered error(s) or reversed decision(s), the specific record should be searched from the file and displayed on the screen for deletion.

If delete button is pressed , the user is asked to enter the project identification number or the project title. If the record exists, a message is displayed for confirmation. If yes button is pressed, the record is deleted. The user is then allowed to request another action or to exit.

USE CASE - REPORT

<USE CASE - ACCESS CONTROL is prerequisite> The progress or periodic report on the potential investment projects may be reported to users. Reports can be printed on paper, on the screen, or to a file to share with others or use for reference. In addition to text, image and other forms of data are included on the report, if necessary.

If report button is pressed, options of where the report is printed is displayed and the user can select on paper, on screen, or to a file option. The user is then allowed to request another action or to exit.

USE CASE - COPY RECORD

<USE CASE - ACCESS CONTROL is prerequisite> The file on the potential investment projects may be copied to another file for back up or data transfer purpose.

If copy button is pressed, the user is asked from where to where to copy the file. If both the files exist and there is enough space on the target file to accommodate the data, a message appears on the screen confirming that the file is successfully copied. The user is then allowed to request another action or to exit.

4.2 Design

Design is the portion of the software development effort that focuses on the solution domain, that is, the targeted implementation hardware and software platforms (Lorenz, 1993). Object-oriented techniques are used to design the classes and methods for the system. To model the system, this phase provides detailed specifications for the classes of the solution domain.

The following strategies have been employed in the design part of the study:

a) Develop collaboration diagram, cardinality relationships, and identify classes, attributes, responsibilities (methods), subsystems, and contracts;

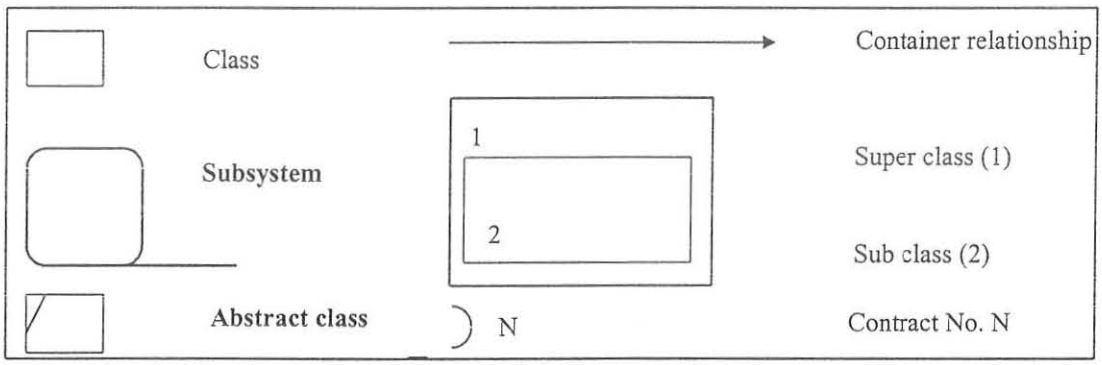
b) Place classes in the hierarchical diagram; and

c) Class definition.

4.2.1 Collaboration Diagram

Collaboration is a more common form of reuse than inheritance (Lorenz, 1993). Collaboration diagrams graphically depict classes, subsystems, contracts, and relationships between classes and subsystems. These diagrams, similar to others, are also used to document the system under development.

Symbols used:



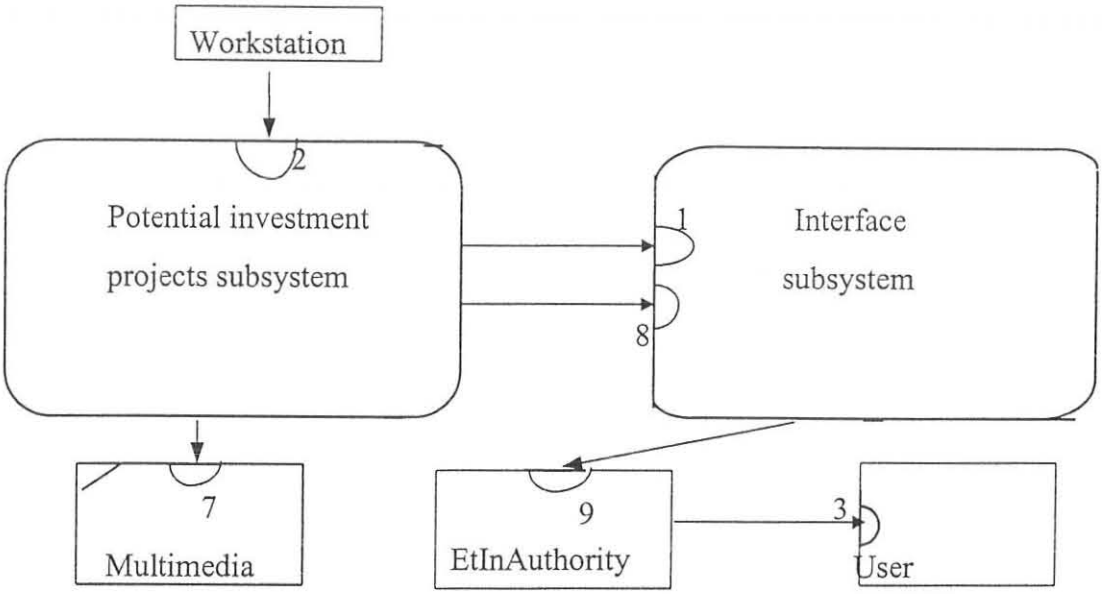


Figure 4.4 Collaboration Diagram

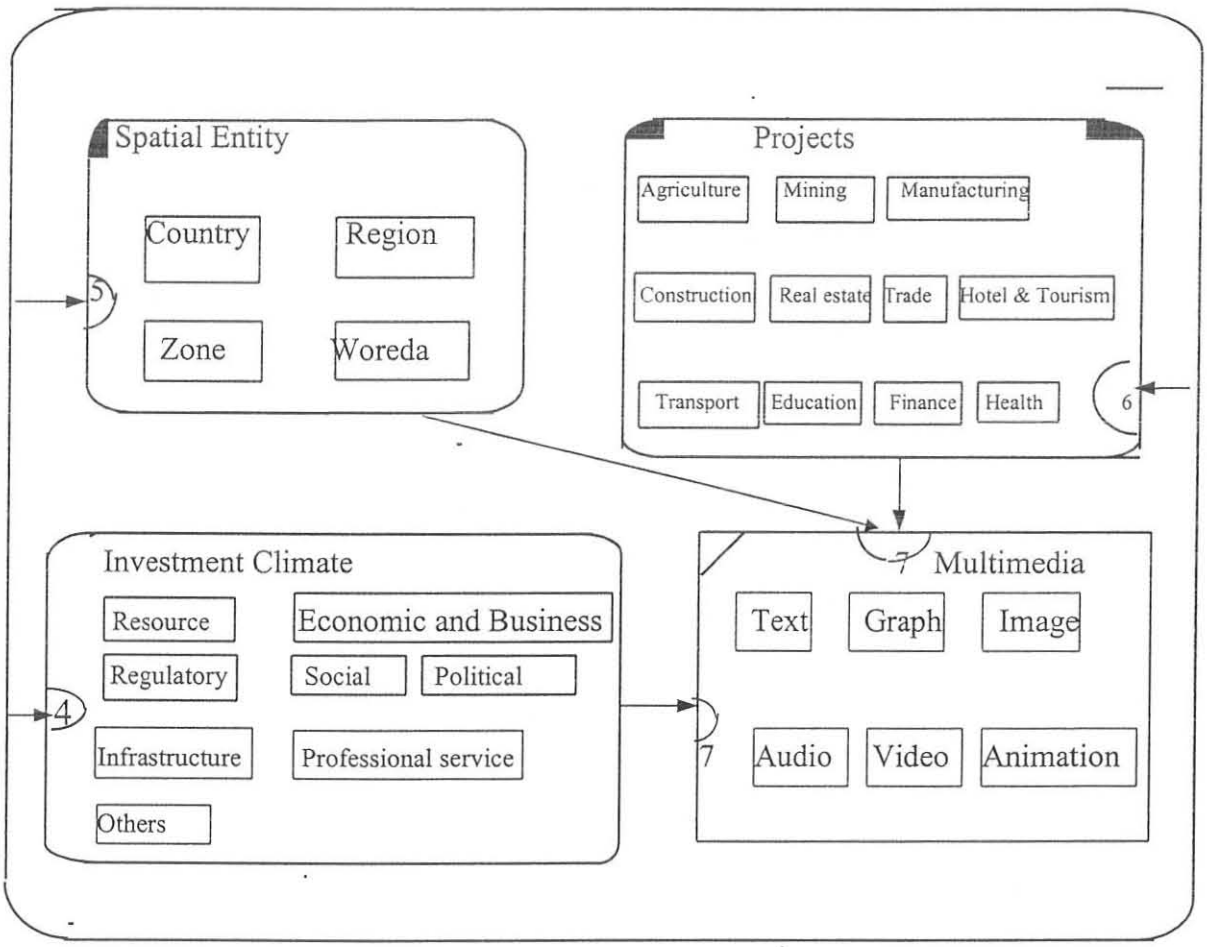


Figure 4.5 Collaboration Diagram within Potential Investment Projects' Subsystem

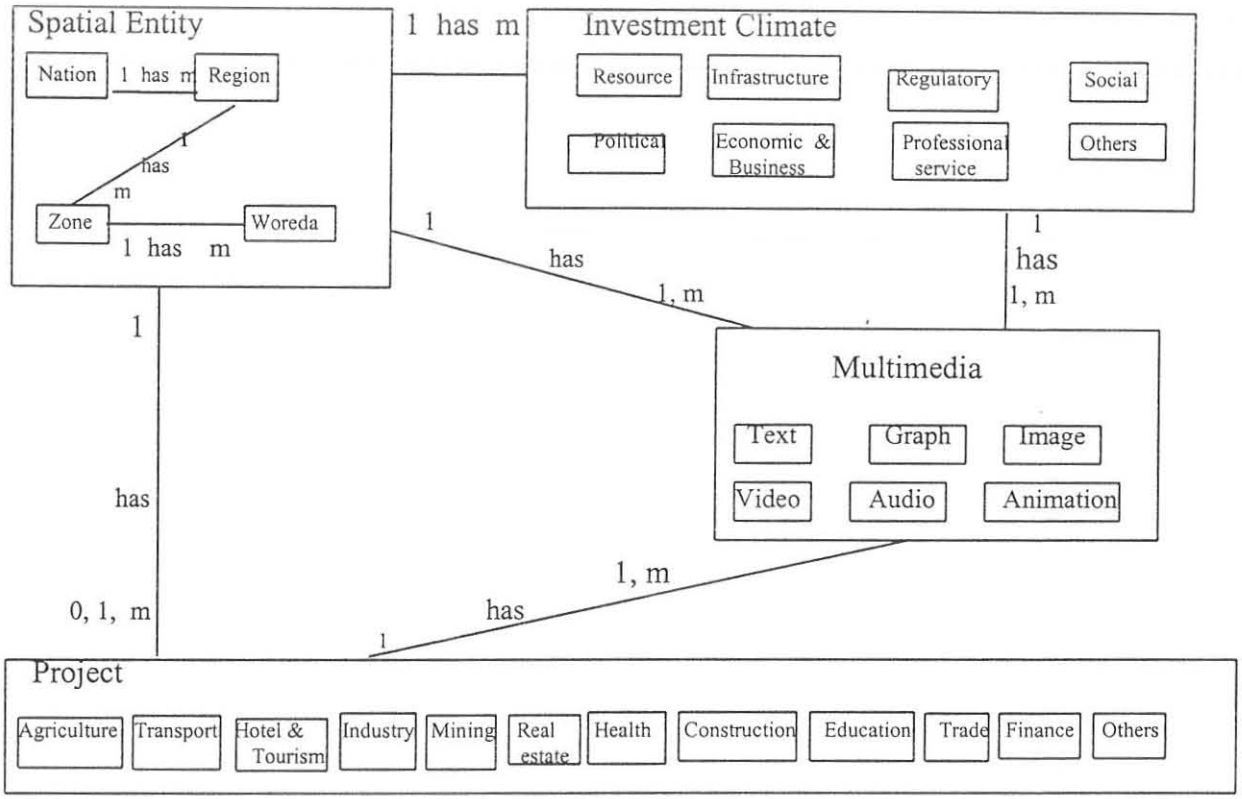


Figure 4.6 Three Object Potential Investment Project Subsystems and Multimedia Object with Cardinality Relationship

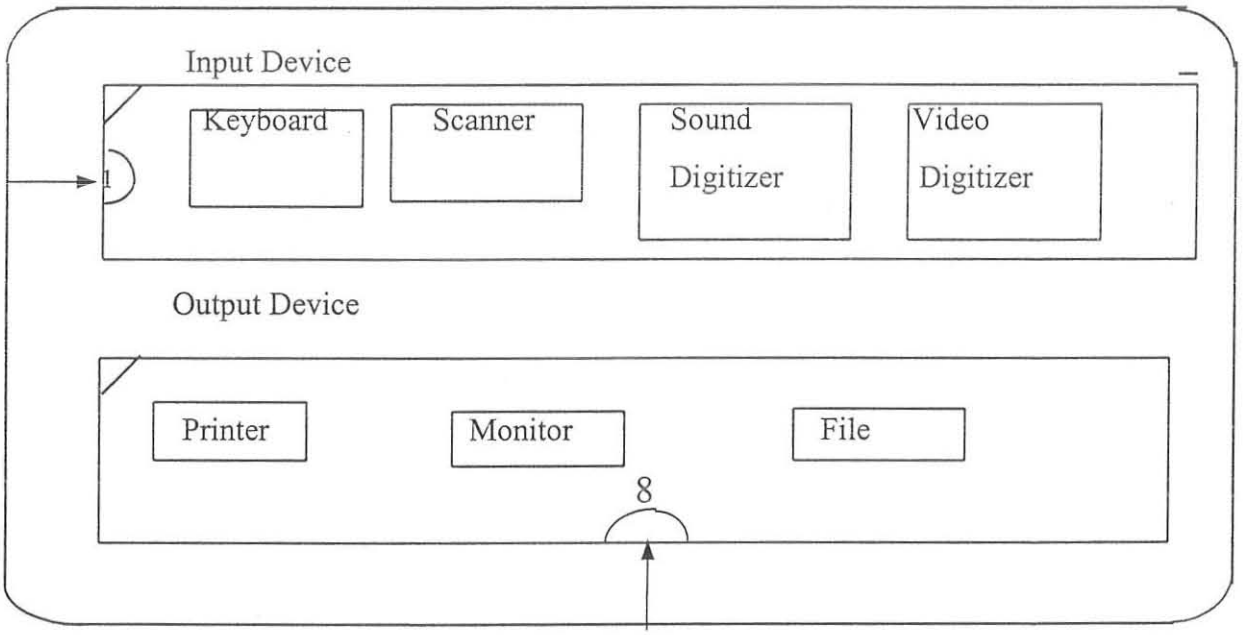


Figure 4.7 Collaboration Diagram within Interface Subsystem

4.2.1.1 Classes

Classes are any physical or conceptual entities with a distinct purpose. Without classes, the properties of each new object should be defined whenever it is created. Considering the requirements identified and verifications made with users, the following key and peripheral classes have been identified: potential investment projects, project, investment climate, spatial entity, infrastructure, resource, regulatory, social, political, economic and business, professional service, sector, multimedia, image, text, audio, video, potential investor, user, nation, region, zone, woreda, input devise, output devise, screen, printer, file, keyboard, scanner, sound digitizer, video digitizer, agriculture, mining, manufacturing, construction, real estate, trade, hotel and tourism, transport, education, finance, and health.

4.2.1.2 Subsystems

A subsystem is a group of classes that work together to provide a related group of functions (Lorenz 1993). Subsystem identification is done on the basis of functional cohesion boundaries or coupling between classes. For this study, subsystems were identified by functionality boundaries. Thus, they may be able to be controlled in the following four subsystems:

1. **The Spatial Entity Subsystem**

Description:	Coordinate the activities related to the maintenance of the spatial entity objects' record and report generation.
Contract	**Responsible Class**
[2] Process Transaction	Transaction
[5] Maintain Spatial Entity Record	Spatial Entity

2. **The Project Subsystem**

Description:	Coordinate the activities related to the project information.
Contract	**Responsible Class**
[2] Process Transaction	Transaction
[6] Maintain Project Record	Project

3. **The Investment Climate Subsystem**

Description:	Coordinate the activities related to the investment climate information
Contract	**Responsible Class**
[2] Process Transaction	Transaction
[4] Maintain Investment climate Record	Investment climate

4. **The Interface Subsystem**

Description:	Coordinate the input-output activities from and to users
Contract	**Responsible Class**
[1] Get input	Input devise
[8] Put output	Output device

4.2.1.3 Contracts

A contract includes description, subsystem, server class, and clients. The contracts identified in this study are described below.

CONTRACT - 1 : GET INPUT

Description: Handles input from the user

Server: Input device (Interface subsystem)

Clients: Workstation

CONTRACT - 2 : PROCESS TRANSACTION

Description: Process the potential investment projects (project, spatial entity, and investment climate) record including, acquire, modify, delete, browse, search, save, report and copy.

Server: Transaction

Clients: Workstation

CONTRACT - 3 : VERIFY PASS-WORD

Description: Provides basic functions for identifying the user whether he/she can have the rights to manipulate the data, that is, make sure that the user has a valid access password.

Server: User

Clients: EtInAuthority

CONTRACT - 4 : MAINTAIN INVESTMENT CLIMATE

Description: Handle and maintain investment climate data

Server: Investment climate subsystem (resource, infrastructure, regulation, etc.)

Clients: Transaction and transaction subclasses

CONTRACT - 5 : MAINTAIN SPATIAL ENTITY

Description: Provides basic spatial entity record maintenance functions

Server: Spatial entity subsystem (Nation, region, zone, and woreda)

Clients: Transaction and transaction subclasses

CONTRACT - 6 : MAINTAIN PROJECT RECORD

Description: Provides basic project record maintenance functions.

Server: Project subsystem (project, agriculture, industry, mining. etc.)

Clients: Transaction and transaction subclasses

CONTRACT - 7 : MAINTAIN AND ASSOCIATE MULTIMEDIA

Description: Maintain and handle data for potential investment projects

Server: Multimedia (Text, image, audio, and video)

Clients: Spatial entity, investment climate, and project subsystems and their corresponding classes

CONTRACT - 8 : PUT OUTPUT

Description: Provides output to the user, including display message, project, spatial entity, and investment climate.
Server: Output devise (Interface subsystem)
Clients: Spatial entity, project, and investment climate subsystems and their corresponding lasses

CONTRACT - 9 : VERIFY TRANSACTION

Description: Make sure that the transaction can be started for the user.
Server: EtInAuthority
Clients: Input device

4.2.2 Classes Hierarchical Diagram

Only classes that have hierarchical relationships within the application are shown in the diagram. This type of diagram helps us to think clearly about good categorization and it shows the paths that will be implemented in the hierarchical diagram. Also, a hierarchical diagram can show inheritance hierarchy or composed of hierarchy (Martin, 1993).

