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APPLICATION OF OBJECT-ORIENTED APPROACH FOR THE DEVELOPMENT OF A TAX DATABASE : A CASE STUDY OF REGION 14 FINANCE BUREAU

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE IN INFORMATION SCIENCE

BY
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ABSTRACT

The tax system of a country is the basis for government revenue by which the funds raised will provide opportunities throughout the economy for development and growth. Strong tax system, in turn, requires more than anything else timely and complete information as one of its prerequisites. The lack of information can slow down the efficiency of taxation and this in turn has impact on the process of national development.

While rapid access to accurate information is critical to the tax operation, in the Ethiopian tax system, there have been reports that access to information was difficult and has been a persistent problems for a long time. Such problem has also been prevalent at Region 14 Finance Bureau which is the case area of this study.

Most of the information required for tax related activities are obtained based on searches across several files of taxpayers. The fact that the information is not readily available and must be extracted from files increase the response time for action and increase the risk of error due to lost or misplacement of original documents. These circumstances pose further difficulties which deter the chasing of tax arrears.

This study, therefore, was undertaken to address the tax information handling problems in the Region 14 Finance Bureau, with the view of exploring the application of the features and capabilities provided by objects-oriented techniques in tackling the information access problems.

Survey instruments, consisting of questionnaire, interview as well as documentary analysis, were used to collect required data for the study. Analysis made on the basis of the data gathered revealed enough evidence to establish the weaknesses of the existing tax information handling. The analysis has also helped in pinpointing the system's requirement as well as identification of possible solution.

As one alternative solution for tackling the problems in the existing manual system, development of a computer based database system is identified. In this connection, an attempt is made to demonstrate the application of object-oriented development techniques (

as an appropriate technique) to develop a database through prototyping. Further, recommendations are made for considerations by the Bureau to fully benefit from the solution suggested by way of identifying the prototype database into fully operational database.

Table of contents

List of figures

List of figures

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Among other things, governments have a central role to effective distribution of national income, proper economic growth, alleviate poverty, stabilise the economy, and improve the warfare of the society (Alemseged, 1994) :

These objectives are exercised and carried out through public finance which governments seek to mobilise and use finance for consumption and investment purpose. And pubic finance comprises four major parts, namely : revenue, expenditures, borrowing and indebtedness, and fiscal administration. Revenue is one major part of public finance in which taxation and other means are used to raise money for governments to help them effect their objectives through budgeting.

In particular, the purpose of taxation according to Ministry of Finance (1996), is

a) to transfer resources from private sector to public sector

b) to transfer the provision of public goods and services

c) to redistribute income

d) to correct market imperfections

e) change incentive structure

This means that taxation is not simply the main instrument by which a government finances its expenditure but also a means for effective distribution of resources, and stabilise the economy.

Ethiopia's taxation system is in a continuous process of change in line with the socio-economic and political restructuring under way. And with the introduction of federal structure since 1993, the former unitary fiscal system has been replaced by a sort of fiscal federalism whereby both the federal and regional government are given tax(revenue) and expenditure assignments to expedite their respective duties and responsibilities.

Though each regional states are empowered to levy and collect dues and taxes, the current regulations, practices and the basic system of taxation are mostly similar from region to region. For this reason, this study focuses on the practice of region 14 (Addis Ababa City Government) as a case study. The result of the study, however, may be applied to other regions in the country with minor modifications because of the just mentioned similarity.

The Addis Ababa Administration (Region 14), the case area, though not a full fledged regional state, is empowered to levy and collect taxes and dues on revenue sources allocated to it. Currently, the Addis Ababa Administration's revenue comprises personal income tax from Addis Ababa Administration employees, profit tax from regional business, sales tax, rental tax, agricultural income tax, land use fee, and other charges and fees. Access to domestic borrowing to the region is also allowed under certain condition. In addition, the federal government is obliged to provide grant to the region. Thus, the four distinct sources of revenue of the region are:(MOF, 1996)

1) own taxes and fees

2) taxes shared with the federal government

3) grants from the federal government

4) domestic borrowing

Yet, given limited access to domestic borrowing and unclear modalities as to the sharing of joint revenue, the only two revenue sources available so far to the region are revenue from own tax and fees, and federal transfer. With the present legal framework, the Addis Ababa Administration has limited capacity to raise its revenue through instituting new taxes or changing the tax base rate. Taking account of these limitations, the region can, however, achieve better results in raising its own revenue by strengthening and improving its tax administration and capacity.

To implement this process of devolution, Region 14 Finance Bureau is established in the region. It is delegated to administer and oversee the fiscal affairs of the Addis Ababa City Government . The Bureau is organised into 6 zones and 28 woredas (districts)

The tax related duties of the Bureau, among others, include to ensure that tax laws are properly enforced and all revenues due from taxes, excise duties, fees and other sources are properly assessed, collected and accounted for.

To undertake these activities, the Bureau more than anything else needs timely and complete information for managing tax assessment and collection. It is well known that the success of any tax system is dependent on availability of adequate information. Taxation is an information intensive process and its success is dependent on information. As such, the importance of information in tax management is unquestionable.

While rapid access to accurate information is critical to the Bureau's tax operation , there are problems not only in the availability of required information but also in accessing even

available information for the purpose of tax planning, assessment, collection, and monitoring tax collection effort.

The lack of information/data has a serious impact on the tax assessment and collection as indicated in the justification part of this paper. It is thus important for the Bureau to establish an effective mechanism for the collection, storage and retrieval, processing and managing data to cater for the needs of different users involved in the tax system.

1.2 STATEMENT OF THE PROBLEM

According to a preliminary investigation made for the purpose of this study, the information required for tax assessment, collection, planning and for other various tax related activities are not easily accessible because of the non existence of well organised tax database system. Most of the information/data are obtained based on searches across several files of taxpayers up to 150 pages of each taxpayer which contains receipts, vouchers, assessment notification (a formal notification to a taxpayer of the amount of tax liability and penalties for the year), declarations(a formal notification of income earned by the taxpayer to tax office), and various correspondences

All documents used since registration and every tax declaration and tax assessment etc. are kept in each taxpayer files. For instances, the process of registering a new tax payer and the tax declaration process involves 13 documents. This shows that the tax payer file contains a number of documents which are too bulky and difficult to handle.

According to the census made by the bureau in 1988 (from September to November) which is not yet actually published, the number of taxpayers (traders) in the region (city) is

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According to the census made by the bureau in 1988 (from September to November) which is not yet actually published, the number of taxpayers (traders) in the region (city) is

estimated to be more than 99,000. Each tax payer can have up to three files, one for each of the three main taxes which include profit taxes, personal income tax and sales tax. In some cases, additional files for income from lease of property and capital gains tax may also be kept.

Under the current practice in the region, the main control to identify audited and unaudited taxpayers account, number of taxpayers made declaration and fail to declare, cases under appeal, suit and execution, and the amount of tax due, the amount paid and the balance outstanding, are the copy of declaration, assessment notification, cash receipt and various correspondences filed in the taxpayer's file. Whenever the need arises, the various files of the taxpayers are collected from the archive and the required information is extracted. In this process some of the documents are observed to be missing from the files and there are no reliable mechanism for tracking down such cases. The fact that information is not readily available and must be extracted from files also increases the response time for actions and increases the risk of error due to lost or misplaced original documents. These circumstances pose further difficulties which deter the effectiveness of chasing tax arrears.

As indicated, with the manual methods in place, it is difficult and significant time and effort is required to access, calculate, update and maintain files and reporting effort is time consuming and inaccurate. To this end, **it is hypothesised that the Bureau is facing with the non-existence of well organised information, data collection, compilation and easily accessible database system, a system that establish an effective mechanism for collection, storage, retrieval, processing and managing data.** And with such condition, it is hardly possible to imagine the proper tax assessment and collection. It is essential

therefore, to make an empirical study on the existing system to make on improvement of the current information handling.

The main purpose of this study, therefore, is to test the hypothesis by way of investigating and analysing the existing problems and requirements so as to explore the possibility of benefiting from the advantage offered by object-oriented technology in database building to minimise the prevailing problems. To this end, the study attempt to seek answers to the following basic research questions.

1) What are the major problems faced due to the current manual system?
2) What are the information requirements of the various groups of users and the capability of the current system to provide the required information?
3) What changes are required to improve the current system ?
4) How can the features and capabilities provided by object-oriented technique help in the design of a better alternative support system?

1.3 JUSTIFICATION OF THE STUDY

Since taxes are an involuntary contribution or payment to government, taxpayers are strongly inclined to minimise their tax liabilities through avoidance and/or evasion. Tax administration, therefore has to aim at improving the efficiency with which taxes are accessed, processed and collected. Timely provision and use of relevant, accurate and reliable tax information is a prerequisite for such required efficiency.

In fact, it is now generally accepted that information is an extremely valuable resource. When organised and used in the proper manner, information contributes substantially to understand problems, make plans, strategies, to set objectives to solve the problem, to organise and co-

ordinate the implementation of those plans, to control and monitor the results and make decisions accordingly.

The main problem areas in which information are needed in taxation include in revenue planning, assessing income of taxpayers, determining and collecting taxes, and appraising the tax collection process and effort. In general, effective use of data/information is required

- for forecasting revenue yields,
- for controlling tax audit operations through the selection of those geographical areas, income levels, taxpayer groups, tax problems, etc., most appropriate for administrative scrutiny, and
- as a tool of management control to gauge the effectiveness of tax administration in general and in its various detailed operations in particular.

At present, as indicated earlier, almost all information related to taxation are processed manually. Due to the usual limitation of the manual data/information processing and the size and complexity of the existing information sources and information needs, it is difficult for the existing manual method to generate timely, reliable, consistent and integrated information for users. In particular, the major limitations noted include the following.