Inheritance hierarchy relates to inheritance and it is used to locate the class in the class hierarchy to optimize the reuse gains. The greatest benefit of driving subclasses comes when a hierarchy of classes is built, with each subclass inheriting most of its functionality from a super class. A subclass modifies the functionality by overriding inherited members or adding new ones. The result is easy code maintenance and a high degree of reusability. In this study,

inheritance hierarchies were drawn for: (1) project, investment climate, and interface subsystems; and (2) transaction and multimedia abstract classes. Here, subsystems are considered as abstract classes.

When an object contains another object, there is an instance of each child object associated with its parent. The child object is part of the parent object. The lower-level items in a composed of hierarchy do not inherit properties from the higher level items. In this study, composed of hierarchy was drawn for potential investment project subsystem.

Sometimes, both inheritance and composition can be shown on the same diagram. In this study, spatial entity subsystem was depicted to show first inheritance (spatial entity as super class and nation, region, zone, and woreda as subclasses) and latter composition (nation composed of region, region composed of zone, and zone composed of woreda).

Symbols used for the diagram are:

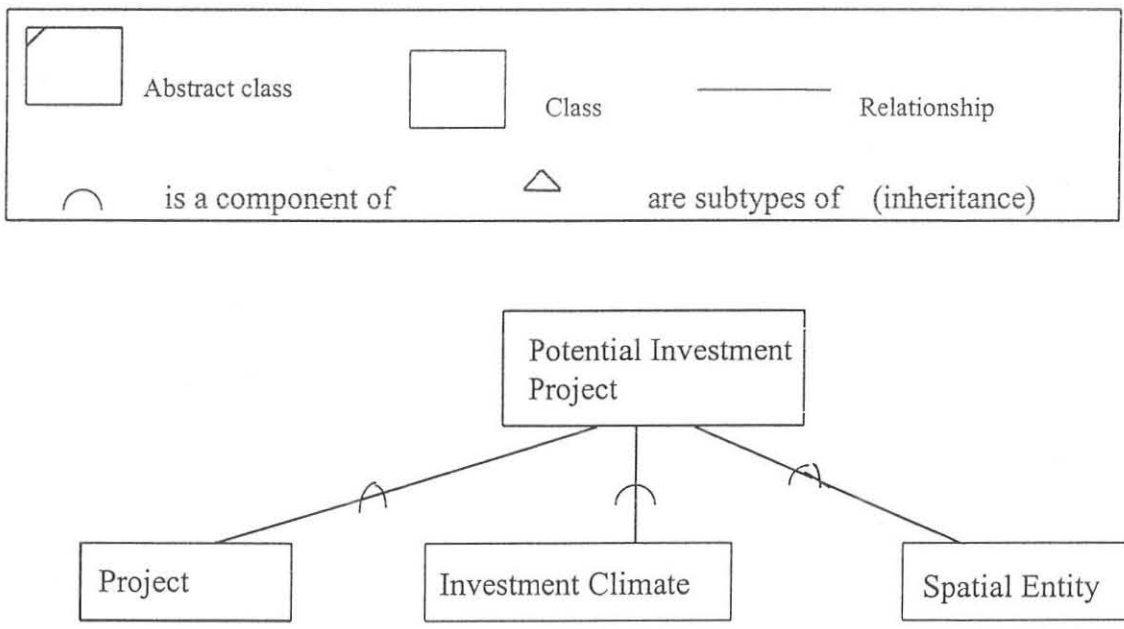


Figure 4. 8 Composed of Hierarchy of Potential Investment Project Subsystem

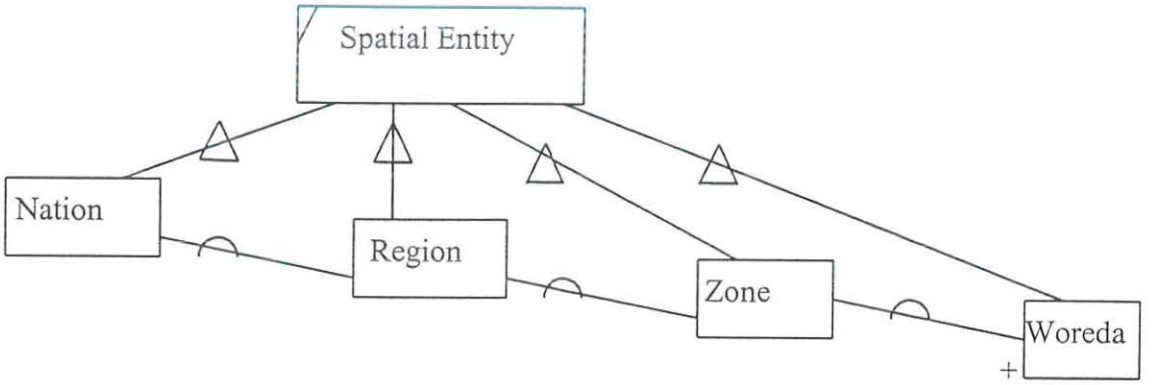


Figure 4.9 Hierarchical Diagram of Spatial Entity. "+" indicates that further sub-classification may be required.

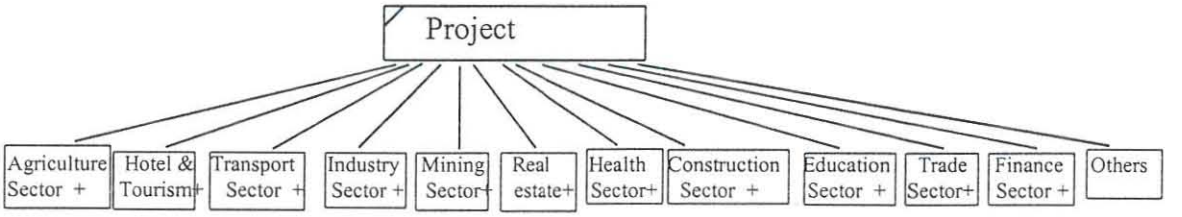


Figure 4.10 Inheritance Hierarchy of Project. "+" indicates that further classification may be required.

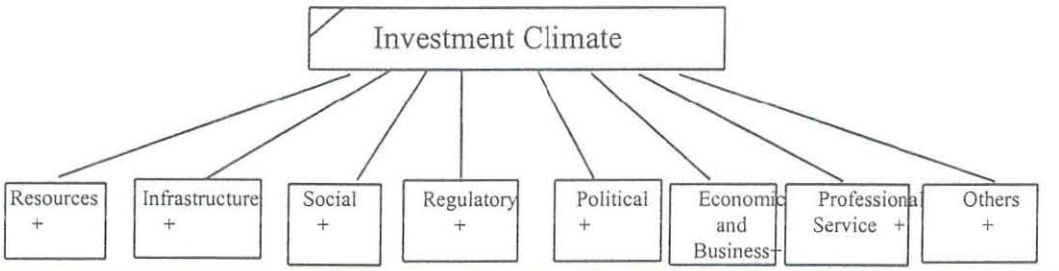


Figure 4.11 Inheritance Hierarchy of Investment Climate. "+" indicates that further classification may be required.

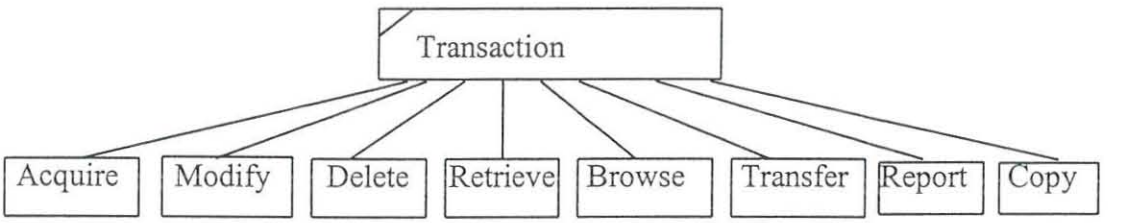


Figure 4.12 Inheritance Hierarchy of Transaction.

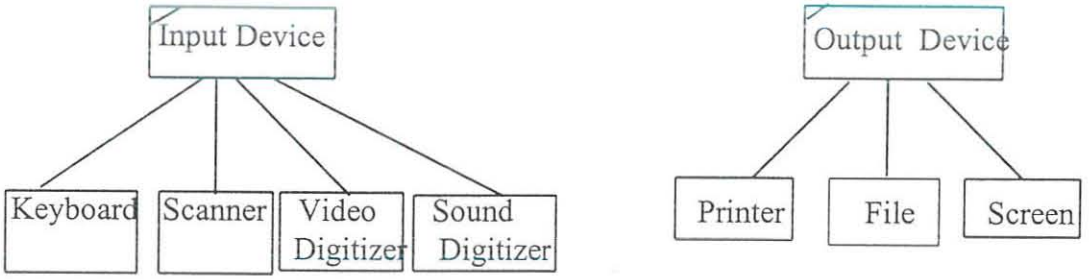


Figure 4.13 Inheritance Hierarchy of Input and Output devices (Interface Subsystem).

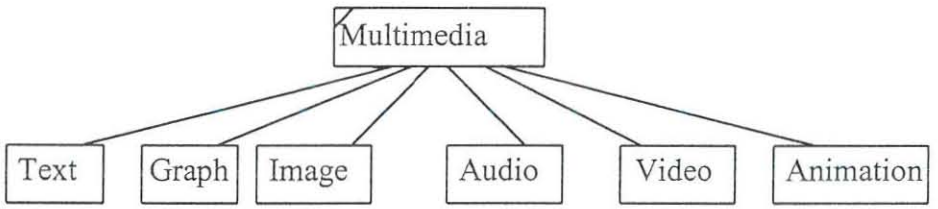


Figure 4.14 Inheritance Hierarchy of Multimedia.

4.2.3 Class Definition

Classes are defined by analyzing the requirements of the project, that is, the data it needs to track, the task it needs to perform, and the output it needs to produce. The classes defined in this study, however, include only those methods that are more general, public and basic. To minimize, repetitions, methods are defined only at super class levels. For some classes, variable or field definitions are not exhaustive. Moreover, interfacing or peripheral classes are not defined because main emphasis was given to classes that are going to be included in the implementation (programming) part of the study.

The key classes are defined as follows.

CLASS – PROJECT

Description – It is an abstract class and provides common attributes to project type objects

Super class – Persistent object
Subclasses – investment sectors
Contract – [6] Maintain project record

Public Methods – Acquire, Delete, Browse, Search, Modify, Save, Selectsec, Selectreg, sendimage, and Callimage

Responsibility	**Description**
Acquire	Acquire and inserts a new project in the database
Modify	Edit project object
Delete	Delete project object
Browse	Show project object
Search	Find and display the specific project object
Save	Save the project record
Selectsec	Select the type of investment sector to use currently
Selectreg	Select the region to use currently
Sendimage	Send a message to image class for creation
Callimage	Activates the object containing corresponding image

Data	**Description**
projectid	Project identification number
projtitle	Project title
sector	Sectoral classification of the project
subsector	Sub-sectoral classification of the project
region	Region where the potential project is available
zone	Zone where the potential project is available
woreda	Woreda where the potential project is available
totalcost	Total capital expenditure required for the project
projlife	Expected time required from the investment decision to the start up of the plant or project
product	Type of product(s) to be produced by the project
capacity	Level of production of the project for each product
registdate	Date on which the potential project is registered
study	Available study on the project, that is, (Pre)-Feasibility, opportunity, technical, market, and/or detailed project description
projtype	Type of the project, that is, new, expansion, and/or modernization
poinvestor	Name of the potential investor (organization) that applied to start investment activity on the project
note	Additional important facts on the project, including purpose of the project, available local and foreign market, available infrastructures on the site (transport, electricity, water, financing source, etc), material and human-power required, nature of the competition, initiator of the project, licenses required, know-how required, problems (if any), early operation cost, yearly benefit, life of the project, etc.

CLASS – AGRICULTURE SECTOR

Description – It is responsible to provide common attributes to all types of agricultural projects

Super class – Project
Subclasses – None

Contract – [6] Maintain project record

Public Methods - Acquire, Delete, Browse, Search, Modify, Save, Sendimage, and Callimage

Data	**Description**
area	Total area coverage of the project
projectid	Project identification number
waterfeed	Water feeding, that is, either irrigation , rain-fed, or both irrigation and rain-fed
temprature	Temperature of the area where the project is cited
rainfall	Rainfall of the area where the project is cited
elevation	Elevation of the area where the project is cited
distance	Distance of the project site from the main city and main road.
Fertility	Fertility of the area where the cite is located

CLASS – IMAGE

Description – It is responsible to maintain and provide information on image of the project

Super class – Multimedia
Subclasses – None
Contract – [7] Maintain and associate multimedia
Public Methods – Acquire, Delete, Browse, Search, Modify, and Save

Data	**Description**
projectid	Project identification number
imagetitle	Title of image
imagedate	Date on which the picture is taken or developed
image	Picture or image of the project
imagesource	Source, that is, where the image is generated

CLASS – AUDIO

Description – It is responsible to maintain and provide information on audio or sound message
Super class – Multimedia
Subclasses – None
Contract – [7] Maintain and associate multimedia
Public Methods – Acquire, Delete, Browse, Modify, and Save

Data	Description
projectid	Project identification number
messtitle	Title of the message
messdate	Date on which the message is produced
message	Content of the message
messource	Source, that is, where the message is produced

CLASS – POTENTIAL INVESTOR

Description – It is responsible to maintain and provide information on potential investors

Super class – persistent object
Subclasses – None
Public Methods – Acquire, Delete, Browse, Search, Modify, and Save

Data	Description
projectid	Project identification number
projtitle	Title of the project for which the potential investor applied for investment
poinvestor	Name of the potential investor or organization
nationalty	Nationality of the potential investor
country	Country of the potential investor
city	City of potential investor
telephone	Phone number of the potential investor
pobox	P.O.Box address of potential investor
email	Email address of the potential investor
history	Past history of potential investor
requesdate	Date on which the potential investor applied for the project
startdate	Date on which the potential investor promised to start the project execution
financing	Potential investor's source of fund to execute the project
formation	Type of business formation, that is, proprietorship, partnership, or corporation

CLASS – INDUSTRY SECTOR

Description – It is responsible to maintain and provide information in all types of industrial projects

Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
projectid	Project identification number
power	Electric power required for the project
water	Volume of water required to run the project
level	The level of the industrial project, that is, heavy, medium, or small
input	The required input(s) for the project
distance	Distance of the project cite from the main city or main road

CLASS – TRADE SECTOR

Description – It is responsible to maintain and provide information on all types of trade projects
Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
customer	Intended group of customers to address
salesvolume	Expected yearly sales volume of the project
supplier	Possible suppliers of the trade project
category	The category of the project as foreign or domestic

CLASS – HEALTH SECTOR

Description – It is responsible to maintain and provide information on all types of health projects
Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
patient	Expected group of beneficiaries of the health project
number	Expected number of beneficiaries from the project
level	The level of the project

CLASS – EDUCATION SECTOR

Description – It is responsible to maintain and provide information on all types of education projects

Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
student	Expected group of beneficiaries from the project number Expected number of beneficiaries from the project

CLASS – MINING SECTOR

Description – It is responsible to maintain and provide information on mining projects
Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
area	Total area coverage of the project
deposit	Expected volume or deposit

CLASS – CONSTRUCTION SECTOR

Description – It is responsible to maintain and provide information on all types of construction projects

Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
grade	Grade of the constructor, that is, 1,2,3,4,5,6,7,8 or 9

CLASS – REAL ESTATE SECTOR

Description – It is responsible to maintain and provide information on all types of real estate projects

Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
level	Level of income of the society in the area
household	Numbers of populations and houses in the area

CLASS – HOTEL AND TOURISM SECTOR

Description – It is responsible to maintain and provide information on all types of hotel and tourism projects

Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
level	Level of the project

CLASS – TRANSPORT SECTOR

Description – It is responsible to maintain and provide information on all types of transport projects

Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
route	The transportation route where the project is to be served
passenger	Intended passengers and their number

CLASS – FINANCE SECTOR

Description – It is responsible to maintain and provide information on all types of finance projects

Super class – Project
Subclasses – None
Contract – [6] Maintain project record

Data	Description
reservecap	The proportion of capital to be reserved as of a warrantee

CLASS – INVESTMENT CLIMATE

Description – It is responsible to maintain and provide information on investment climate

Super class – Persistent object
Subclasses – Investment climate subclasses
Contract – [4] Maintain investment climate record
Public Methods – Acquire, Delete, Browse, Search, Modify, Save, and Select

Data	Description
date	Date on which the information is registered
type	Type of the investment climate, such as resource, infrastructure, regulation, social, political, economic and business, professional service
subtype	Further classification of each type
level	Level at which the investment climate data is registered, that is, nation, region, zone, or woreda
source	Source that proclaimed, declared or initiate the investment climate
additional	Additional source to be referred for further understanding

CLASS – RESOURCE

Description – It is responsible to maintain and provide information on resource of the nation, region, and zone.
Super class – Investment climate
Subclasses – None
Contract – [4]Maintain investment climate record

Data	Description
source	local or foreign
humanpower	Availability of human power (skilled, semi-skilled, and unskilled, number, qualification, etc.)
material	Availability of raw material for the projects identified (type, quantity, etc.)

CLASS – INFRASTRUCTURE

Description – It is responsible to maintain and provide information on investment infrastructures of the nation, region, zone, woreda, and project-specific

Super class – Investment climate
Subclasses – None
Contract – [4] Maintain investment climate record

Data	Description
transport	Availability and standard of roads, railways, shipping lines, and airlines
tellecom	Availability and standard of telecommunications
finance	Availability, standard, and functions of banks and insurance
electric	Availability, consistency, and standard of electricity
water	Availability, quantity, and consistency of water

CLASS – REGULATION

Description – It is responsible to maintain and provide information on investment related regulations of the nation and region.

Super class – Investment climate
Subclass – None
Contract – [4] Maintain investment climate record

Data	Description
date	Date of regulation when it is declared
impexpo	Import-export policy
taxation	Taxation measures
permit	Licenses permission policy
incentive	Incentives allowed
copyright	Copyright policy
patent	Patent policy
exchange	Foreign money exchange policy
repatrate	Capital repatriation policy
laborlegis	Labor legislation policy
reserve	Reservation areas for public sector

CLASS – SOCIAL CONDITION

Description – It is responsible to maintain and provide information on social conditions of the nation and region.
Super class – Investment climate
Subclasses – None
Contract – [4] Maintain investment climate record

Data	Description
education	Educational level (percentage of literate population, educational expenditure, school participation rate, number of students attending school, number of teachers)
health	Health coverage, medical expenditure, number of physicians and nurses
population	size of population, birth rate, life expectancy, death rate, infant mortality rate, ethnic composition
customs	Social customs, traditions, and cultural practice, religion composition, language composition,

CLASS – POLITICAL CONDITION

Description – It is responsible to maintain and provide information on political condition of the nation and region.
Super class – Investment climate
Subclasses – None
Contract – [4] Maintain investment climate record

Data	Description
life	Life of the government
attitude	Attitude of the government towards investment
peace	Peace condition of the country, including fight for power, armed conflict, etc.