. Since all activities are manual, they result in,

- a lot of paper work that leads to erroneous aggregations and missing of data,
- delays and untimely provision of information,
- duplication of data in different files,
- a lot of man-hours are spent on routine and clerical activities,
- too many receipts, vouchers, transactions which are difficult to handle,

. It is often difficult to get statistical and detailed information on the amount of tax

assessed, collected, the number and class of taxpayers which is helpful:

- to formulate the revenue plan,
- to know the current status of tax assessment and collection,
- to know the amount of tax arrears,
- to provide on the number, class and detail description of taxpayers,
- to produce management reports which contain, monthly taxes receivable position, monthly and cumulative analysis against budget/plan and reports on repaid taxes, overdue taxes,

- It is often difficult to locate and retrieve tax payers' file and various forms, reports, and documents which contain taxpayer and revenue information,
- Loss or intentional removal of information from the taxpayers' files and significant duplication of information;

Hence, continuing with the manual method isn't a recommended option as it is not cost effective under the current trends and circumstances in terms of time and resources. Thus, there is a need to seek ways to alleviate these problems and it is felt that they can be met, at least partly, by designing an integrated tax database with proper storage and retrieval tools.

There are various types of systems approach which people are using as a weapon for developing a database. The constantly changing trend in information technology is also rapidly introducing new concepts and means of information retrieval. Conventional information retrieval systems built on the basis of traditional approaches for textual information handling are no longer the preferred means for information handling practice in such dynamic area of taxation whose information requirements are not only complex in nature but constantly changing. Object-oriented approaches are among the new techniques

that are coming into the scene with features and capabilities that enhance the performance of conventional storage and retrieval techniques to meet the challenges in such area.

Use of object-oriented technologies in the design of modern information storage and retrieval system has been increasing and seen as a better means that deserves attention. Currently, there is an upward trend in the interest for object-oriented approach as a way for overcoming limitations in traditional data models (Clementini and Felice, 1994). Because the object-oriented approach tries to model the real world as closely as possible, database built on the basis of this approach are reported to avoid system complexities and have greater efficiency. The capability to model the real world in a closer way has the advantage of representing and manipulating links and relationships among entities in a direct way.

Hence, in order to build a tax database that can handle a complex data types and to meet a constantly changing requirements, adapting object-oriented approach is considered a better choice. This study, therefore explore the application of the features and capabilities provided by object-oriented techniques in tackling the tax information access problems.

It is also expected that the outcome of this study may help the following groups of users to have readily available information who are directly or indirectly involved in the tax system of the Addis Ababa City Government.

- **Bureau, and departmental heads**: involved in designing, studying, planning and monitoring the taxing system of the region;
- **Planning experts** : to formulate yearly revenue plan of the region, zones and woredas and to consolidate monthly, quarterly and yearly revenue reports;

- **Tax auditors/inspectors** : to determine the taxable income require information on the income of taxpayers , import and export items information, production and sales information of manufacturers and wholesalers, prepaid taxes, date of declaration, tax collected etc.
- **Tax collectors** : They require information regarding tax payers, amount of tax declared, tax assessed and notified, etc.;
- **Appeal commission** : they require information regarding the assessment notification to confirm or amend the assessment;
- **Legal section** : they require information on tax due but unpaid, and the tax payers detail description in order to institute legal proceedings.

1.4 OBJECTIVES OF THE STUDY

GENERAL OBJECTIVE

The general objective of this study is to analyse the existing information access problems and requirements with a view to explore the features that an object-oriented method provides in designing and developing a database which would enhance accessibility of information at region 14 Finance Bureau.

SPECIFIC OBJECTIVES

For the purpose of achieving the general objectives of this study, the following specific objectives have been considered :

1. to review and analyse the existing tax information handling with particular emphasis on the identification of information critical to the goals and objectives of taxation;
2. to identify the existing major problems in accessing information/data particularly in

managing tax related functions;

3. to assess the present status, application, capacity and utilisation of computer technology in the Bureau;
4. to apply an object-oriented approach to the design and development of the prototype database for taxation.

1.5 SCOPE AND LIMITATIONS

1.5.1 Scope

The concern of this study is to examine the existing tax information handling in order to come up with a well organised tax database system that will facilitate the access of tax related information which in turn might improve the efficiency of tax related functions. This study will only focus on the improvement of the current tax information handling of Region 14 Finance Bureau. However, the results of the study might provides a useful background information for similar studies for other similar offices in the country.

1.5.2 Limitations

A case study approach has been adapted to demonstrate the application of object-oriented principles for designing a tax database. Moreover, the scope of the study also took into considerations the time and financial limitations faced by the researcher. Due to the time limitation, a prototype of the proposed system which consists of prototype tax database and user interface were developed.

The prototype was developed using dBASE V for windows. dBASE for windows is not a full object-oriented DBMS, rather it is primarily a relational system although it provides some

features for creating and using objects and classes, and declare the subclasses from super classes there by enabling object oriented design and development.

Sample size determination for the survey was more subjective because of two reasons:

i) readily available estimate of the parameters to be measured was not available;

ii) the population to be sampled was relatively smaller for the probability sampling formula to be used;

For reasons of reducing the size of the project to a manageable proportion, keeping in view the resources available, the study did not provide a detailed database design, nor was it necessary at this stage.

1.7 **Methodology**

The method of conducting this study consisted of first reviewing the information requirements at BOF, followed by designing a tax database as one proposed solution to meet the information requirements. At a third stage, an attempt was made to demonstrate an aspect of the database system proposed using existing technological facilities at the Bureau. In view of this, the data sources and materials, data collection method, and system development methodology used have been discussed as under.

i) Data sources and materials

The study was based on the information obtained from literature review, interviewing the prospective users, various written documents and questionnaires.

ii) Data collection method

The general method which has been used to collect the data for this study was a survey method. However, analysis of documentary sources were also applied to supplement the above method. Survey tools were selected to ensure that the most appropriate data for the research are collected . The data collection instruments used include:

a) **Questionnaire**

A questionnaire was used during the course of the survey as a means to collect data on major requirements and problems faced. The questionnaires were distributed randomly to individuals/professionals in the Bureau and each Zonal Offices who are involved in tax assessment, collection, recording, enforcement and revenue planning.

The questionnaire was designed based on consultation with the methods documented in literature. It was particularly designed to identify:

- information requirement and sources of information;
- the problem and limitation of the existing system, and how could it be improved;
- opinion/attitudes of users regarding the automation of some of the activities;
- information exchange patterns/manners between the Bureau and tax payers, various government organisations, wholesalers/distributors.

Before the distribution of the final questionnaire, initially the questionnaire was pre-tested on five staff of the Bureau and friends and colleagues in SISA to test the validity of questions and to see unattended areas. On the basis of the pilot survey, comments were given on the questions of information requirements, problems related to information access, availability,

and timeliness. Accordingly, modifications were made, updated and final questionnaires were produced and dispatched.

The personnel list of the Bureau was used to identify the individuals involved in tax assessment, collection, recording, enforcement, and planning. According to their professional categories, the population were subdivided into 4 groups. These were administrative heads (Bureau head, department and service heads, zonal office heads), tax auditors, tax collectors, attorneys. The final list which contains a population of 420 users was prepared. Out of which 9 are the management, 250 are the tax auditors, 120 tax collectors, and 30 attorneys,. In this study, sampling was made in order to increase the representatives of the individuals involved in every level of the tax system.

Given the scope, time and financial resources constraints under which the study was conducted, sampling was done in this study to ensure that the final sample size is manageable. Too large a sample implies a waste of resources, and too small a sample diminishes the utility of the results (Cochran 1977, 72). Determining the correct size of a sample requires certain decisions and guesses (Carpenter and Vas, 1978:72).

The sample size was designed to be 20% of the total population. As a matter of fact, the sample size depends on a number of considerations (Agarwal, 1994:163) including the following :

- The purpose for which the sample is drawn;
- The type of population from which the sample is to be drawn. That is, if the sample units constituting the population are highly variable, a large sample is required and conversely, if the population comprises of less variable units, then a small sample is

good enough. For perfectly homogeneous population, a single unit is sufficient to get the correct results for the whole population.

. Resources allotted for the study in terms of time and money.

To this end, the sample size taken in this study is relatively high (20%) in order to make the study representative. This is done because there is a variation among the group of users in terms of their position, respected duties, information requirement, and sources of information, etc. Therefore, 20% of each group of users are randomly selected. The following table summarises the samples taken.

Table 1.1 - Sample size determination

No	Level	Population	%	Sample
1	Bureau, Department , Service, and Zonal Office heads	9	20	4
2	Tax auditors	250	20	50
3	Tax collectors	120	20	24
4	Attorneys	33	20	6
	Total	420	20	84

b) **Interview**

The information concerning the problem which are to be collected from the user is of great importance to investigate and analyses the system. One way to get the information is through interviewing users. It helps to obtain user participation which is one of the determining factors in developing a good system.

In this study, with in the time available, a direct interview (face-to-face) have been conducted with various users including the Heads of the Bureau, Planning and Research Service, Legal service, Revenue Department, three Zonal Finance Departments.

These interviews were considered mainly to strengthen some of the issues addressed in the questionnaire particularly where user responses require elaboration. Data collected through questionnaire and interview were analysed using SAS, a statistical package to draw inferences.

c) **Documentary Sources**

The purpose of document searching was to obtain quantitative information, and to confirm or quantify information already supplied by respondents. To this end, the taxpayer's files, procedures manuals and proclamation, register books, formats, reports and compliant (appeal) reports were reviewed.

iii) SYSTEM DEVELOPMENT METHODOLOGY

Of the several methods available at the disposal of the researcher for analysis and design of the database, object-oriented approach was employed in this work. The reason for this is because it provides benefits such as more realistic modelling, faster design, modularity, reusability, stability, easier maintenance, reliability, flexibility, high user communication etc. (Martin, 1994). In particular, object oriented data model suggested by Lorenz was used.