CLASS – ECONOMIC AND BUSINESS CONDITION

Description – It is responsible to maintain and provide information on economic and business condition of the nation and region.

Super class – Investment climate
Subclasses – None
Contract – [4] Maintain investment climate record

Data	Description
market	Availability of market
GDP	Gross domestic product and its trend
expenditure	Level and type of government expenditure

CLASS – PROFESSIONAL SERVICE

Description – It is responsible to maintain and provide information on professional services of the nation.
Super class – Investment climate
Subclasses – None
Contract – [4] Maintain investment climate record

Data	Description
accounting	Accounting and auditing professionals in number and level of qualification
legal	Legal professionals in number and level of qualification
management	Management professionals in number and level of qualification

CLASS – SPATIAL ENTITY

Description – It Provides common attributes to all types of spatial objects
Super class – Persistent object
Subclasses – Nation, region, zone, woreda
Contract – [5] Maintain Spatial Entity
Public Methods – Acquire, Delete, Browse, Search, Modify, Save, Select

Data	**Description**
name	Classification name of the entity
level	Hierarchic division (national, regional, zone, woreda)
totalarea	Total area of the entity
boundary	Boundary shared with other political boundaries
environment	A document containing descriptions of the environment
latitude	Latitudinal measure of a location
longitude	Longitudinal measure of a location
altitude	Average altitude or elevation of the entity
map	Map of the entity
peculiar	Peculiar feature of the entity

CLASS – NATION

Description – It Provides attributes for all country objects
Super class – Spatial entity
Subclasses – None
Contract – [5] Maintain Spatial Entity

Data	**Description**
capitalcity	Capital city of the country
regionno	Number of regions in the country
regionname	Name of regions in the country
language	National language(s) of the country

CLASS – REGION

Description – It Provides common attributes to all types of region objects

Super class – National
Subclasses – None
Contract – [5] Maintain Spatial Entity

Data	**Description**
regtown	Capital town of the region
zoneno	Number of zones in the region
zonename	Name of zones in the region
regionlang	Official language of the region

CLASS – ZONE

Description – It provides common attributes to all types of zone objects

Super class – Region
Subclasses – None
Contract – [5] Maintain Spatial Entity

Data	**Description**
zonetown	Capital town of the zone
zonelang	Official language of the zone
woredano	Number of woredas in the zone
woredaname	Name of woredas in the zone

CLASS – WOREDA

Description – It Provides common attributes to all types of woreda objects
Super class – Zone
Subclasses – none
Contract – [5] Maintain Spatial Entity

Data	**Description**
woredatown	Capital town of the woreda
kebeleno	Number of kebeles in the woreda
kebelename	Name of kebeles in the woreda

4.3 Prototype Implementation

4.3.1 General

In dealing with the implementation, a prototyping approach was followed. Prototyping here is used to mean a partially functional version of the proposed solution. As such the implementation under reference does not aim at constructing the full versions of all data files or support all the procedures and functions of the proposed system. Instead, for reasons of

reducing the magnitude of the attempt to a manageable size, the prototyping was restricted to the project subsystem with emphasis on the agricultural sector.

The prototype was developed using dBASE for Windows, version 5.0. In addition to its structured programming support, dBASE for Windows provides some features for creating and using objects and classes, and declare subclasses from super classes thereby enabling object-oriented design and implementation. It was possible to crate and edit, as well as play back and display, popular windows multimedia formats for sounds and graphic images.

However, because it is basically a relational DBMS it is not without its limitations when it comes to some basic design concepts. For instance, it separates the data from the object and store them in tables, which is not in accord with object characteristics. For persistent objects, as dBASE does not provide straight solutions (not provides as basic feature), tables have been created to store their attributes, and for procedures another set of files, mostly forms, has been created. A form is one of the standard class provided by dBASE for Windows and used to build the user interface of an application.

4.3.2 Classes Implemented

The key classes considered for implementation in the prototype are: project, agriculture, image, audio, and potential investor. A brief description of each is given below.

Project Class: The prototype is developed by considering project class as the base class of investment sectors. It is derived from the standard FORM class. Project class

contains entry fields and methods for entering and displaying common values. Project identification number is used as a unique identification variable or keyword. Different investment sector classes inherit variables and methods from this base class. Although only the agriculture class is derived and implemented in the program, it is possible to extend the implementation for other classes with minor modification.

Agriculture Class: This is one of the twelve derived classes or subclasses of the project class. It borrows or inherits variables and functions from its super class (project class) and adds its own variables and functions.

Image class: This is created to provide image or picture information. It is associated with the project and the agriculture classes.

Audio Class: This is created to provide messages from the investment officers. In the prototype, this is associated with the welcome screen.

Potential investor: This is created to provide information on the potential investors that are applying for investment permit by selecting potential investment project(s). In the prototype, this is associated with the project and the agriculture classes.

For each of the above mentioned classes, their corresponding tables were created to store their attributes. For procedures and capturing of events, another set of files (mostly forms) has been created. The designed forms contain window interface objects (controls) that let users to maintain transactions. Since it is a container of the objects it displays, releasing a form

definition from memory automatically releases the definitions of the objects it contains. The attributes of tables and most of the procedures of forms are taken directly from their corresponding class definitions.

Other Interfacing Classes: Welcome screen, password dialog box, potential investment project dialog box, investment sector dialog box, region dialog box, search dialog box, and report dialog box are also created. In addition to these, many built in classes or controls have been used.

4.3.3 Screen Flow and Layout

The sequence of screens, data entry forms, and dialog boxes of the prototype is as shown below.

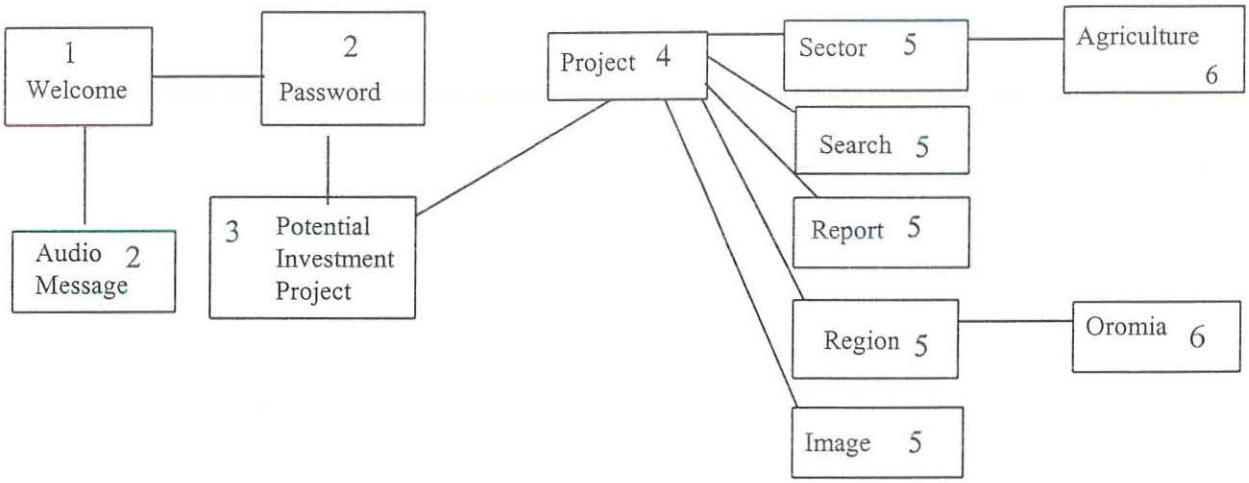


Figure 4.15 The Flow of Screens, Data Entry Forms, and Dialog Boxes

Brief descriptions and corresponding screen dumps for the main parts of the above mentioned screens, data entry forms, and dialog boxes are given below.

The Welcome Screen: The welcome screen, shown in Figure 4.16, appears when the program starts. It is used to display a welcome message to the database user. As shown in the figure, the screen has the map of Africa, focused on Ethiopia, scanned from World Report on Ethiopia dated March 7, 1998 as a background. This screen also includes close, sound message, and continue controls; thus it is possible to close the welcome window and terminate the program, to listen to the message of the investment officer, or to continue or proceed to the other parts of the database by clicking these buttons respectively. When the continue button is clicked, the password dialog box appears.

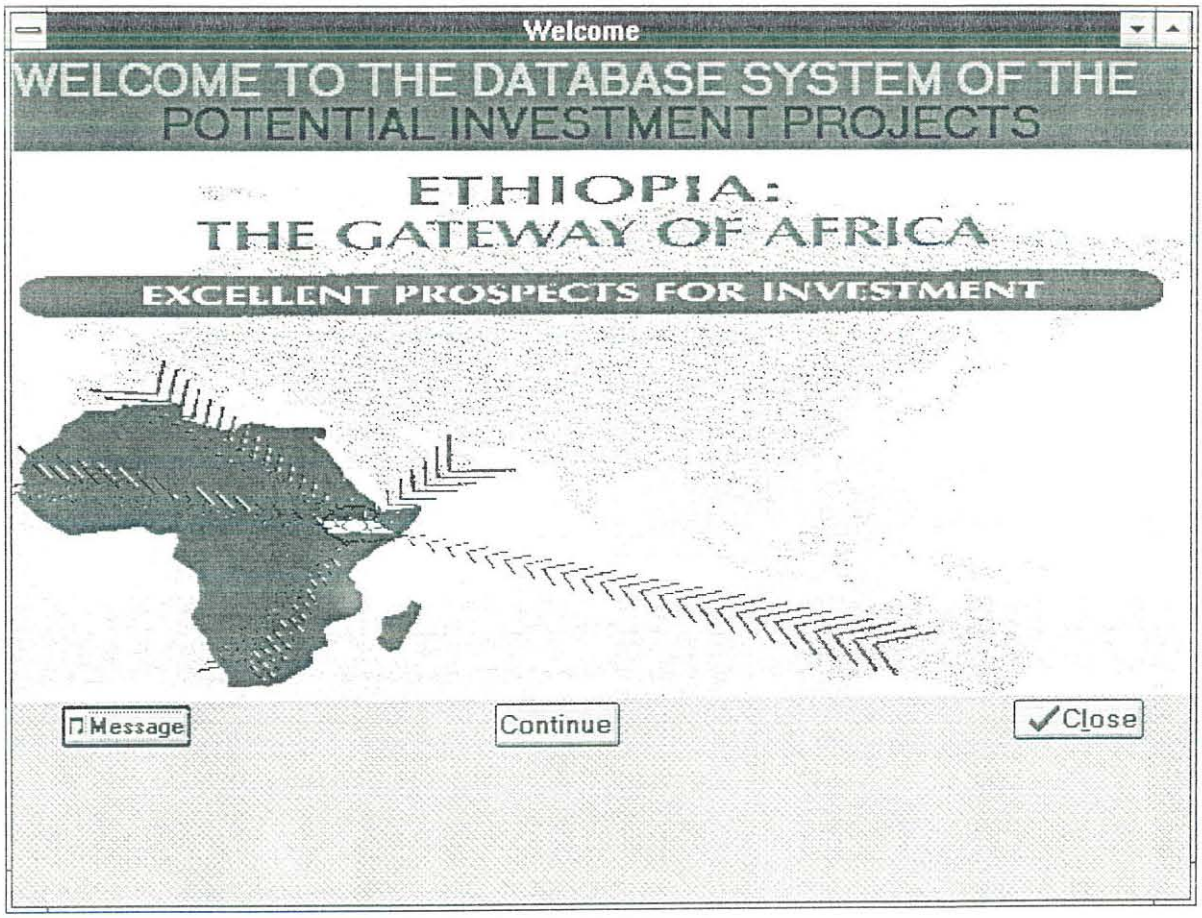


Figure 4.16 Welcome Screen

The Potential Investment Project Dialog Box: When the continue button is clicked from the password dialog box, after entering the right password, potential investment project dialog box, shown in Figure 4.17, is activated. As shown, this provides buttons identifying the three basic subsystems. Although the user can select any one of them, implementation is made only for project subsystem, that is, the other two options are not developed in this version.

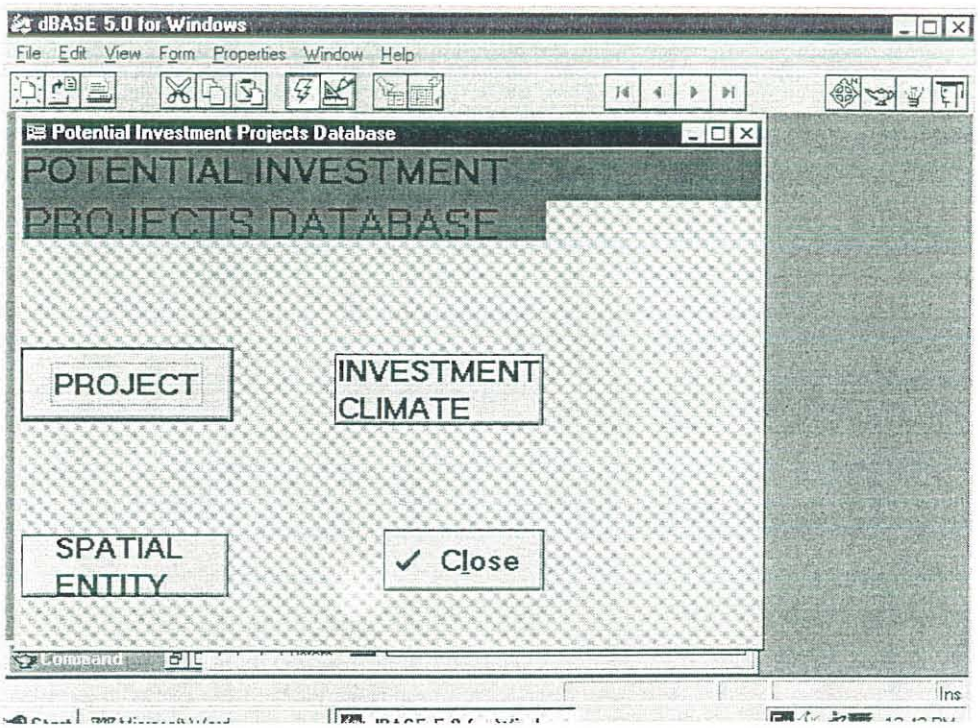


Figure 4.17 Potential Investment Project Dialog Box

The Project Data Entry Form: When the project button is selected or clicked from the potential investment project dialog box, the project data entry from, shown in figure 4.18, is opened. As can be seen, this consists of common entry fields and methods of all investment sectors. The content of this form includes information on sectoral classification, location, expected benefits and costs, and other attributes on each potential investment project.

The project data entry form contains various controls which are used to maintain records and produce reports. Images relating to the investment sectors are associated with their corresponding text data. If one wants to view the image of the object, he/she can click on the image button which opens a form that displays the information on the image and binary field. Using this form the user can add data, view image by double clicking on the binary field, and edit image data. It is also possible to navigate through image records. Searching of saved data

is possible by the project identification number, project title, location, or subsector. New data can be acquired, saved data can be browsed, and a report can be generated. The user can navigate from record to record as well as between the higher and lower level windows or classes. Moreover, data can be accessed by region as well as sectoral classifications.

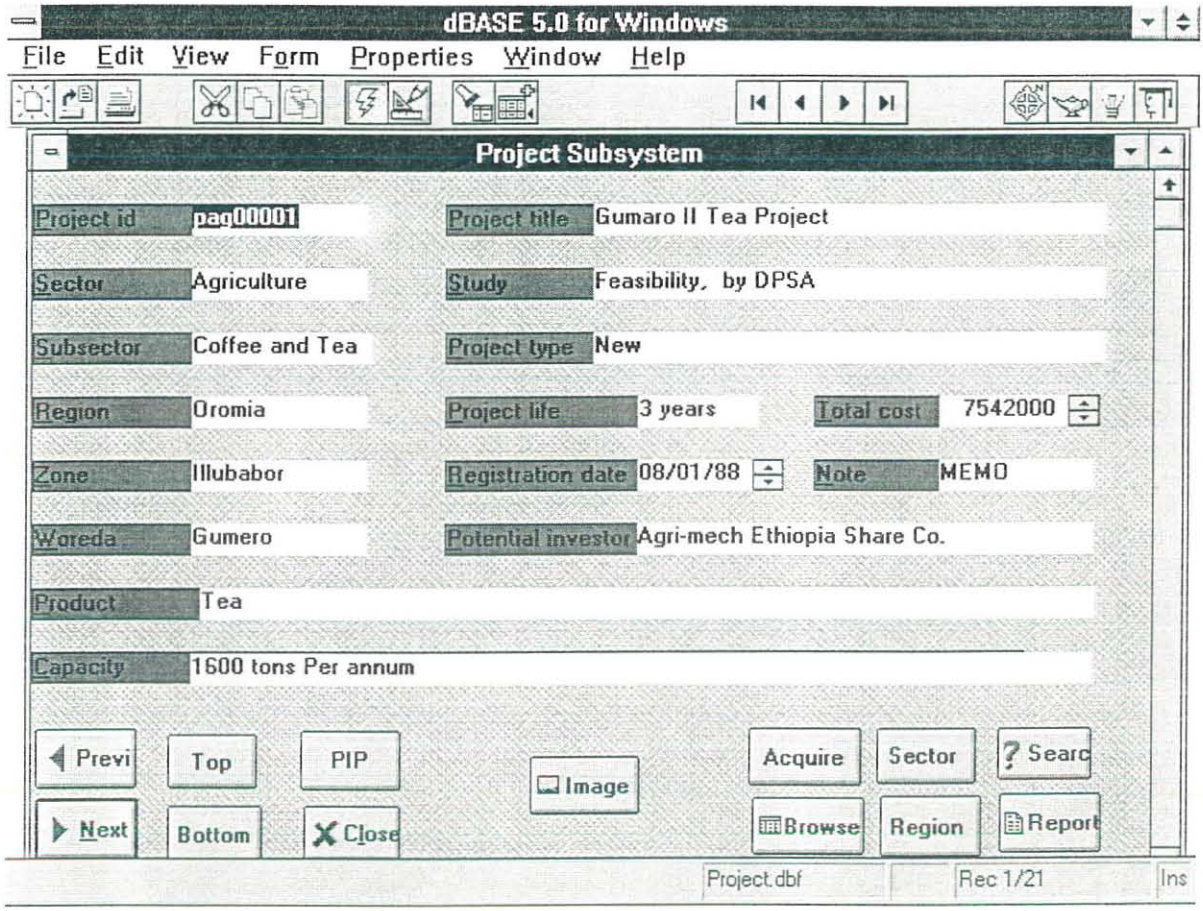


Figure 4.18 Project Data Entry Form

The Investment Sector Dialog Box: When the sector button is selected from the project data entry form, a dialog box, shown in Figure 4.19, containing investment sectors of the country is opened. From the available options, however, implementation is made only for agriculture sector, for reasons indicated earlier.