1.8 Organisation of the thesis

The thesis is organised into six chapters. The first chapter is the introduction which contains background information of the study, statement of the problem, justification, objectives, scope and limitations, and the methodology used. Chapter two reviews the application of object-oriented approach to build a database, characteristics of object-oriented database, object-oriented approach and record based approach to data modelling. The third chapter

attempt to document the existing tax information handling at BOF. The limitations of the existing manual methods and the systems requirement's were also delineated. Chapter four is about the design of proposed system. Chapter five presents the prototype constructed for the purpose of demonstrating the suggested solutions. Chapter six is left to conclusion and recommendations.

CHAPTER - 2

Object Oriented Approach and Object Oriented Database : An Overview

There are various types of approaches available for use in the course of developing an information system. Some approaches (methodologies) differ from the others by their principal doctrine or treatment of the system in relation to the human behavior; some by their tools and techniques; some by their easiness for use.

As indicated in the previous chapter, the object-oriented approach was considered for use in this study. To this end, an attempt is made in this chapter to introduce the basic concepts and principles that underlie the object-oriented approach.

2.1 Object Orientation: definition

The object-oriented approach has evolved into its present status over a long period of time. The concept first was used in programming languages, and gradually has become adapted in areas of analysis and design. Since its early appearance much literature has been produced in all three areas (i.e., system analysis, system design and programming) although literature on the programming part has the lion's share. In terms of standardization and stability, object oriented programming is more standardized and stabilized than object oriented analysis and object oriented design.

Many scholars have tried to define what object oriented approach mean. The following four definitions are sufficient to indicate the definitions and meaning of object oriented approach.

i) Object-Oriented approach is a way of modeling the real world for the purpose of computations (system development) which is also referred to as object-orientation or object-oriented paradigm. It is modeling the real world as a series of objects with characteristics, where each object interacts with the other and each object inherits the characteristics of objects to which it belongs to (Losee, 1990).

ii) Object oriented is a " data-oriented " approach to system development where the data is encapsulated in objects and messages, and are used to manipulate the data. The operations (which are called interface functions) that can be performed on the encapsulated data are specified as part of the interface to the object. (Taylor, 1992).

iii) Object-orientation is " an approach to system development that proposes the use of system " Objects " to build new systems and rebuild old ones " (Weinberg, et al, 1989). It tries to model and represent the real world in terms of objects which are easier to visualize and understand.

Iv) Object oriented approach to information system development is built up on three basic ideas: objects, messages, and classes (Deng and Fuhr, 1995).

A model which is designed using an object oriented approach is often easy to understand , as it can be directly related to reality. Thus, with object oriented approach, only a small semantic gap will exist between reality and the model. Interest in the object-oriented approach has grown rapidly over the last few years. This is mainly due to the fact that it has

shown many good qualities. Amongst the most prominent qualities of system designed with an object-oriented approach are the following (Taylor, 1992):

i) Understanding of the system is easier as the semantic gaps between the system and reality is small;

ii) Modifications to the model tend to be local as they often result from an individual item which is represented by a single object.

2.2 Object Oriented VZ. Structured Approach

Structured and object-oriented approaches are categories under the same systems thought i.e., scientific approach . Both use mathematical model to represent a system and decomposes a complex system into different sub-systems until the last module becomes simpler to tackle the problem.

However, there is also difference among them. The structured approach was developed as a means to emulate the system being developed by translating it from humans(users) terms and concepts into computer terms and concepts. So, the real world objects are not carried over to application implementations. It is based on functional decomposition that is the breaking down of a complex problems into manageable units in a disciplined way and treat function and data as separate, while the object-oriented approach view functions and data as highly integrated.

The Structured approach relies on modeling the process or methods that are used to transform an input data into the desired output. Unlike the structured approach that

emphasizes the interconnection among processes, object-oriented approach highlights the objects and the interactions between objects.

The other main feature of object-oriented approach that makes it different from the structured approach is its suitability to reusing code. It is more advantageous to reuse software rather than develop new code. The more new code we develop, the greater becomes the need for proper testing procedures. As a corollary to that principle, the more the code(i.e., tested code) we reuse the fewer the bugs we introduce and lesser the overall software development costs.

As such though both approach relies on the decomposition of a system into different sub-systems, the modules in object-oriented approach are more independent to each other and easy to develop individually than that of the structured approach. Generally, object-oriented approach is an approach which tries to eliminate or narrow the gap by shifting the basis of modeling from the procedural nature of data processing to the objects that constitute the real world system and the conceptual relationships existing among them (Loose, 1990).

2.3 Characteristics of object-oriented databases

Databases are one of the major components of information systems. Due to this, lots of efforts have been put to the betterment of database management systems since their introduction in the data processing environment in the late 1960s.

Initial approaches stored records in long list or hierarchy (network data model). This approach was very slow in retrieval from large databases and caused lots of problems for programmers. The relational database, which is based on the relational data model, was the first attempt to change this situation. Because relational approaches have been found to provide better performance, flexibility, integrity and security, they have proliferated (Japscott and Caston, 1993).

Despite these features, the relational model imposes some restrictions on the representation of data. The followings are some of the limitations of relational database management systems (Bhalla, 1990; Hurson, 1993).

- Their data structures do not support the actual structure of information in the real world;
- Their data structuring capabilities do not adequately support complexity and variations (heterogeneity) that occur in real data;
- Relational data model lacks semantic expressiveness for some applications, i.e., it does not explicitly include semantics as part of the data representation;
- Can not handle the new database applications like multimedia databases and knowledge bases.

Object-oriented approach is adapted to develop a new data model (called object oriented data model) based on which new DBMSs (called object-oriented database management systems/OODMSs) which surpass the above limitations are developed.

Object DBMS represent a genuine break through in information storage. As with flat files commonly used in conventional systems, object DBMS give users the freedom to store any kind of data; object DBMSs place no restrictions on the types or size of data element that can be stored and users are free to invent new data types of any complexity. In fact, object DBMSs can store anything that can be digitized making them ideal for multimedia and other advanced applications.

Object oriented database first evolved from a need to support object oriented programming which needed a stored data that remain after a process is terminated. The need also arose to associate certain procedures that could help control the integrity of the data or their security with the data and activate them when the data were accessed.

There was a need to put intelligence (Knowledge) in the database so as to make the data inaccessible except with the method stored in the database and hence make the data of all objects encapsulated and active all the time. It also became important for handling binary large objects, such as images, sound, video, and unformatted text (Martin, 1993; Cliffon and Sutchiffe, 1994).

Although the concept of object-oriented database still requires stable and standard definition, there is a consensus starting to build. Object-oriented databases combine object-orientation with database functionality's, i.e., persistence, concurrency, transaction management, recovery, querying, versioning, integrity, security and performance (Khoshafian, 1993). As object-oriented data models originated from the tradition of semantic data modeling, object-oriented database are a combination of the two concepts: object-orientation and database.

Taylor (1992) distinguished the following three reasons for adapting object oriented databases which are almost similar to the ones discussed above :

1) The need for better database management system capabilities the motivation of which is emanated from overcoming limitations of traditional database management systems. Some of them are :
   - give the freedom to store any kind of data without restriction to the sizes/types of data elements to be stored;
   - free to convert new data types;
   - suitable to multimedia and other advanced applications by storing anything that can be digitized;
   - provide flexibility as a result of encapsulation;
   - provide a powerful capability for multiple view of the same information; and
   - faster in handling complex data structure and exception to normal information structure.
2) The need for persistence of object language. Object orientation performs the storing and sharing of objects. This new use shifted the language of using data definition/manipulation language which required transaction between application and database languages. This language compatibility is achieved commonly with C++ , which is an object oriented language.
3) The repositories for software components. For software to be constructed from a library of reusable classes, there must be some repositories for storing those classes and sharing them among many programmers. Thus, object oriented databases represent the obvious for storing and sharing reusable classes.

The object-oriented paradigm has gained wide acceptance as a unifying paradigm for the design of database systems, programming languages and knowledge-based systems. This paradigm has evolved with the advent of object-oriented programming languages. The elements that captures the very essence of object-orientation are described in the following sections.

i) Object

The first and most important concept that we describe is, of course, the concept of the object. *What is an object* ? An object is an entity able to save a state(information) and which offers a number of operations(behavior) to either examine or affect the state (Taylor, 1992). We can also define an object as anything, real or abstract, about which we can store data plus those operations that manipulate the data (Martin, 1993).

ii) Classes and instances

For better organizations and simplicity, objects can be grouped together in object types (classes) based on their common attributes and operations. The class thus created is just an abstract concept. It is simply a description of the common characteristics of several objects. An object that belongs to a certain class is called an instance of that class(Jacobson, et al 1992).

The concept of a class serves two purposes. First, it describes the structure of objects and operations that are used to access the object. Second, it represents a collection of all objects which have the same type (Bhalla, 1990).

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iii) Class hierarchy and inheritance

As in any abstraction, classes can be organized in different manners. A class may belong within (i.e., may be a subset of) another class or classes. This means one can create a class from one or many existing class(es). The new class thus created is referred to as a subclass (descendent) while the earlier class is called a super class (ancestor). This relationship between objects can be conveniently organized and described using the concept of class hierarchy (Bhalla, 1990).

When a class is created from an existing class, it inherits all the information structure and behavior of the existing class and can have additional properties specific to it. (Jacobson, et al, 1992). This means all instances of a sub class are also instances of its super class.

iv) Messages and methods

Object-oriented systems allow the state and behavior of an object to be accessed or invoked only through messages. Messages(also called requests or stimuli) are generated by one object or system interface for the transmission to another with the aim of either modifying/viewing it or using it resources and capabilities.