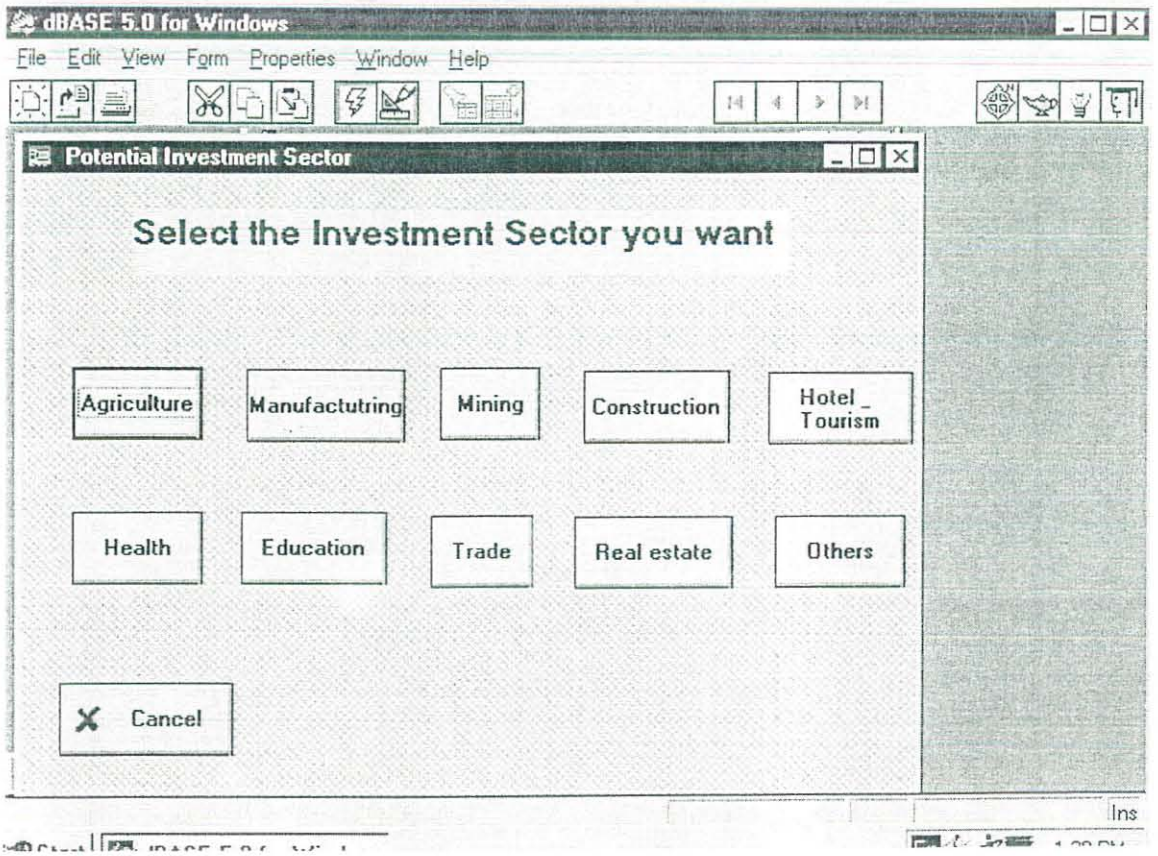


Figure 4.19 Investment Sector Dialog Box

The Agriculture Data Entry Form: When the agriculture button is clicked from the sector dialog box, a data entry form for the agriculture investment sector, shown in Figure 4.20, is opened. This form inherits common properties and methods from the project data entry form. It also adds its own properties and methods. Hence, there was a need to bring together data from different tables and supply to the agriculture class. This was achieved by inheritance from project form as well as creating a query containing data from project, agriculture, image and potential investor tables.

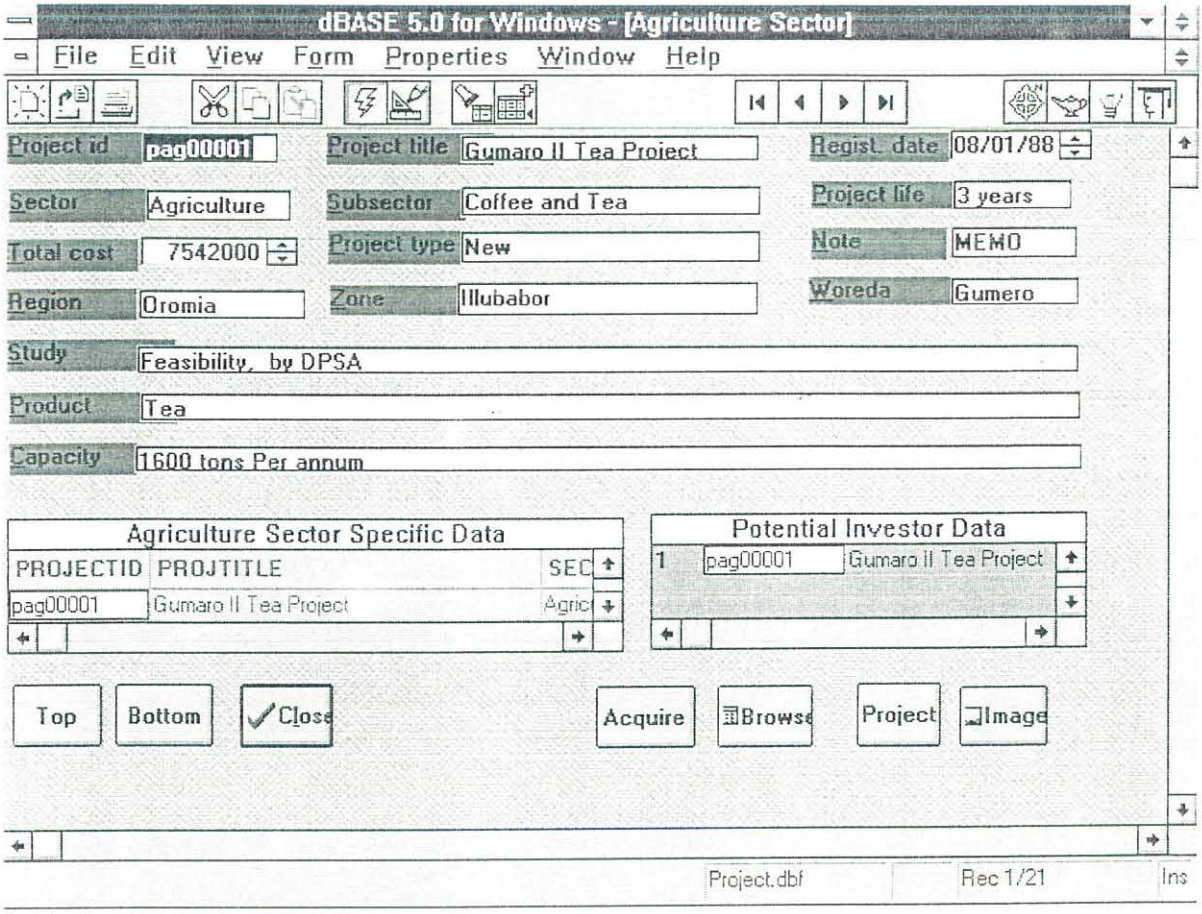


Figure 4.20 Agriculture Data Entry Form

The Region Dialog Box: When region button is clicked from the project data entry form, a dialog box containing all regions of the country is activated. The user can select one of the regions to access project data of that particular region. However, implementation is made only for Oromia region, due to limitations of time.

In addition to the transaction maintenance facilities that are attached on each of the forms, dBASE standard menu can also be used to perform some of the tasks, such as saving, deleting, and editing functions.

4.4 Testing

Function and acceptance tests were attempted in this study for improving the prototype. The information requirements of potential investors and use cases delivered early in the development effort were used as inputs for function tests of the system.

Among their requirements and described use cases, the following were implemented by the prototype:

- Data are classified into regions and investment sectors;
- The database is structured into three subsystems: project, investment climate, and spatial entity;
- The prototype includes text, image, and sound;
- The prototype renders data maintenance facilities such as acquire, browse, search, and report;
- The database is password protected; and
- Data on potential investors are maintained and associated with corresponding potential investment projects.

However, the prototype has the following limitations:

- Transfer record transaction maintenance facility is not implemented; and
- The prototype did not include all forms of data. For instance, it has no video data, and all the required image data are not associated with their corresponding text data.

The prototype was demonstrated to and discussed with voluntary officers of the Authority and staff members of School of Information Studies for Africa. Their comments and suggestions were considered for improving the prototype.

Analysis of the data collected through the prototype assessment sheet, Appendix III, and discussions made with observers indicated that the prototype is simple to understand, and has attempted to cover basic requirements. Its user interface provided simple but powerful navigation utilities and various basic query mechanisms. The multimedia nature of the database is also considered important for potential investors and other users to immediately and clearly understand the related projects and their corresponding location. When the prototype is developed into fully operational system, it was expressed that it will assist the Authority to establish organized information system for potential investment projects in order to provide prompt services and relevant information to potential investors and other concerned users. Moreover, it was also suggested that the database so designed be made available to users through Internet.

In addition, users have also commented that the data on potential investment projects should be classified and displayed by regions and sectors; transaction maintenance facilities be attached on each forms or windows instead of on a single main menu; the uncompleted parts of the prototype be finalized; further and detail data should be gathered and integrated. Within the time available, an attempt was made to incorporate the first two comments.

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The objective of the study was to develop a prototype multimedia database system for potential investment projects by identifying the basic information requirements of potential investors with the aim of upgrading the existing data management system at the Ethiopian Investment Authority. To this end, a survey was conducted to identify the potential investors information requirements, to assess the extent to which the existing data management systems of the Authority meets these information requirements, and to explore the possibility of maintaining a multimedia database by applying object-oriented approach that meet the identified requirements.

The results of this study indicate that the data management system of the Authority is experiencing serious problems in meeting the information requirements of potential investors. Most of the time, the data on potential investment projects are not available in complete form, even the available information is not easily accessible, not regularly consistent, not completely accurate, not most current, and not perfectly relevant. The major causes are: absence of organized system such as integrated database; lack of strong communications with other organizations; under-utilization of information technology; lack of properly trained, experienced, and motivated personnel; lack of user studies to identify potential investors' information requirements; and lack of investment opportunities or resource endowments identification.

Among major factors described above, identification of potential investors' information requirements and creation of multimedia database for potential investment projects were considered in this study. Before making investment decision, potential investors require information on investment opportunities, investment climate, and spatial entity. The findings also indicated that the database should integrate different forms or types of data, such as text, image, audio, and video. Thus, a multimedia database with object-oriented approach was designed and its prototype was implemented. The prototype was demonstrated to the Authority officers and School of Information Studies for Africa staff members. Testing and discussions of results indicated that the proposed multimedia database solution, when fully developed, will provide for most of the user requirements identified.

5.2 Recommendation

To overcome or at least to minimize the existing data management problems being expressed regarding potential investment projects at the Authority, the following recommendations were drawn.

- **Implement the Stated Duties and Responsibilities of the Authority.** Nagarit Gazeta, proclamation No. 37/1996, clearly stated that the Authority should collect, compile, analyze, and disseminate information on the resource potential of the country and on the investment opportunities it offers; and promote concrete investment projects. However, as mentioned earlier, data on potential investment projects are neither exhaustively collected nor readily available at the Authority. Therefore, data on investment opportunities should

be collected and readily available. The proclamation also described that each regional investment organ should transmit to the Authority information compiled with respect to the resource potential and investment opportunities of the region as well as periodic reports on investment activities therein. However, according to the findings of this study, regional investment organs periodically send report on actual investment data but the potential investment data. Therefore, regarding data on potential investment projects, regional investment offices and the Authority should coordinate their activities by maintaining effective information flows and channels of communications to meet their requirements.

- **Further Identification of Potential Investors' Information Requirements.** The information requirements of potential investors were not identified by the Authority or by other organization. Although this study attempted to identify some of the requirements, vast, detail, and continuous user studies should be conducted because successful development of data management systems depends on, among others, accurate and complete determination and definition of users' information requirements. The identification of information requirements of potential investors should be followed by their satisfaction survey to measure and monitor the progress of work in relation to the plan.

- **Exploiting the Available Personnel and Computer Resources as well as Upgrading Them.** The available resources are not optimally utilized for managing data properly. Moreover, the Authority has a shortage of qualified and experienced personnel such as system analyst as well as appropriate information technologies such as multimedia for

managing data at the required level. To overcome these problems, the Authority should utilize its available personnel and computer resources and, in the long-run, upgrade them.

- **Implement the Design Using Proper Object-Oriented Database**. To fully implement and thereby benefit from the features and capabilities of the proposed database in this study, a proper object-oriented database management system is required. Thus, the Authority should consider this in any planned acquisition of information technologies to support the proposed database.

- **Develop the Prototype Database into a Fully Operational Database**. Different organizations have developed investment opportunities database as the core of investment promotion efforts. The result of this study also indicated that a multimedia database for potential investment projects is essential in Ethiopia. Thus, the manual information system should be changed to computerized information system.

For the development of a fully operational multimedia database for potential investment projects, on the basis of the results of this study, the Authority should consider to undertake the following basic activities:

(i) Exhaustively identify the investment opportunities or resource endowments of the country;

(ii) Initiate an automation project that aims at acquisition, organizing, and processing the data on potential investment projects; and

(iii) Use the multimedia database at the appropriate place and load its free part of information through the Internet or world wide web page.

BIBLIOGRAPHY

Belot, J. Therese and Weigel, Dale R. (1992). Programs in Industrial countries to Promote Foreign Investment in Developing Countries. In: **Foreign Investment Advisory Service**, Occasional Paper 3. Washington, D.C: The World Bank.

Borland dBASE for Windows, Version 5.0 (1994). **Programmers Guide**. Borland International.

Burch, G. John and Grudnitski, Gory (1989). **Information Systems: Theory and Practice**. New York: John Wiley & Sons.

Chang, S.K and Costabile, M.F. (1997). Visual Interfaces to Multimedia Databases. In: Grosky, I. William (ed.). **The Hypermedia of Information Management.** Prince Hall PTR: USA

Clementini, Eliseo and Filce, Paolino (1994). Object-Oriented Modeling of Geographic Data. In: **Journal of the American Society for Information Service**. 45(9): 694-704.

Cliffton, H.D. and Sutcliffe, A.G. (1994). **Business Information Systems**. 5th ed. Hertfordshire: Prentice Hall International (UK) Limited.

Coad, Peter and Yourdon, Edward (1991). **Object-Oriented Analysis**. 2nd ed. Englewood Cliffs: Prentice-Hall Incorporated.

Davis, Ben (1992). Prototyping Multimedia: Lessons from the Visual Computing Group at Project Athena Center for Educational Computing Initiative. In: Edward Barrette (ed.), **Sociomedia: Multimedia, Hypermedia, and the Social Construction of Knowledge.** Cambridge: The MIT Press.

Eckert, G. and Golder, A. (1994). Improving Object-Oriented Analysis. In: **Information and Software technology,** 36(2) 37-86.

Federal Democratic Republic of Ethiopia (1996). Federal Negarit Gazeta, **Investment Proclamation No. 37/1996**, the 2nd year No. 25 18th June, Addis Ababa.

Garland, John C. (1986). **How to Develop Business Information Systems for End Users**. New York: John Wiley.

Guble, Carole (1997). Image Database prototypes. In: William I. Grosky (ed.), **Handbook of Multimedia Information Management**. New Jersey: PTR Prentice Hall

Gunther, Oliverand and Lmbarrts, Johannes (1994). Object-Oriented Techniques for Management of Geographic and Environmental Data. In: **The Computer Journal**, 37(1).

Gupta, Satish (1997). The Multimedia Odyssey. In: Jessica Keyes (ed.), **The Ultimate Multimedia Handbook**. New York: McGraw-Hill.

Hartman, Alison; Diem, E. John and Quaglina, Matthew (1992). The Many Faces of Multimedia: How new Technologies might Change the Nature of the Academic Endeavor. In: Edward Barrett (ed.), **Sociomedia: Multimedia and the Social Construction of Knowledge**. The MIT Press: Cambridge.

Hurson, A.R. and Pakzad, S.H. (1993). Object-Oriented Database Management Systems: Evolution and Performance Issues. **IEEE** 48-60.

Investment Office of Ethiopia (1992). **Ethiopia: A Guide to Investments.** Addis Ababa.

International Finance Corporation and Foreign Investment Advisory service (1997). **Lessons of Experience: Foreign Direct Investment**. Washington D.C:

Ivari, J. (1995). An Object-Orientation as Structural, Functional and Behavioral Modeling: A Comparison of Six Methods for Object-Oriented Analysis. In: **Information and Software Technology**, 37(3): 155-163.

Jones, P. Charles (1991). **Investment Analysis and Management**. New York: John Wiley & Sons Inc.

Karr, Roger (1997). Design Considerations for Multimedia Based Executive Information Systems. In: Jessica Keyes (ed.). **The Ultimate Multimedia Handbook**. New York: McGraw-Hill.

Keyes, Jessica (1997). Getting Started in Multimedia. In: Jessica Keyes (ed.), **The Ultimate Multimedia Handbook.** New York: McGraw-Hill.

Khoshafian, Setrag (1993). **Object-Oriented Databases**. New York: John Wiley & Sons, Inc.

Kroenke, M. David (1992). **Database Processing: Fundamentals, Design, and Implementation.** New York: Macmillan Publishing Company.

Law, D and Longworth (1987). **Systems Development: Strategies and Techniques**. England: NCC Limited.

Loomis, E.S. Mary (1987). **The Database Book.** New York: Macmillan Publishing Company.

Lorenz, Mark (1993). **Object-Oriented Software Development: A Practical Guide.** Englewood Cliffs: PTR Prentice Hall.

Martin, James (1993). **Principles of Object Oriented Analysis and Design**. New Jersey: PTR Prentice Hall.

Neelameghan, A. (1992). **Information for Small Enterprises.** Bungler: Sarada Ranganathan Endowment for Library Science.

Oomoto, Eitetsu and Tanka, katsumi (1997). Video Database Systems--Recent Trends in research and Development Activities. In: Grosky, I. William (ed.), **The Handbook of Multimedia Information Management**. Prince Hall PTR: USA

Pfeffermann, P. Guy and Madarassy, Andrea (1991). Trends in Private Investment in Developing Countries, 1990-1991 Edition. In: **International Finance Corporation**, Discussion Paper Number 11. Washington, D.C: The World Bank.

Schlusselberg, Evelyn and Harward, V. Judson (1992). Multimedia: Information Alchemy or conceptual typography? In: Edward Barrett (ed.) **Sociomedia: Multimedia and the Social Construction of Knowledge.** The MIT Press: Cambridge.

Schwarz, L.K. William; Pawlos Abraham and Kifle-Mariam Zerom (1968). **Industrial Investment Climate in Ethiopia.** California: Stanford Research Institute.

Sodhi, Jag and Prince, Sodhi (1996). **Object Oriented Methods for Software Development.** New York: McGraw-Hill.

Tayler, A. David (1992). **Object-Oriented Information System: Planning and Implementation**. Canada: John Wiley & Sons, Inc.

Wells, Jr. Louis T. and Wint, G. Alvin (1991). Facilitating Foreign Investment: Government Institutions to Screen, Monitor, and Service Information from Abroad. In: **Foreign Investment Advisory Service**, Occasional Paper 2. Washington, D.C: The World Bank.

Zemko, A. John (1992). Attracting Foreign Investment. In: Wayne Hall (ed.), **Prosperity Papers Series**. U.S.A: United States Information Agency.

APPENDIX I-A
QUESTIONNAIRE
FOR OFFICERS AT THE ETHIOPIAN INVESTMENT AUTHORITY AND REGIONAL INVESTMENT OFFICES

March 10, 1998

Dear sir/Madame,

This survey is being conducted as part of a project entitled

> "A PROTOTYPE MULTIMEDIA DATABASE SYSTEM FOR POTENTIAL INVESTMENT PROJECTS IN ETHIOPIA: AN OBJECT-ORIENTED APPROACH"

to assess the information requirements of investors in the areas of potential investment projects in Ethiopia, with a view to suggest better ways of data management that increase the accessibility of available information. Based on the results, a recommendation will be made for the improvement of the information handling activities at the Authority.

As the success of this study depends on your cooperation, I am keen to receive your response at your earliest convenience. All replies will be handled in strict confidence.

Thank you in anticipation of your kind cooperation.

Worku Gedlie
Addis Ababa University
School of Information Studies for Africa
P.O.Box 1176
Addis Ababa

Please, put an 'x' mark on the space provided to indicate your choice where applicable, and/or use the spaces provided to write your response. You may use additional paper where the space provided is not enough.

Part I: Identification

1. Identification information
   Region/ place _____
   Department Name: _____
   Profession: _____
   Position: _____
2. What are the specific activities you are currently engaged in? _____
   _____
   _____
   _____
   _____

Part II: Category of Information and Sources

3. Below (on column 1) are listed broad categories of information related to potential investment projects. Indicate the category of information that potential investors require from you to carry out their activities. Moreover, choose or indicate at what level they require each category of information (on column 2).

Categories of Information	Information is Required at the Level of:
___3.1 Geographic • Location's data (latitude, longitude, elevation, etc.) • Climatic data (rain fall, temperature...)	National Regional Zone Woreda Enterprise Project National Regional Zone Woreda Enterprise Project
___3.2 Project-specific (cost, benefit, type, sector, size, products, etc.)	National Regional Zone Woreda Enterprise Project
___3.3 Availability of resources (human power, raw material, loan, machine and equipment, etc.)	National Regional Zone Woreda Enterprise Project
___3.4 Infrastructure (power, telephone, road, etc.)	National Regional Zone Woreda Enterprise Project
___3.5 Regulatory measures (import/ export policy, taxation measures, investment permission policy, incentives, copyright and patent law, foreign exchange, labor legislation, reservation areas of public sector, etc.)	National Regional Zone Woreda Enterprise Project
___3.6 Social conditions (size of	

population, birth rate, tradition, etc.)	National Regional Zone Woreda Enterprise Project
___3.7 Political conditions (durability of existing regime, attitude of government to investment, armed conflicts, etc.)	National Regional Zone Woreda Enterprise Project
___3.8 Economic and business conditions (government expenditure, Gross domestic product, per capita of the country, level of sectarian production, availability of market, competitors position, etc.)	National Regional Zone Woreda Enterprise Project
___3.9 Professional services (Accounting and auditing, legal, management constancy, etc.)	National Regional Zone Woreda Enterprise Project
___3.10 Others, please, specify _____ _____ _____ _____	National Regional Zone Woreda Enterprise Project

4. What sources do you use to meet potential investors information requirements?
   - Telephone
   - Cassette (radio and video)
   - Library (documentation center), where? Please, specify_____
   - A central database, Where, please, specify_____
   - Media (Radio, TV, news paper), What? Please, specify_____
   - Meetings, seminars, etc. , where? Please, specify_____
   - Reports and monographs, What? Please, specify_____
   - Social occasions, Where? Please, specify _____
   - Other, please, specify_____

Part III: Information Types and Forms

5. Does the information they require includes image sound, maps, etc. types?
   - Yes
   - No

6. If your response for (5) is "Yes", what kind?
   - pictures(photographic images)

cartographic types (maps, etc.)
engineering designs(plans, architectural drawings, etc.)
sound (message of investment officers, etc.)
other, please, specify _____
_____

7. How do you store information to satisfy their needs?
   as a periodically consecutive information (as a time series data tables/documents)
   as a one time (cross-sectional) information in a single file or folder regardless of time
   other, please, specify _____
   _____

8. How do you classify the data when you store it to describe the items consistently to help you at the time of searching?
   by type of indicators (information), please, elaborate_____
   _____

   by spatial location (national, region, zone, woreda, etc.)
   other, please, specify _____
   _____

9. When you receive and transfer information on potential investment projects, how do you do it?
   on paper
   media (radio, TV, newspapers, etc.)
   on floppy disk
   accessing from a central database
   others, please, specify _____
   _____

Part IV: Accessibility, availability and other factors related to quality or characteristics of information

10. How do you rate the **availability** and **completeness** of information on potential investment projects' at your workplace (institution)?
    Exhaustively available
    Moderately available
    Poorly available
    unavailable

11. If you have felt that **availability** of information on potential investment projects is unavailable or poorly available, what do you think the reason(s) could be?
    absence of an organized system, such as absence of central database services and poor manual systems
    low level of utilization of information technology

poor communication with regional investment offices and the Authority
low level of recognition for the role of information
lack of potential investment projects identification
lack of properly trained human power
other, please, specify_____
_____

12.How do you rate the **accessibility** of the available information on potential investment projects?

easily accessible
moderately accessible
poorly accessible
inaccessible

13.If your response for (12) is "poorly accessible" or "inaccessible", what in your opinion is (are) the possible cause(s)?

absence of an organized system, such as absence of central database services and poor manual systems
lack of proper utilization of information technology
absence of tracer slip or file movement register
absence of project register and location register
absence of finding aids such as lists, indexes and other guides
difficulty in searching and locating because of the manual nature of the information service
lack of properly trained manpower in the area of information services
other, please, specify _____
_____

14. How do you rate the **consistency** of the information you are receiving and providing?

regularly consistent
always consistent
sometimes consistent
inconsistent

15. If your response for (14) is "inconsistent" or "sometimes consistent", what do you think the reason(s) could be?

absence of an organized information system within the Authority
manual nature of information systems
low level of application of information technology
Poor communication between the Authority and other organizations
unreliable external information sources
other, please, specify_____
_____

16. How do you rate the **accuracy** or **reliability** of the information you are receiving and providing?

completely accurate
always accurate
sometimes accurate
inaccurate

17. If you feel that the information you get is "inaccurate" or "sometimes accurate", what in your opinion the reason(s) could be?
    absence of an organized/integrated information system
    low level of application of information technology
    poor communication between the Authority and other organizations
    unreliable external information sources
    manual nature of information systems
    other, please, specify_____
    _____

18. How do you rate the **timeliness** of the information you are getting and providing?
    most current (most recent)
    moderately current
    rarely current
    outdated

19. If your response for (18) is "outdated" or "rarely current", what in your opinion the reason(s) could be?
    absence of an organized information system
    low level of application of information technology
    poor delivery system linked with external sources
    lack of potential investment projects identification
    lack of study to identify potential investors information requirements
    manual nature of information systems
    other, please, specify_____
    _____

20. Do you think that the information you provide is **relevant** (addresses potential investors specific needs, that is, conforms to or matches with their demands)?
    perfectly relevant
    always relevant
    sometimes relevant
    irrelevant

21. If your response for (20) is irrelevant or sometimes relevant, what in your opinion the reason(s) could be?
    their information requirements are not identified
    absence of an organized/integrated information system
    low level application of Information technology
    poor data selection
    manual nature of information systems

absence of finding or searching aids
poor communication between the Authority and other organizations
other, please, specify_____

_____

22. How do you rate the **utilisation** of the available information?
    Highly utilised
    partially utilised
    rarely utilised
    unutilized

23. If your response for (22) is unutilized or rarely utilized, what in your opinion the reason(s) could be?
    investors information requirements are not identified
    absence of an organized/integrated information system
    low level application of Information technology
    lack of motivation of employees at the Authority or investment office
    poor data selection
    lack of advertisement
    inappropriate channel
    Other, please, specify_____

    _____

24. What media are included in your collection to distribute potential investment projects data?
    Photograph
    Video _
    Sound
    Other, please, specify_____

25. How do you rate the existing level of support (facilities and services) provided by the information services?
    adequate
    inadequate

26. If your response for (25) is "inadequate", what course of action do you suggest to minimize, if not eliminate, the problems you are currently experiencing?

_____

_____

_____

_____

PART V: Facility and Service

27. What type of IT facilities are available at the Authority?

Type	Quantity	Description
Computers		
Printers		
CD-ROM		
Scanners		
digital camera		
Others, specify		

28. For what purpose(s) do you use computer (s)?

word processing
financial analysis and forecasting
statistical analysis (including econometric and time series analysis)
actual investment records management
potential investment projects' data management
others, please specify _____

_____

29. Do you have any employee who has some qualifications in the field of information science/library science or related fields? If yes,

No.	field of study	qualification	position

PART VI: Others

30. Who are the major users of potential investment projects information system?

Potential investors
Ethiopian Investment Authority
Ministry of Economic Cooperation and Development
Ministry of foreign Affairs
others, please, specify_____

_____

_____

31. Who are the major sources of potential investment projects information system?

Regional investment offices
Ministry of Mining and Resources
Institute of Agricultural Research
Donor Agencies
other, please, specify_____

_____

32. How do you collect data on potential investment projects?_____

_____

_____

_____

33. Is there any plan to automate the potential investment data management system?

Yes

No

34. If your response for (33) is Yes, what type is it?

a conventional automated system:

with additional features such as the ability of the creation and use of indexes and other retrieval tools

a multimedia system that integrates all types of information: text, picture, sound, etc.

other, please specify_____

35. If your response for (33) is Yes, how do you plan to finance the automation?

own fund

other government funds

funds from other organisations

36. Internet is introduced in our country. Thus, do you think that connecting your system to the Internet helps in some way or another in facilitating your activities? If yes, for what purpose?

for collaborative research

access practices of similar institutions

for advertising your collections

others, please specify_____

37. From the following investment sectors listed below, which one highly attracts investors in Ethiopia?

Agriculture

Livestock

Water resource

Industry

Mining and Energy

Electric power

Other, please, specify_____

Why? _____

_____

38. Other relevant information, if any _____

_____

_____

APPENDIX I-B
QUESTIONNAIRE
FOR POTENTIAL INVESTORS IN ETHIOPIA

March 10, 1998

Dear sir/Madame,

This survey is being conducted as part of a project entitled

> "A PROTOTYPE MULTIMEDIA DATABASE SYSTEM FOR POTENTIAL INVESTMENT PROJECTS IN ETHIOPIA: AN OBJECT-ORIENTED APPROACH"

to assess the information requirements of investors in the areas of potential investment projects in Ethiopia, with a view to suggest better ways of data management that increase the accessibility of available information. Based on the results, a recommendation will be made for the improvement of the information handling activities at the Authority.

As the success of this study depends on your cooperation, I am keen to receive your response at your earliest convenience. All replies will be handled in strict confidence.

Thank you in anticipation of your kind cooperation.

Worku Gedlie
Addis Ababa University
School of Information Studies for Africa
P.O.Box 1176
Addis Ababa

Please, put an 'x' mark on the space provided to indicate your choice where applicable, and/or use the spaces provided to write your response. You may use additional paper where the space provided is not enough.

Part I: Identification

1. Identification information
   Organization_____
   Investment area/sector_____
   Place of investment_____
   Position: _____
2. What are the specific activities your organization is currently engaged in? _____
   _____
   _____
   _____
   _____

Part II: Category of Information and Sources

3. Below (on column 1)are listed broad categories of information related to potential investment projects. Indicate the category of information that you require to carry your activities. Moreover, choose or indicate at what level you require each category of information (on column 2).

Categories of Information	Information is Required at the Level of:
___3.1 Geographic • Location's data (latitude, longitude, elevation, etc.) • Climatic data (rain fall, temperature...)	National Regional Zone Woreda Enterprise Project National Regional Zone Woreda Enterprise Project
___3.2 Project-specific (cost, benefit, type, sector, size, products, etc.)	National Regional Zone Woreda Enterprise Project
___3.3 Availability of resources (human power, raw material, loan, machine and equipment, etc.)	National Regional Zone Woreda Enterprise Project
___3.4 Infrastructure (power, telephone, road, etc.)	National Regional Zone Woreda Enterprise Project
___3.5 Regulatory measures (import/ export policy, taxation measures, investment permission policy, incentives, copyright and patent law, foreign exchange, labor legislation, reservation areas of public sector, etc.)	National Regional Zone Woreda Enterprise Project
___3.6 Social conditions (size of	

population, birth rate, tradition, etc.)	National Regional Zone Woreda Enterprise Project
___3.7 Political conditions (durability of existing regime, attitude of government to investment, armed conflicts, etc.)	National Regional Zone Woreda Enterprise Project
___3.8 Economic and business conditions (government expenditure, Gross domestic product, per capita of the country, level of sectarian production, availability of market, competitors position, etc.)	National Regional Zone Woreda Enterprise Project
___3.9 Professional services (Accounting and auditing, legal, management constancy, etc.)	National Regional Zone Woreda Enterprise Project
___3.10 Others, please, specify _____ _____ _____ _____	National Regional Zone Woreda Enterprise Project

4. What sources do you prefer to use to meet your information requirements regarding potential investment projects?

   Telephone
   Cassette (radio and video)
   Library (documentation center), where? Please,
   specify_____
   A central database, Where, please,
   specify_____
   Media (Radio, TV, news paper), What? Please,
   specify_____
   Meetings, seminars, etc. , where? Please,
   specify_____
   Reports and monographs, What? Please,
   specify_____
   Social occasions, Where? Please,
   specify _____
   Other, please, specify_____

Part III: Information Types and Forms

5. Does the information you require includes image, sound, map etc. types?

   Yes
   No

6. If your response for (5) is "Yes", what kind?
   - pictures(photographic images)
   - cartographic types (maps, etc.)
   - engineering designs(plans, architectural drawings, etc.)
   - sound (message from investment officers, etc.)
   - other, please, specify _____

7. When you receive information on potential investment projects, how do you get it?
   - on paper
   - on floppy disk
   - accessing from a central database
   - media (Radio, TV, news paper,...)
   - others, please, specify _____

Part IV: Accessibility, availability and other factors related to quality or characteristics of information

8. How do you rate the **availability** and **completeness** of information on potential investment projects' at the Ethiopian Investment Authority?
   - exhaustively available
   - moderately available
   - poorly available
   - unavailable

9. If you have felt that availability of information on potential investment projects is unavailable or poorly available, what do you think the reason(s) could be?
   - absence of an organized system such as absence of central database services and poor manual systems
   - low level of utilization of information technology
   - poor communication with the Ethiopian Investment Authority and other organizations
   - low level of recognition for the role of information
   - lack of potential investment projects identification
   - lack of properly trained human power
   - other, please, specify _____

10. How do you rate the **accessibility** of the available information on potential investment projects at the Ethiopian Investment Authority?
   - easily accessible
   - moderately accessible
   - poorly accessible
   - inaccessible

11. If your response for (10) is "poorly accessible" or "inaccessible", what in your opinion is (are) the possible cause(s)?

absence of organized system, such as absence of central database services and/or poor manual information systems
lack of proper utilization of information technology by the Authority
absence of tracer slip or file movement register
absence of project register and location register
absence of finding aids such as lists, indexes and other guides
difficulty in searching and locating because of the manual nature of the information service
lack of properly trained manpower in the area of information services
other, please, specify _____
_____

12. How do you rate the **consistency** of the information you are receiving?

regularly consistent
always consistent
sometimes consistent
inconsistent

13. If your response for (12) is "inconsistent" or "sometimes consistent", what do you think the reason(s) could be?

absence of an organized information system within the Authority
low level of application of information technology
unreliable external information sources
poor communication between the Authority and other organizations
manual nature of information systems
other, please, specify_____
_____

14. How do you rate the **accuracy** or **reliability** of the information you are receiving?

completely accurate
always accurate
sometimes accurate
inaccurate

15. If you feel that the information you get is "inaccurate" or "sometimes accurate", what in your opinion the reason(s) could be?

absence of an organized/integrated information system
low level of application of information technology
unreliable external information sources
poor communication between the Authority and other organizations
manual nature of the information system
other, please, specify_____
_____

16. How do you rate the **timeliness** of the information you are getting?
    - most current (most recent)
    - moderately current
    - rarely current
    - outdated

17. If your response for (16) is "outdated" or "rarely current", what in your opinion the reason(s) could be?
    - absence of an organized/integrated information system at the Authority
    - low level of application of information technology
    - poor delivery system linked with external sources
    - lack of potential investment projects identification
    - lack of study to identify potential investors information requirements
    - manual nature of the information system
    - other, please, specify_____

    _____

18. Do you think that the information you receive is **relevant** (addresses your specific needs, that is, conforms to or matches with your demands?
    - perfectly relevant
    - always relevant
    - sometimes relevant
    - irrelevant

19. If your response for (18) is irrelevant or sometimes relevant, what in your opinion the reason(s) could be?
    - your information requirements are not identified
    - absence of an organized/integrated information system at the Authority
    - low level application of Information technology
    - poor data selection
    - manual nature of the information system
    - absence of finding and searching tools
    - poor communication between the Authority and other organizations
    - other, please, specify_____

    _____

20. How do you rate the **utilization** of the available information?
    - highly utilized
    - partially utilized
    - rarely utilized
    - unutilized

21. If your response for (20) is "unutilized" or "rarely utilized", what in your opinion the reason(s) could be?
    - absence of an organized/integrated information system at the Authority
    - low level of application of information technology

poor data selection
lack of motivation of employees at the Authority of investment office
inappropriate channel
poor investment policy
lack of advertisement
lack of investors information requirement study
other, please, specify_____
_____

Part V: Others

22. How do you rate the existing level of support (facilities and services) provided by the information services?
    adequate
    inadequate

23. If your response for (22) is "inadequate", what course of action do you suggest to minimize, if not eliminate, the problems they are currently experiencing?
    _____
    _____
    _____
    _____

24. From the following investment sectors listed below, which one highly attracts you to invest?
    Agriculture
    Livestock
    Water Resource
    Industry
    Mining
    Electric Power
    Other, please, specify_____
    Why?_____
    _____

25. Other relevant information, if any_____
    _____

Appendix II

Discussion Guide for Investment Officers at the Ethiopian Investment Authority

Date: March 16-March 30, 1998
Place: Ethiopian Investment Authority
Interviewees: Discussions were made with four officers of the Authority

1. What are the major users of information on potential investment projects of the country?

2. What form of information (text, picture, sound, video) do they require?

3. What are your major sources of data on potential investment projects of the country?

4. When you acquire data on potential investment projects from their source, what form of data (text, picture, sound, video) do you use?