For each messages understood by an object there is a corresponding operation that execute the messages. An object reacts to a message by executing the corresponding operation and returning an object (i.e., responses) or performing requested action (Bhalla, 1990). When these operations are encoded in software, they are referred to as methods(Martin, 1993).

v) Polymorphism

Instances, created from classes, constitute the dynamic systems we wish to model. It is through the communication of these instances(objects) that the system's behavior is performed. An instance may know of other instances to which messages can be sent. If an

instance sends a message to another instance, but does not have to know which class the receiving instance belongs to , we say we have polymorphism. This means one operation can be implemented in different ways in different classes as the message can be interpreted in different ways, depending on the receiver's class(Jacobson, et al, 1992). This property greatly enhances the flexibility of object-oriented models and systems.

2.4 Abstraction Mechanisms

Abstraction is a mechanism to describe some of the system details while suppressing others . "It is used to form a higher level construct. It is the principle of defining a data type in terms of the operations that apply to objects of the type, with the constraint that the values of such objects can be modified and observed only by the use of the separations" (Coad and Yourdon, 1991).

Within the data model, abstraction mechanisms are used to form higher-level constructs. An abstraction mechanism also allows one to hide or ignore irrelevant details. The mechanisms are identified as classification, aggregations, generalization and associations(Bhalla, 1990).

i) Classification / instantiation

Classification is a form of abstraction in which a collection of objects with common properties form a class. The inverse of classification is instantiation. Thus, between an object and the class there exist " is- instance-of " relationships.

ii) Aggregations

Aggregation refers to an abstraction in which component objects are aggregated to form a higher-level object. Between the component objects and their aggregate objects there exist " is-part-of " relationships.

In object-oriented database systems, a class is an aggregation of its attributes. There exist " is-part-of" relationships between an instance of a class and the values of the attributes of the class.

iii) Generalization/specialization

Generalization refers to an abstraction in which similar object/classes are regarded as a generic object class. The inverse of generalization is specialization. There exist " is-a " relationships between the specialized class and the generalized class.

The concept of super class and sub class in object-oriented databases supports this mechanism. A super class is a generalization of the sub classes which inherit attributes from it. Conversely, a sub class is a specialization of the super class from which it inherits properties.

iv) Associations

Association is a kind of abstraction in which a relationship between collections of objects is considered as a higher-level set object. Between the objects and the set-object there exist "is-member-of" relationships.

2.5 Object-oriented approach and record-based approach to data modeling

The conventional record-based (relational) database do not provide features that fulfill the demands of newly arising applications. The object-oriented approach has several advantages over the record-based approach(Bhalla, 1994). Some of these are discussed below:

- In the object-oriented approach, objects with common information can be modeled as two objects with a shared " sub-object " containing common information. The sharing of objects reduces the update anomalies existing in relation data models.
- A relational model has been found to be lacking semantic expressiveness for some application. It is necessary to create relationship relations for modeling many-to-many relations. This results in a large number of relations which often have to be joined by queries. Also, there is no super type-subtype hierarchy. Object-oriented database systems provide powerful data modeling capabilities through flexible data structuring.
- The data structuring capabilities of record based systems do not adequately support the complexity and variations that occur in real data. Records of a given type are identical in structure. Every record of a given type must have the same field and a field must draw its value from the same type in each record. Object-oriented databases systems allow variations in structuring objects to enable arbitrary data items as value.
- The traditional database management systems don't support storage of multimedia data types, such as text (used in variable length strings), voice (used for digitized voice) , and pictures (used in digitized images for graphics devices). The information systems of today are not only required to support these new data types, but are also required to

provide operations which are appropriate for them. The object-oriented approach allows new data types and suitable operations to be added to a DBMS.

- In a relational systems, the connections between entities are logical through attributes values. At least one address translation is required to get from a key value to the location of a tuple. In object-oriented systems objects refer to sub-components by identity and not by key values.
- Modeling complex design entities in relational systems increase the levels of indirection between an entity and a sub-component due to normalization. Re-assembling the components of an entity in the database requires taking joins involving few tuples from many different relations. Complex entities can be represented directly in object-oriented database systems with less encoding. To access such an entity requires fewer levels of mapping and the computation at each level is simpler.
- In record-based database systems, constraints on database updating have to be maintained by the applications. In object-oriented database systems, the operations to maintain constraints can be put into the database management system itself.
- The object-oriented framework provides better support for managing time and changes in a databases. A change in the value of an object is seen by all objects which refer to it. In relational systems, a change in key value of an entity is not propagated to other tuples that refer to it.
- The database operations in an object-oriented data model can be stored within the database . This ensures that only on copy of each operations exists. Also, database access can be restricted through these operations. It reduces the risk of intentional corruption of data by program. The operations can be optimized to limit the number of calls to the underlying storage subsystems. Also, a database operations can be shared by many different applications.

- Objects refer to sub objects by identity not by key values, thus avoiding one level of mapping.
- Object-oriented approach improve problem domain understanding as it organizes information in the same way people have been organizing their thinking: objects and attributes etc.
- Object oriented approach attempt to bridge the gap between structured process analysis and data analysis there by avoiding the over-reliance on either the functional side or the database side that is inherent in these approaches. Thus object oriented ensures proper integration of data and process.