5. In order to satisfy the information requirements of users, how you organize, process, and store data on potential investment projects?

6. To disseminate information on potential investment projects to users, what format and channels do you use?

7. What other services does the Ethiopian Investment Authority render to users regarding potential investment projects?

8. On the basis of the following four features affecting the quality or characteristics of information, at what levels do you satisfy the requirements of information users?
   (a) Availability of information on potential investment projects
   (b) Satisfying users' requirements within appropriate time-limit
   (c) Coinciding with users' specific and basic information requirements
   (d) Recency of information (supplying up-to-date investment information)

9. Did the Authority conduct a survey to identify users' information requirements and/or to measure their satisfaction? If not, why?

Appendix III
Prototype Assessment Sheet

Date: May 2, 1998
Place: Ethiopian Investment Authority and School of Information Studies for Africa (SISA)
Observers: Officers of the Authority and staff members of SISA

This prototype assessment sheet is prepared to test the prototype multimedia database system for potential investment projects in Ethiopia. Please, follow and observe the demonstration, discuss, and provide your comments for improving the prototype.

Major features of the prototype	Strengths of the prototype you observed	Limitations of the prototype
1. General structure of the prototype, including coverage, simplicity, category, etc.		
2. User interface of the prototype, such as navigation, visibility, color combination, etc.		
3. Multimedia feature of the prototype, such as accessibility of varied information, understanding, necessity, making abstract real and distant immediate, etc.		

4. Level of operations of the prototype to acquire, organize, process the data, and to produce the report. It includes the capability of the prototype to include all necessary fields or variables and operations or functions to perform necessary activities in order to storing and retrieving varied types of information, securing information, backing up data, etc.		
5. Expected significance of the prototype to overcome or minimize the existing data management problems of the Ethiopian Investment Authority		

6. Please, provide any other comment or suggestion regarding the prototype in particular and the study in general. _____

_____

_____

_____

_____

APPENDIX IV
PROGRAM CODING

```
** END HEADER -- do not remove this line*
* Generated on 05/13/98
*
LOCAL f
f = NEW WELCOMEFORM()
f.Open()

CLASS WELCOMEFORM OF FORM
  Set                Procedure                To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.Top =        0
  this.Width =       36.3525
  this.HelpId = ""
  this.HelpFile = ""
  this.Text = "Welcome"
  this.OnOpen = CLASS::FORM_ONOPEN
  this.Height =       10.8291
  this.MDI = .F.
  this.ScaleFontSize =       24
  this.ColorNormal = "B/0X82FF82"
  this.Left =        0



  DEFINE PUSHBUTTON GOONTONEXT OF
THIS;
    PROPERTY;
      Top        8.292,;
      Width        3.8838,;
      OnClick
CLASS::GOONTONEXT_ONCLICK,;
      Text "Continue",;
      Group .T.,;
      FontSize        10,;
      Height        0.5615,;
      ColorNormal "N/W",;
      Left        14.9395

DEFINE CLOSEBUTTON CLOSEBUTTON1 OF
THIS;
    PROPERTY;
      Top        8.292,;
      Width        4,;
      Group .T.,;
      FontSize        10,;
      Height        0.5127,;
      Left        30.9404

  DEFINE TEXT TEXT1 OF THIS;
    PROPERTY;
      Top        0.0225,;
      Border .F.,;
      Width        36.8818,;
      Text "WELCOME TO THE DATABASE
SYSTEM OF THE",;
      FontSize        18,;
      Height        0.6602,;
      ColorNormal "0x40ff00/GB",;
      Left        0.0586

  DEFINE TEXT TEXT2 OF THIS;
    PROPERTY;
      Top        0.585,;
      Border .F.,;
      Width        36.9414,;
      Text "            POTENTIAL INVESTMENT
PROJECTS",;
      FontSize        18,;
      Height        0.707,;
      ColorNormal "B+/GB",;
      Left        0.0586

  DEFINE LINE LINE1 OF THIS;
    PROPERTY;
      Top        10,;
      Width        1,;
      Bottom        10,;
      Right        101,;
      ColorNormal "N",;
      Left        57

  DEFINE LINE LINE2 OF THIS;
    PROPERTY;
      Top        10,;
      Width        1,;
      Bottom        10,;
      Right        101,;
      ColorNormal "N",;
      Left        57

  DEFINE LINE LINE3 OF THIS;
    PROPERTY;
      Top        10,;
      Width        1,;
      Bottom        10,;
      Right        101,;
      ColorNormal "N",;
      Left        57

  DEFINE LINE LINE4 OF THIS;
    PROPERTY;
      Top        10,;
      Width        1,;
      Bottom        10,;
      Right        101,;
```

```
    ColorNormal "N",;
    Left       57

  DEFINE LINE LINE5 OF THIS;
    PROPERTY;
     Top       10,;
     Width      1,;
     Bottom     10,;
     Right     101,;
     ColorNormal "N",;
     Left      57

  DEFINE LINE LINE6 OF THIS;
    PROPERTY;
     Top       10,;
     Width      1,;
     Bottom     10,;
     Right     101,;
     ColorNormal "N",;
     Left      57

  DEFINE LINE LINE7 OF THIS;
    PROPERTY;
     Top       10,;
     Width      1,;
     Bottom     10,;
     Right     101,;
     ColorNormal "N",;
     Left      57

  DEFINE PUSHBUTTON PUSHBUTTON9 OF
THIS;
    PROPERTY;
     Top       8.292,;
     Width      4,;
     Text "Message ",;
     Group .T.,;
     UpBitmap "RESOURCE #618",;
     Height     0.5371,;
     ColorNormal "N/W",;
     Left       1.5293

  DEFINE IMAGE IMAGE1 OF THIS;
    PROPERTY;
     Top       1.292,;
     Width     36.8223,;
     Height     6.9512,;
     DataSource                    "FILENAME
F:\HOME\WORKUG\PIPDATA\BITMAP.BMP",;
     Left      -0.4697

  Procedure GOONTONEXT_OnClick
  set procedure to pass.wfm additive
  do pass.wfm

ENDCLASS


public name
** END HEADER -- do not remove this line*
* Generated on 05/14/98
*
LOCAL f
f = NEW PASSFORM()
f.Open()

CLASS PASSFORM OF FORM
  Set                Procedure                To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.Left =       27
  this.MDI = .F.
  this.Top =        3.9121
  this.Width =      50.4277
  this.HelpId = ""
  this.Text   =   "Potential   Investment   Project
Database User Identification"
  this.SysMenu = .F.
  this.OnSelection                              =
CLASS::FORM_ONSELECTION
  this.EscExit = .F.
  this.HelpFile = ""
  this.StatusMessage = "Enter Your Name and Pass
Word"
  this.ScaleFontName = "Times New Roman"
  this.Height =       9.2607
  this.ScaleFontSize =      12
  this.ColorNormal = "B/0X82FF82"

  DEFINE TEXT TEXT1 OF THIS;
    PROPERTY;
     Left       4.8555,;
     Top        4.6934,;
     Width     22.8584,;
     Text "User Name:",;
     FontItalic .T.,;
     FontName "Times New Roman",;
     FontSize      16,;
     Border .F.,;
     Height      0.915,;
     ColorNormal "B/W"

  DEFINE TEXT PASS OF THIS;
    PROPERTY;
     Left       5.1426,;
     Top        6.3906,;
     Width     21.8574,;
     Text "Pass Word:",;
     FontItalic .T.,;
```

```
    FontName "Times New Roman",;
    FontSize      16,;
    Border .F.,;
    Height        0.8701,;
    ColorNormal "B/W"

DEFINE ENTRYFIELD NAME OF THIS;
  PROPERTY;
    Left        27.7139,;
    Top         4.6953,;
    Width       23.1426,;
    FontName "Times New Roman",;
    Border .T.,;
    Height      0.9131,;
    Value ""

DEFINE ENTRYFIELD PASSWRD OF THIS;
  PROPERTY;
    Left        27,;
    OldStyle .T.,;
    ValidRequired .T.,;
    ColorHighLight "0xe8ffff/0xe8ffff",;
    Top         6.3906,;
    Width       23.2852,;
    Border .T.,;
    Height      0.7832,;
    Value "",;
    ColorNormal "0xe8ffff/0xe8ffff"

DEFINE PUSHBUTTON PUSHBUTTON1 OF
THIS;
  PROPERTY;
    Left        5,;
    Top         8.043,;
    Width       16,;
    Group .T.,;
    Text "Click to continue",;
    Default .T.,;
    Height      1,;
    ColorNormal "B/W"

DEFINE TEXT TEXT2 OF THIS;
  PROPERTY;
    Left        5.1426,;
    Top         0.4346,;
    Width       53.8574,;
    Text "To run the application, enter your  ",;
    FontSize      16,;
    Border .F.,;
    Height      1.4775,;
    ColorNormal "B/0X82FF82"

DEFINE TEXT TEXT3 OF THIS;
  PROPERTY;
    Left        5.7139,;
    Top         1.7383,;
    Width       30.1426,;
    Text "name and password",;
    FontSize      16,;
    Border .F.,;
    Height      1.3916,;
    ColorNormal "B/0X82FF82"

Procedure Form_Onselection(selectid)
name=this.name.value

do case
   case selectid=-1
if this.passwrd.value="Workuge"
   this.close()
   set procedure to Pipmenu.wfm
   do Pipmenu.wfm
  elseif (selectid=-1) .and. (this.passwrd.value <>
"Workuge")
     ??chr(7)+chr(7)+chr(7)

endif

endcase

ENDCLASS

** END HEADER -- do not remove this line*
* Generated on 05/14/98
*
LOCAL f
f = NEW PIPMENUFORM()
f.Open()

CLASS PIPMENUFORM OF FORM
  Set                Procedure                To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.Width =      57.5
  this.HelpId = ""
  this.HelpFile = ""
  this.Text   =   "Potential   Investment   Projects
Database"
  this.Height =     17.1758
  this.MDI = .F.
  this.ColorNormal = "B/0X82FF82"
  this.Left =       37.166
  this.Top =        2.8232

  DEFINE TEXT TEXT1 OF THIS;
    PROPERTY;
      Width     100,;
      Border .F.,;
      FontSize      18,;
      Text "POTENTIAL INVESTMENT",;
      Height      2,;
      ColorNormal "B+/GB",;
```

```
    Left        0,;
    Top         0

  DEFINE PUSHBUTTON PUSHBUTTON1 OF
THIS;
    PROPERTY;
     Width      23.166,;
     OnClick
CLASS::PUSHBUTTON1_ONCLICK,;
     FontSize   14,;
     Text "PROJECT",;
     Group .T.,;
     Default .T.,;
     Height     2.8232,;
     ColorNormal "B/W",;
     Left       0,;
     Top        7.5879

  DEFINE PUSHBUTTON PUSHBUTTON2 OF
THIS;
    PROPERTY;
     Width      23.002,;
     FontSize   14,;
     Text "INVESTMENT CLIMATE",;
     Group .T.,;
     Height     2.707,;
     ColorNormal "B/W",;
     Left       34.1641,;
     Top        7.8223

  DEFINE PUSHBUTTON PUSHBUTTON3 OF
THIS;
    PROPERTY;
     Width      22.502,;
     FontSize   14,;
     Text "SPATIAL ENTITY",;
     Group .T.,;
     Height     2.4121,;
     ColorNormal "B/W",;
     Left       0.1641,;
     Top        14.7051

  DEFINE CLOSEBUTTON CLOSEBUTTON1
OF THIS;
    PROPERTY;
     Width      17.6689,;
     FontSize   14,;
     Group .T.,;
     Height     2.3525,;
     ColorNormal "B/W",;
     Left       39.6641,;
     Top        14.5293

  DEFINE TEXT TEXT2 OF THIS;
    PROPERTY;
     Width      57.1689,;
     Border .F.,;
     FontSize   22,;
     Text "PROJECTS DATABASE",;
     Height     1.5898,;
     ColorNormal "B+/GB",;
     Left       0.1641,;
     Top        1.9395

  Procedure PUSHBUTTON1_OnClick
  set procedure to project.wfm additive
  do project.wfm

ENDCLASS


create session
public pnumber
** END HEADER -- do not remove this line*
* Generated on 05/18/98
*
LOCAL f
f = NEW PROJECTFORM()
f.Open()

CLASS PROJECTFORM OF FORM
  Set                Procedure                To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.View = "project.qbe"
  this.Left =        1.666
  this.Top =         0
  this.ScrollBar =       1
  this.ColorNormal = "B/0X82FF57"
  this.Text = "Project Subsystem"
  this.Width =       100.166
  this.HelpId = ""
  this.HelpFile = ""
  this.Height =      22.1172

  DEFINE TEXT TEXT2 OF THIS;
    PROPERTY;
     Left       0,;
     OldStyle .T.,;
     Top        1,;
     Border .T.,;
     ColorNormal "B/GB",;
     Text "&Project id",;
     Width      23,;
     Height     1

  DEFINE ENTRYFIELD ENTRYFIELD1 OF
THIS;
    PROPERTY;
     Left       14.3311,;
     Top        1,;
     Border .F.,;
```

```
    ColorNormal "N/W+",;
    Width       15.6689,;
    DataLink "PROJECT->:PROJECTID:",;
    Height      1

  DEFINE TEXT TEXT3 OF THIS;
    PROPERTY;
    Left        37,;
    OldStyle .T.,;
    Top         1,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Project title",;
    Width       48,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD2 OF
THIS;
    PROPERTY;
    Left        50.3311,;
    Top         1,;
    Border .F.,;
    ColorNormal "N/W+",;
    Width       45.6689,;
    DataLink "PROJECT->:PROJTITLE:",;
    Height      1

  DEFINE TEXT TEXT4 OF THIS;
    PROPERTY;
    Left        0,;
    OldStyle .T.,;
    Top         3,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Sector",;
    Width       28,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD3 OF
THIS;
    PROPERTY;
    Left        14.3311,;
    Top         3,;
    Border .F.,;
    ColorNormal "N/W+",;
    Width       15.6689,;
    DataLink "PROJECT->:SECTOR:",;
    Height      1

  DEFINE TEXT TEXT5 OF THIS;
    PROPERTY;
    Left        0,;
    OldStyle .T.,;
    Top         5,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Subsector",;
    Width       29,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD4 OF
THIS;
    PROPERTY;
    Left        14.3311,;
    Top         5,;
    Border .F.,;
    ColorNormal "N/W+",;
    Width       16.1689,;
    DataLink "PROJECT->:SUBSECTOR:",;
    Height      1

  DEFINE TEXT TEXT6 OF THIS;
    PROPERTY;
    Left        70,;
    OldStyle .T.,;
    Top         7,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Total cost",;
    Width       20,;
    Height      1

  DEFINE SPINBOX SPINBOX1 OF THIS;
    PROPERTY;
    Left        81.3311,;
    Top         7,;
    Border .F.,;
    ColorNormal "N/W+",;
    Rangemax    100,;
    Rangemin    1,;
    Width       14.1689,;
    DataLink "PROJECT->:TOTALCOST:",;
    Height      1

  DEFINE TEXT TEXT7 OF THIS;
    PROPERTY;
    Left        37,;
    OldStyle .T.,;
    Top         7,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Project life",;
    Width       24,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD5 OF
THIS;
    PROPERTY;
    Left        54.3311,;
    Top         7,;
    Border .F.,;
    ColorNormal "N/W+",;
```

```
    Width       10.6689,;
    DataLink "PROJECT->:PROJLIFE:",;
    Height      1

  DEFINE TEXT TEXT8 OF THIS;
    PROPERTY;
    Left        37,;
    OldStyle .T.,;
    Top         3,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Study",;
    Width       59,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD6 OF
THIS;
    PROPERTY;
    Left        50.3311,;
    Top         3,;
    Border .F.,;
    ColorNormal "N/W+",;
    Width       45.6689,;
    DataLink "PROJECT->:STUDY:",;
    Height      1

  DEFINE TEXT TEXT9 OF THIS;
    PROPERTY;
    Left        0,;
    OldStyle .T.,;
    Top         7,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Region",;
    Width       29,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD7 OF
THIS;
    PROPERTY;
    Left        14.3311,;
    Top         7,;
    Border .F.,;
    ColorNormal "N/W+",;
    Width       15.6689,;
    DataLink "PROJECT->:REGION:",;
    Height      1

  DEFINE TEXT TEXT10 OF THIS;
    PROPERTY;
    Left        0,;
    OldStyle .T.,;
    Top         9,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Zone",;
    Width       30,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD8 OF
THIS;
    PROPERTY;
    Left        14.3311,;
    Top         9,;
    Border .F.,;
    ColorNormal "N/W+",;
    Width       15.6689,;
    DataLink "PROJECT->:ZONE:",;
    Height      1

  DEFINE TEXT TEXT11 OF THIS;
    PROPERTY;
    Left        0,;
    OldStyle .T.,;
    Top         11,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Woreda",;
    Width       29,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD9 OF
THIS;
    PROPERTY;
    Left        14.3311,;
    Top         11,;
    Border .F.,;
    ColorNormal "N/W+",;
    Width       15.6689,;
    DataLink "PROJECT->:WOREDA:",;
    Height      1

  DEFINE TEXT TEXT12 OF THIS;
    PROPERTY;
    Left        0,;
    OldStyle .T.,;
    Top         13,;
    Border .T.,;
    ColorNormal "B/GB",;
    Text "&Product",;
    Width       89,;
    Height      1

  DEFINE ENTRYFIELD ENTRYFIELD10 OF
THIS;
    PROPERTY;
    Left        15.1641,;
    Top         13,;
    Border .F.,;
    ColorNormal "N/W+",;
    Width       80.002,;
    DataLink "PROJECT->:PRODUCT:",;
```

```
    Height      1

  DEFINE TEXT TEXT13 OF THIS;
    PROPERTY;
     Left       0,;
     OldStyle .T.,;
     Top        15,;
     Border .T.,;
     ColorNormal "B/GB",;
     Text "&Capacity",;
     Width      89,;
     Height     1

  DEFINE ENTRYFIELD ENTRYFIELD11 OF
THIS;
    PROPERTY;
     Left       14.3311,;
     Top        15.0586,;
     Border .F.,;
     ColorNormal "N/W+",;
     Width      80.6689,;
     DataLink "PROJECT->:CAPACITY:",;
     Height     1

  DEFINE TEXT TEXT14 OF THIS;
    PROPERTY;
     Left       37,;
     OldStyle .T.,;
     Top        9,;
     Border .T.,;
     ColorNormal "B/GB",;
     Text "&Registration date",;
     Width      30,;
     Height     1

  DEFINE SPINBOX SPINBOX2 OF THIS;
    PROPERTY;
     Left       54.3311,;
     Top        9,;
     Border .F.,;
     ColorNormal "N/W+",;
     Rangemax {11/09/88},;
     Rangemin {08/01/88},;
     Width      13.002,;
     DataLink "PROJECT->:REGISTDATE:",;
     Height     1

  DEFINE TEXT TEXT15 OF THIS;
    PROPERTY;
     Left       37,;
     OldStyle .T.,;
     Top        5,;
     Border .T.,;
     ColorNormal "B/GB",;
     Text "&Project type",;
     Width      59,;
     Height     1

  DEFINE ENTRYFIELD ENTRYFIELD12 OF
THIS;
    PROPERTY;
     Left       50.3311,;
     Top        5,;
     Border .F.,;
     ColorNormal "N/W+",;
     Width      45.6689,;
     DataLink "PROJECT->:PROJTYPE:",;
     Height     1

  DEFINE TEXT TEXT16 OF THIS;
    PROPERTY;
     Left       70,;
     OldStyle .T.,;
     Top        9,;
     Border .T.,;
     ColorNormal "B/GB",;
     Text "&Note",;
     Width      13,;
     Height     1

  DEFINE ENTRYFIELD ENTRYFIELD13 OF
THIS;
    PROPERTY;
     Left       81.3311,;
     Top        9,;
     Border .F.,;
     ColorNormal "N/W+",;
     Width      13.6689,;
     DataLink "PROJECT->:NOTE:",;
     Height     1

  DEFINE TEXT TEXT17 OF THIS;
    PROPERTY;
     Left       37,;
     OldStyle .T.,;
     Top        11,;
     Border .T.,;
     ColorNormal "B/GB",;
     Text "&Potential investor",;
     Width      32,;
     Height     1

  DEFINE ENTRYFIELD ENTRYFIELD14 OF
THIS;
    PROPERTY;
     Left       54.3311,;
     Top        11,;
     Border .F.,;
     ColorNormal "N/W+",;
     Width      40.6689,;
     DataLink "POINVEST->:POINVESTOR:",;
     Height     1
```

```
  DEFINE NEXTBUTTON NEXTBUTTON1 OF
THIS;
    PROPERTY;
     Left       0.3311,;
     Top        19.5879,;
     Group .T.,;
     Width      9.335,;
     Height     2

  DEFINE CLOSEBUTTON CLOSEBUTTON1
OF THIS;
    PROPERTY;
     Left       24.5,;
     Top        19.8223,;
     UpBitmap "RESOURCE #28",;
     Group .T.,;
     Width      8.666,;
     Height     1.7656

  DEFINE                    BROWSEBUTTON
BROWSEBUTTON1 OF THIS;
    PROPERTY;
     Left       64.6641,;
     Top        19.5879,;
     Text "Browse",;
     Group .T.,;
     Width      10.1689,;
     Height     1.8232

  DEFINE PUSHBUTTON PUSHBUTTON3 OF
THIS;
    PROPERTY;
     Left       24.1641,;
     Top        17.4688,;
     OnClick
CLASS::PUSHBUTTON3_ONCLICK2,;
     ColorNormal "N/W",;
     Text "PIP",;
     Group .T.,;
     Width      9.002,;
     Height     1.8838

  DEFINE PUSHBUTTON PUSHBUTTON4 OF
THIS;
    PROPERTY;
     Left       86.665,;
     Top        17.4102,;
     OnClick
CLASS::PUSHBUTTON4_ONCLICK1,;
     ColorNormal "N/W",;
     Text "Search",;
     UpBitmap "RESOURCE #32",;
     Group .T.,;
     Width      8.335,;
     Height     1.6484

  DEFINE PUSHBUTTON PUSHBUTTON5 OF
THIS;
    PROPERTY;
     Left       76.1641,;
     Top        19.5293,;
     OnClick
CLASS::PUSHBUTTON5_ONCLICK,;
     ColorNormal "N/W",;
     Text "Region ",;
     Group .T.,;
     Width      9.1689,;
     Height     1.9404

  DEFINE PUSHBUTTON PUSHBUTTON1 OF
THIS;
    PROPERTY;
     Left       12.3311,;
     Top        17.5879,;
     OnClick {; go top},;
     ColorNormal "N/W",;
     Text "Top",;
     Group .T.,;
     Width      8.002,;
     Height     1.7061

  DEFINE PUSHBUTTON PUSHBUTTON2 OF
THIS;
    PROPERTY;
     Left       12.3311,;
     Top        19.8223,;
     OnClick {; go bottom},;
     ColorNormal "N/W",;
     Text "Bottom",;
     Group .T.,;
     Width      8.502,;
     Height     1.8242

  DEFINE PUSHBUTTON PUSHBUTTON6 OF
THIS;
    PROPERTY;
     Left       64.3311,;
     Top        17.4102,;
     OnClick
CLASS::PUSHBUTTON6_ONCLICK,;
     ColorNormal "N/W",;
     Text "Acquire",;
     Group .T.,;
     Width      10.1689,;
     Height     1.8242

  DEFINE PUSHBUTTON PUSHBUTTON7 OF
THIS;
    PROPERTY;
     Left       44.8311,;
     Top        18.293,;
```

```
      OnClick
CLASS::PUSHBUTTON7_ONCLICK,;
      ColorNormal "N/W",;
      Text "Image",;
      UpBitmap "RESOURCE #617",;
      Group .T.,;
      FocusBitmap "RESOURCE #617",;
      Width       9.835,;
      Height      1.8242

  DEFINE PREVBUTTON PREVBUTTON1 OF
THIS;
    PROPERTY;
      Left       0.3311,;
      Top        17.4102,;
      Text "Previ",;
      Group .T.,;
      Width      9.1689,;
      Height     1.8838

  DEFINE PUSHBUTTON PUSHBUTTON8 OF
THIS;
    PROPERTY;
      Left       86.8311,;
      Top        19.4688,;
      OnClick
CLASS::PUSHBUTTON8_ONCLICK1,;
      ColorNormal "N/W",;
      Text "Report",;
      UpBitmap "RESOURCE #614",;
      Group .T.,;
      Width      9.002,;
      Height     1.8838

  DEFINE PUSHBUTTON PUSHBUTTON9 OF
THIS;
    PROPERTY;
      Left       75.832,;
      Top        17.4102,;
      OnClick
CLASS::PUSHBUTTON9_ONCLICK,;
      ColorNormal "N/W",;
      Text "Sector ",;
      Group .T.,;
      Width      9.001,;
      Height     1.7656

  Procedure SECTOR_OnClick
  form.close()
  form.release()
  set procedure to selectsr.wfm
  do selectsr.wfm


  Procedure PUSHBUTTON3_OnClick
  form.close()
  form.release()
  set procedure to pipdmenu.wfm additive
  do pipmenu.wfm



 Procedure PUSHBUTTON4_OnClick1

  select 1
  form.searchoptions()
  set filter to projectid = pnumber
  go top
 return

 Procedure PUSHBUTTON5_OnClick
 form.close()
 form.release()
 set procedure to region.wfm additive
 do region.wfm

 Procedure PUSHBUTTON6_OnClick
 select project
 go bottom
 append blank
 return

 Procedure PUSHBUTTON7_OnClick
     public projID
     projID = form.entryfield1.value
      msgbox("Value",projID,0)
     create session
     local i

     set procedure to image.wfm additive
     i = new imageform()
     i.open()
     select 1
     set order to tag projectID
     set key to "&projID"
     go top
     return

   procedure callshowimage
   local tprojectid
   if type ("form.imageform")<>"U"
   tprojectid=project->projectid
   form.imageform.showimage2(tprojectid)
   endif
   return


 Procedure PREVBUTTON1_OnClick
 prev::onClick()
 form.callshowimage()
 return
```

```
  Procedure PUSHBUTTON8_OnClick
  form.callshowimage()
  return

  Procedure PREVBUTTON1_OnClick1
  form.callshowimage()
  return

  Procedure searchoptions
  create session
  local p
  set procedure to
f:\home\workug\pipdata\search.wfm additive
  p = new searchform()
  p.readmodal()
  return

  Procedure PUSHBUTTON8_OnClick1
  report form project.rpt

  Procedure PUSHBUTTON9_OnClick
  set procedure to selectsr.wfm additive
  do selectsr.wfm
  return

ENDCLASS

** END HEADER -- do not remove this line*
* Generated on 05/14/98
*
LOCAL f
f = NEW IMAGEFORM()
f.Open()

CLASS IMAGEFORM OF FORM
  Set Procedure To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.Width =      64
  this.HelpId = ""
  this.HelpFile = ""
  this.Text = "Agriculture"
  this.View = "image1.dbf"
  this.ScrollBar =      2
  this.Height =      12
  this.ColorNormal = "N/GB"
  this.Left =      28.333
  this.Top =      4.2344

  DEFINE TEXT TEXT1 OF THIS;
    PROPERTY;
      Width      18,;
      Border .F.,;
      Text "Image1",;
      FontSize      18,;
      Height      2.0293,;
      ColorNormal "RG+/GB",;
      Left      1,;
      Top      0.5

  DEFINE TEXT TEXT2 OF THIS;
    PROPERTY;
      Width      14,;
      OldStyle .T.,;
      Border .T.,;
      Text "&Projectid",;
      Height      2.1758,;
      ColorNormal "B/GB",;
      Left      1,;
      Top      3

  DEFINE ENTRYFIELD ENTRYFIELD1 OF
THIS;
    PROPERTY;
      Width      10.8682,;
      Border .F.,;
      DataLink "IMAGE1->:PROJECTID:",;
      Height      1,;
      ColorNormal "N/W+",;
      Left      1.2979,;
      Top      4

  DEFINE TEXT TEXT3 OF THIS;
    PROPERTY;
      Width      35,;
      OldStyle .T.,;
      Border .T.,;
      Text "&Imagetitle",;
      Height      2.1758,;
      ColorNormal "B/GB",;
      Left      15,;
      Top      3

  DEFINE ENTRYFIELD ENTRYFIELD2 OF
THIS;
    PROPERTY;
      Width      37.3682,;
      Border .F.,;
      DataLink "IMAGE1->:IMAGETITLE:",;
      Height      1,;
      ColorNormal "N/W+",;
      Left      15.2979,;
      Top      4

  DEFINE TEXT TEXT4 OF THIS;
    PROPERTY;
      Width      14,;
      OldStyle .T.,;
      Border .T.,;
      Text "&Imagedate",;
      Height      2.1758,;
```

```
    ColorNormal "B/GB",;
    Left        1,;
    Top         5

  DEFINE SPINBOX SPINBOX1 OF THIS;
    PROPERTY;
    Width       13.0352,;
    Border .F.,;
    DataLink "IMAGE1->:IMAGEDATE:",;
    Rangemax {06/15/98},;
    Rangemin {03/07/98},;
    Height      1,;
    ColorNormal "N/W+",;
    Left        1.2979,;
    Top         6

  DEFINE TEXT TEXT5 OF THIS;
    PROPERTY;
    Width       35,;
    OldStyle .T.,;
    Border .T.,;
    Text "&Imagesourc",;
    Height      2.1758,;
    ColorNormal "B/GB",;
    Left        15,;
    Top         5

  DEFINE ENTRYFIELD ENTRYFIELD3 OF
THIS;
    PROPERTY;
    Width       35.7021,;
    Border .F.,;
    DataLink "IMAGE1->:IMAGESOURC:",;
    Height      1,;
    ColorNormal "N/W+",;
    Left        15.2979,;
    Top         6

  DEFINE TEXT TEXT6 OF THIS;
    PROPERTY;
    Width       14,;
    OldStyle .T.,;
    Border .T.,;
    Text "&Image",;
    Height      2.1758,;
    ColorNormal "B/GB",;
    Left        1,;
    Top         7

  DEFINE ENTRYFIELD ENTRYFIELD4 OF
THIS;
    PROPERTY;
    Width       8.5352,;
    Border .F.,;
    DataLink "IMAGE1->:IMAGE:",;
    Height      1,;
    ColorNormal "N/W+",;
    Left        1.2979,;
    Top         8

  Procedure PUSHBUTTON1_OnClick
  private proid
  set order to tag projectid
  proid = projectid1
  set index to projectid order projectid
  set key to "&proid"
  go top
  seek projectid1
  return

  Procedure showimage2(projectid1)
  private proid
  set order to tag projectid
  proid = projectid1
  set index to projectid order projectid
  set key to "&proid"
  go top
  seek projectid1
  return
ENDCLASS

create session
public pnumber
** END HEADER -- do not remove this line*
* Generated on 05/19/98
*
LOCAL f
f = NEW SEARCHFORM()
f.Open()

CLASS SEARCHFORM OF FORM
  Set                Procedure                To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.Height =      18
  this.MDI = .F.
  this.ColorNormal = "B/0X82FF57"
  this.Left =        25.5
  this.Text = "Form"
  this.Top =         2.1172
  this.Width =       63
  this.HelpId = ""
  this.HelpFile = ""

  DEFINE TEXT TEXT1 OF THIS;
    PROPERTY;
    Height      1.6484,;
    Border .F.,;
    ColorNormal "B/0x82ff57",;
    Left        4.5,;
    Text "Searching is possible either by ",;
    Top         0.9395,;
```

```
    FontSize        14,;
    Width       48.5

  DEFINE TEXT TEXT2 OF THIS;
    PROPERTY;
    Height      1.3525,;
    Border .F.,;
    ColorNormal "B/0x82ff57",;
    Left        4.8311,;
    Text "project ID, project title, subsector, or
      zone ",;
    Top         2.5293,;
    FontSize        10,;
    Width       48.835

  DEFINE TEXT TEXT3 OF THIS;
    PROPERTY;
    Height      1.3535,;
    Border .F.,;
    ColorNormal "B/0x82ff57",;
    Left        6.3311,;
    Text "Click or choose one of them or exit",;
    Top         3.6465,;
    FontSize        12,;
    Width       45.002

  DEFINE PUSHBUTTON PUSHBUTTON1 OF
THIS;
    PROPERTY;
    Height      1.7656,;
    ColorNormal "N/W",;
    OnClick
CLASS::PUSHBUTTON1_ONCLICK,;
    Left        6,;
    Text "Project ID",;
    Group .T.,;
    Default .T.,;
    Top         6.4688,;
    Width       15.166

  DEFINE PUSHBUTTON PUSHBUTTON2 OF
THIS;
    PROPERTY;
    Height      1.8252,;
    ColorNormal "N/W",;
    Left        6.3311,;
    Text "Project Title",;
    Group .T.,;
    Top         9.4688,;
    Width       15.502

  DEFINE PUSHBUTTON PUSHBUTTON3 OF
THIS;
    PROPERTY;
    Height      1.5889,;
    ColorNormal "N/W",;
    Left        31.8311,;
    Text "Subsector",;
    Group .T.,;
    Top         6.7051,;
    Width       16.002

  DEFINE PUSHBUTTON PUSHBUTTON4 OF
THIS;
    PROPERTY;
    Height      1.6484,;
    ColorNormal "N/W",;
    Left        31.5,;
    Text "Zone",;
    Group .T.,;
    Top         9.4102,;
    Width       17.333

  DEFINE CLOSEBUTTON CLOSEBUTTON1
OF THIS;
    PROPERTY;
    Height      1.9404,;
    Left        6.5,;
    Group .T.,;
    Top         13,;
    Width       14.666

  Procedure PUSHBUTTON1_OnClick
    form.getprojectid()
    form.close()
  return

  Procedure getprojectid
  create session
  local p
  set                   procedure                   to
f:\home\workug\pipdata\getprid.wfm additive
  p = new getpridform()
  p.readmodal()
  return

ENDCLASS

** END HEADER -- do not remove this line*
* Generated on 05/19/98
*
LOCAL f
f = NEW GETPRIDFORM()
f.Open()

CLASS GETPRIDFORM OF FORM
  Set               Procedure               To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.Height =     6.5293
  this.MDI = .F.
  this.ColorNormal = "B/0X82FF57"
```

```
this.View = "PROJECT.QBE"
this.Left =       27.333
this.Text = "Form"
this.OnSelection = CLASS::ONSELECTION
this.Top =        2.1758
this.Width =       38
this.HelpId = ""
this.HelpFile = ""

DEFINE ENTRYFIELD PROJ_NO OF THIS;
  PROPERTY;
   Height       1.1182,;
   Border .T.,;
   Left       17.1641,;
   Value "",;
   Top        1.6465,;
   Width       16.002

DEFINE TEXT TEXT1 OF THIS;
  PROPERTY;
   Height       1.1768,;
   Border .F.,;
   ColorNormal "B/W",;
   Left        1,;
   Text "Enter Project ID:",;
   Top        1.6465,;
   Width       15.5

DEFINE PUSHBUTTON OK OF THIS;
  PROPERTY;
   Height       1.2959,;
   ColorNormal "N/W",;
   Left       8.1641,;
   Text "OK",;
   Group .T.,;
   ID         1,;
   Default .T.,;
   Top        3.4688,;
   Width       9.6689

DEFINE PUSHBUTTON CANCEL OF THIS;
  PROPERTY;
   Height       1.2959,;
   ColorNormal "N/W",;
   OnClick CLASS::CANCEL_ONCLICK,;
   Left       21.8311,;
   Text "Cancel",;
   Group .T.,;
   ID         0,;
   Top        3.4688,;
   Width       9.6689

Procedure CANCEL_OnClick
  form.close()

procedure Onselection(controlID)
  if controlID <> 0
    pnumber = form.Proj_NO.value
    form.close()

  endif
ENDCLASS

** END HEADER -- do not remove this line*
* Generated on 05/13/98
*
LOCAL f
f = NEW SELECTSRFORM()
f.Open()

CLASS SELECTSRFORM OF FORM
  Set                Procedure                To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.HelpId = ""
  this.HelpFile = ""
  this.Height =       12.25
  this.ColorNormal = "B/0X82FF82"
  this.Text = " Potential Investment Sector"
  this.Left =       17.25
  this.ScaleFontSize =       10
  this.Top =        1.75
  this.Width =       57.75

  DEFINE PUSHBUTTON PUSHBUTTON1 OF
THIS;
    PROPERTY;
     OnClick
CLASS::PUSHBUTTON1_ONCLICK,;
     Height       2,;
     ColorNormal "B/W",;
     Text "Agriculture",;
     Group .T.,;
     Default .T.,;
     Left       3.25,;
     Top        3.75,;
     Width       9

  DEFINE PUSHBUTTON PUSHBUTTON2 OF
THIS;
    PROPERTY;
     Height       2,;
     ColorNormal "B/W",;
     Text "Manufactutring",;
     Group .T.,;
     Left      13.875,;
     Top        3.7998,;
     Width       11

  DEFINE PUSHBUTTON PUSHBUTTON3 OF
THIS;
    PROPERTY;
```

```
    Height      2,;
    ColorNormal "B/W",;
    Text "Mining",;
    Group .T.,;
    Left      26.75,;
    Top       3.7998,;
    Width      7

  DEFINE PUSHBUTTON PUSHBUTTON4 OF
THIS;
    PROPERTY;
    Height      2,;
    ColorNormal "B/W",;
    Text "Construction",;
    Group .T.,;
    Left      35,;
    Top       3.7998,;
    Width     10.125

  DEFINE PUSHBUTTON PUSHBUTTON5 OF
THIS;
    PROPERTY;
    Height      2,;
    ColorNormal "B/W",;
    Text "Hotel & Tourism",;
    Group .T.,;
    Left      46.125,;
    Top       3.8994,;
    Width     10

  DEFINE PUSHBUTTON PUSHBUTTON6 OF
THIS;
    PROPERTY;
    Height      2,;
    ColorNormal "B/W",;
    Text "Health",;
    Group .T.,;
    Left      3.25,;
    Top       6.0498,;
    Width     9

  DEFINE PUSHBUTTON PUSHBUTTON7 OF
THIS;
    PROPERTY;
    Height      2,;
    ColorNormal "B/W",;
    Text "Education",;
    Group .T.,;
    Left      14,;
    Top       5.9492,;
    Width     10.125

  DEFINE PUSHBUTTON PUSHBUTTON8 OF
THIS;
    PROPERTY;
    Height      2,;
    ColorNormal "B/W",;
    Text "Real estate",;
    Group .T.,;
    Left      34.875,;
    Top       6,;
    Width     11

  DEFINE PUSHBUTTON PUSHBUTTON9 OF
THIS;
    PROPERTY;
    Height      2,;
    ColorNormal "B/W",;
    Text "Trade",;
    Group .T.,;
    Left      26.75,;
    Top       5.9492,;
    Width     7.125

  DEFINE PUSHBUTTON PUSHBUTTON10 OF
THIS;
    PROPERTY;
    Height      1.9502,;
    ColorNormal "B/W",;
    Text "Others",;
    Group .T.,;
    Left      46.5,;
    Top       6.0996,;
    Width     9.625

  DEFINE TEXT TEXT1 OF THIS;
    PROPERTY;
    FontSize    14,;
    Height      1.8018,;
    ColorNormal "N/W",;
    Text "Select the Investment Sector you
want",;
    Border .F.,;
    Left      7.625,;
    Top       0.9482,;
    Width     45.375

  DEFINE CANCELBUTTON
CANCELBUTTON1 OF THIS;
    PROPERTY;
    Height      1.7998,;
    ColorNormal "B/W",;
    Group .T.,;
    Left      3.125,;
    Top       8.8496,;
    Width     9.25

  Procedure PUSHBUTTON1_OnClick
  form.close()
  form.release()
  set procedure to agri.wfm additive
  do agri.wfm
```

```
ENDCLASS

** END HEADER -- do not remove this line*
* Generated on 05/13/98
*
LOCAL f
f = NEW AGRIFORM()
f.Open()

CLASS AGRIFORM OF FORM
  Set                    Procedure                    To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.ColorNormal = "B/0X82FF57"
  this.Left =        0.5
  this.Top =         0.1758
  this.Width =       99.833
  this.Text = "Agriculture Sector"
  this.WindowState =       2
  this.HelpId = ""
  this.HelpFile = ""
  this.View = "AGRI.QBE"
  this.ScrollBar =         1
  this.Height =      18.7051

  DEFINE TEXT TEXT2 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left        0.3311,;
     Top         0.1172,;
     Width       15.002,;
     Text "&Project id",;
     Border .F.,;
     OldStyle .T.,;
     Height      1

  DEFINE ENTRYFIELD ENTRYFIELD1 OF
THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left        12.3311,;
     Top         0.1172,;
     Width       12.1689,;
     Border .T.,;
     DataLink "PROJECT->:PROJECTID:",;
     Height      1

  DEFINE TEXT TEXT3 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left        28.6641,;
     Top         0.1172,;
     Width       15.002,;
     Text "&Project title",;
     Border .F.,;
     OldStyle .T.,;
     Height      1

  DEFINE ENTRYFIELD ENTRYFIELD2 OF
THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left        40.6641,;
     Top         0.1758,;
     Width       26.8359,;
     Border .T.,;
     DataLink "PROJECT->:PROJTITLE:",;
     Height      0.8828

  DEFINE TEXT TEXT4 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left        0.5,;
     Top         1.8809,;
     Width       12.166,;
     Text "&Sector",;
     Border .F.,;
     OldStyle .T.,;
     Height      1.0596

  DEFINE ENTRYFIELD ENTRYFIELD3 OF
THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left        12.6641,;
     Top         1.8809,;
     Width       13.002,;
     Border .T.,;
     DataLink "PROJECT->:SECTOR:",;
     Height      1.0596

  DEFINE TEXT TEXT5 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left        28.6641,;
     Top         1.8809,;
     Width       12.502,;
     Text "&Subsector",;
     Border .F.,;
     OldStyle .T.,;
     Height      1.001

  DEFINE ENTRYFIELD ENTRYFIELD4 OF
THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left        40.6641,;
     Top         1.7637,;
     Width       27.002,;
     Border .T.,;
     DataLink "PROJECT->:SUBSECTOR:",;
```

```
    Height        1.001

  DEFINE TEXT TEXT6 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left         0.3311,;
     Top          3.4688,;
     Width        11.6689,;
     Text "&Total cost",;
     Border .F.,;
     OldStyle .T.,;
     Height       1.001

  DEFINE SPINBOX SPINBOX1 OF THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left         12.1641,;
     Top          3.3516,;
     Width        14.1689,;
     Rangemax     100,;
     Rangemin     1,;
     Border .T.,;
     DataLink "PROJECT->:TOTALCOST:",;
     Height       1.001

  DEFINE TEXT TEXT7 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left         72,;
     Top          1.6465,;
     Width        12.833,;
     Text "&Project life",;
     Border .F.,;
     OldStyle .T.,;
     Height       0.8828

  DEFINE ENTRYFIELD ENTRYFIELD5 OF
THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left         84.6641,;
     Top          1.5879,;
     Width        10.8359,;
     Border .T.,;
     DataLink "PROJECT->:PROJLIFE:",;
     Height       1

  DEFINE TEXT TEXT8 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left         0.3311,;
     Top          6.5879,;
     Width        15.002,;
     Text "&Study",;
     Border .F.,;
     OldStyle .T.,;
     Height       1

  DEFINE ENTRYFIELD ENTRYFIELD6 OF
THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left         11.8311,;
     Top          6.7637,;
     Width        84.335,;
     Border .T.,;
     DataLink "PROJECT->:STUDY:",;
     Height       0.9414

  DEFINE TEXT TEXT9 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left         0.3311,;
     Top          5,;
     Width        11.502,;
     Text "&Region",;
     Border .F.,;
     OldStyle .T.,;
     Height       1

  DEFINE ENTRYFIELD ENTRYFIELD7 OF
THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left         12,;
     Top          5,;
     Width        15,;
     Border .T.,;
     DataLink "PROJECT->:REGION:",;
     Height       1

  DEFINE TEXT TEXT10 OF THIS;
    PROPERTY;
     ColorNormal "B/GB",;
     Left         29,;
     Top          4.8809,;
     Width        11.666,;
     Text "&Zone",;
     Border .F.,;
     OldStyle .T.,;
     Height       0.9424

  DEFINE ENTRYFIELD ENTRYFIELD8 OF
THIS;
    PROPERTY;
     ColorNormal "N/W+",;
     Left         40.3311,;
     Top          4.7637,;
     Width        27.1689,;
     Border .T.,;
     DataLink "PROJECT->:ZONE:",;
     Height       1.1182
```

```
DEFINE TEXT TEXT11 OF THIS;
  PROPERTY;
   ColorNormal "B/GB",;
   Left       71.8311,;
   Top        4.6465,;
   Width      12.6689,;
   Text "&Woreda",;
   Border .F.,;
   OldStyle .T.,;
   Height     0.8828

DEFINE ENTRYFIELD ENTRYFIELD9 OF
THIS;
  PROPERTY;
   ColorNormal "N/W+",;
   Left       84.5,;
   Top        4.6465,;
   Width      11.666,;
   Border .T.,;
   DataLink "PROJECT->:WOREDA:",;
   Height     0.9414

DEFINE TEXT TEXT12 OF THIS;
  PROPERTY;
   ColorNormal "B/GB",;
   Left       0.5,;
   Top        8.2344,;
   Width      15,;
   Text "&Product",;
   Border .F.,;
   OldStyle .T.,;
   Height     1

DEFINE ENTRYFIELD ENTRYFIELD10 OF
THIS;
  PROPERTY;
   ColorNormal "N/W+",;
   Left       12.1641,;
   Top        8.2344,;
   Width      84.1689,;
   Border .T.,;
   DataLink "PROJECT->:PRODUCT:",;
   Height     0.9414

DEFINE TEXT TEXT13 OF THIS;
  PROPERTY;
   ColorNormal "B/GB",;
   Left       0.5,;
   Top        9.8223,;
   Width      11.333,;
   Text "&Capacity",;
   Border .F.,;
   OldStyle .T.,;
   Height     1.001

DEFINE ENTRYFIELD ENTRYFIELD11 OF
THIS;
  PROPERTY;
   ColorNormal "N/W+",;
   Left       11.6641,;
   Top        9.8809,;
   Width      84.8359,;
   Border .T.,;
   DataLink "PROJECT->:CAPACITY:",;
   Height     0.8838

DEFINE TEXT TEXT14 OF THIS;
  PROPERTY;
   ColorNormal "B/GB",;
   Left       71.8311,;
   Top        0.1172,;
   Width      12.6689,;
   Text "&Regist. date",;
   Border .F.,;
   OldStyle .T.,;
   Height     0.9414

DEFINE SPINBOX SPINBOX2 OF THIS;
  PROPERTY;
   ColorNormal "N/W+",;
   Left       84.3311,;
   Top        0,;
   Width      13.002,;
   Rangemax {11/09/88},;
   Rangemin {08/01/88},;
   Border .T.,;
   DataLink "PROJECT->:REGISTDATE:",;
   Height     1.0586

DEFINE TEXT TEXT15 OF THIS;
  PROPERTY;
   ColorNormal "B/GB",;
   Left       28.8311,;
   Top        3.1758,;
   Width      15.002,;
   Text "&Project type",;
   Border .F.,;
   OldStyle .T.,;
   Height     1.0586

DEFINE ENTRYFIELD ENTRYFIELD12 OF
THIS;
  PROPERTY;
   ColorNormal "N/W+",;
   Left       40.6641,;
   Top        3.1758,;
   Width      27.002,;
   Border .T.,;
   DataLink "PROJECT->:PROJTYPE:",;
   Height     1.0586
```

```
    Group .T.,;
    Text "Amhara",;
    Height      2,;
    Left      14.666

  DEFINE PUSHBUTTON PUSHBUTTON3 OF
THIS;
    PROPERTY;
    Top       5.4697,;
    Width      11,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "Tigray",;
    Height      2,;
    Left      29.333

  DEFINE PUSHBUTTON PUSHBUTTON4 OF
THIS;
    PROPERTY;
    Top       5.4697,;
    Width      12,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "South People",;
    Height      2,;
    Left      45.166

  DEFINE PUSHBUTTON PUSHBUTTON5 OF
THIS;
    PROPERTY;
    Top       8.5879,;
    Width      9,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "Afar",;
    Height      2,;
    Left      0.833

  DEFINE PUSHBUTTON PUSHBUTTON6 OF
THIS;
    PROPERTY;
    Top       8.5293,;
    Width      10,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "Somalia",;
    Height      2,;
    Left      14.5

  DEFINE PUSHBUTTON PUSHBUTTON7 OF
THIS;
    PROPERTY;
    Top       8.4697,;
    Width      10,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "Harari",;
    Height      2,;
    Left      29.166

  DEFINE PUSHBUTTON PUSHBUTTON8 OF
THIS;
    PROPERTY;
    Top       8.3525,;
    Width      12,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "Benshagun Gumz",;
    Height      2,;
    Left      45

  DEFINE PUSHBUTTON PUSHBUTTON9 OF
THIS;
    PROPERTY;
    Top       11.5293,;
    Width      9,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "Gambela",;
    Height      2,;
    Left      0.666

  DEFINE PUSHBUTTON PUSHBUTTON10 OF
THIS;
    PROPERTY;
    Top       11.5293,;
    Width      10,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "Addis Ababa",;
    Height      2,;
    Left      14.5

  DEFINE PUSHBUTTON PUSHBUTTON11 OF
THIS;
    PROPERTY;
    Top       11.4697,;
    Width      11,;
    ColorNormal "B/W",;
    Group .T.,;
    Text "Dire Dawa",;
    Height      2,;
    Left      29.166

  DEFINE                CANCELBUTTON
CANCELBUTTON1 OF THIS;
    PROPERTY;
    Top       14.8818,;
    Width      12,;
    ColorNormal "B/W",;
    Group .T.,;
    Height      2,;
```

```
    Left        44.666

  Procedure Form_OnSelection(controlId)

  Procedure PUSHBUTTON1_OnClick
  form.close()
  form.release()
  set procedure to oromia.wfm additive
  do oromia.wfm

  Procedure PUSHBUTTON12_OnClick
  close.form()
  release.form()
  set procedure to project.wfm additive
  do project.wfm
ENDCLASS

** END HEADER -- do not remove this line*
* Generated on 05/18/98
*
LOCAL f
f = NEW OROMIAFORM()
f.Open()

CLASS OROMIAFORM OF FORM
  Set                Procedure                To
C:\DBASEWIN\SAMPLES\BUTTONS.CC
additive
  this.Height =        18.9404
  this.ColorNormal = "B/0X82FF57"
  this.View = "oromia.qbe"
  this.Left =        1
  this.Text = " Poteintal Investment Projects in
        Oromia"
  this.ScrollBar =        2
  this.Top =        0
  this.Width =        98.333
  this.HelpId = ""
  this.HelpFile = ""
  DEFINE TEXT TEXT2 OF THIS;
    PROPERTY;
      Height        1,;
      Border .T.,;
      ColorNormal "B/GB",;
      Left        0,;
      Text "&Project ID",;
      OldStyle .T.,;
      Top        1,;
      Width        28
  DEFINE ENTRYFIELD ENTRYFIELD1 OF
THIS;
    PROPERTY;
      Height        1,;
      Border .F.,;
      ColorNormal "N/W+",;
      Left        12.3311,;
      Top        1,;
      Width        15.6689,;
      DataLink "PROJECT->:PROJECTID:"
  DEFINE TEXT TEXT3 OF THIS;
    PROPERTY;
      Height        1,;
      Border .T.,;
      ColorNormal "B/GB",;
      Left        32,;
      Text "&Project title",;
      OldStyle .T.,;
      Top        1,;
      Width        12
  DEFINE ENTRYFIELD ENTRYFIELD2 OF
THIS;
    PROPERTY;
      Height        0,;
      Border .F.,;
      ColorNormal "N/W+",;
      Left        44,;
      Top        2,;
      Width        27,;
      DataLink "PROJECT->:PROJTITLE:"
  DEFINE TEXT TEXT4 OF THIS;
    PROPERTY;
      Height        1,;
      Border .T.,;
      ColorNormal "B/GB",;
      Left        0,;
      Text "&Sector",;
      OldStyle .T.,;
      Top        3,;
      Width        28
  DEFINE ENTRYFIELD ENTRYFIELD3 OF
THIS;
    PROPERTY;
      Height        1,;
      Border .F.,;
      ColorNormal "N/W+",;
      Left        12.3311,;
      Top        3,;
      Width        15.6689,;
      DataLink "PROJECT->:SECTOR:"
  DEFINE TEXT TEXT5 OF THIS;
    PROPERTY;
      Height        1,;
      Border .T.,;
      ColorNormal "B/GB",;
      Left        32,;
      Text "&Subsector",;
      OldStyle .T.,;
      Top        3,;
      Width        28
  DEFINE ENTRYFIELD ENTRYFIELD4 OF
THIS;
    PROPERTY;
```

```
    Border .F.,;
    ColorNormal "N/W+",;
    Left       77.3311,;
    Top        9,;
    Width      9.6689,;
    DataLink "PROJECT->:NOTE:"
  DEFINE                    CANCELBUTTON
CANCELBUTTON1 OF THIS;
    PROPERTY;
    Height     2,;
    Left       40,;
    Group .T.,;
    Top        16,;
    Width      11

  DEFINE LINE LINE1 OF THIS;
    PROPERTY;
    ColorNormal "N",;
    Bottom     10,;
    Left       71,;
    Right      71,;
    Top        9,;
    Width      1

  DEFINE LINE LINE2 OF THIS;
    PROPERTY;
    ColorNormal "N",;
    Bottom     10,;
    Left       71,;
    Right      86,;
    Top        10,;
    Width      1

  DEFINE LINE LINE3 OF THIS;
    PROPERTY;
    ColorNormal "N",;
    Bottom     10,;
    Left       71,;
    Right      87,;
    Top        10,;
    Width      1

  DEFINE LINE LINE4 OF THIS;
    PROPERTY;
    ColorNormal "N",;
    Bottom     10,;
    Left       87,;
    Right      87,;
    Top        9,;
    Width      1

  DEFINE LINE LINE5 OF THIS;
    PROPERTY;
    ColorNormal "N",;
    Bottom     9,;
    Left       71,;
    Right      87,;
    Top        9,;
    Width      1

  DEFINE PREVBUTTON PREVBUTTON1 OF
THIS;
    PROPERTY;
    Height     2,;
    Left       1,;
    Group .T.,;
    Top        16,;
    Widt
```

DECLARATION

This thesis is my original work and has not been submitted for a degree in any other University.

Worku Gedlie

22 May, 1998

The thesis has been submitted for examination with my approval as University advisor.

Ato Tesfaye Birru

May 22, 1998