CHAPTER THREE

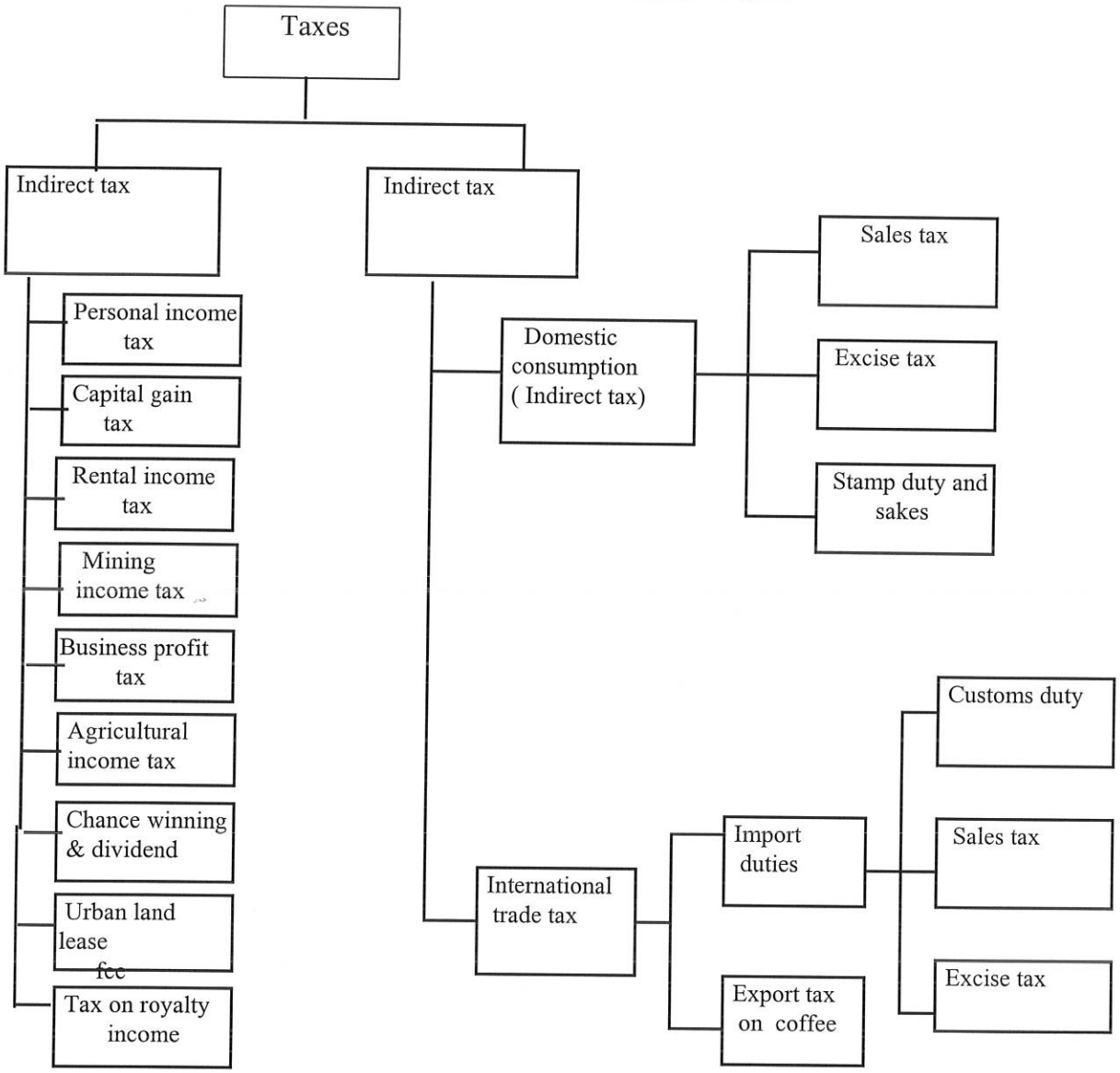
THE EXISTING TAX INFORMATION HANDLING SYSTEM AT BOF: A SURVEY

A survey was conducted in order to investigate and analyze the existing tax information handling/management system at BOF with a view to come up with a proposal for the maintenance of an object-oriented tax database which will improve the information handling/management activities at the Bureau. For the purpose of documenting the existing system and to uncover some of the inherent problems and limitations of the existing tax information handling, in addition to reviewing related documentation, a survey was conducted using a questionnaire. In addition, interview and extensive discussions were held with technical staff of the Bureau. Summaries of the survey and discussion held are presented in this chapter.

3.1 Structure of taxes in Ethiopia

Since the purpose of this study is to analyze the existing tax information handling, and develop a tax database, it is found logical to discuss first the structure of taxes in the country. Thus, the Ethiopia tax structure may broadly be divided into direct and indirect taxes for the purpose of noting their broad features. The detailed classification of taxes in Ethiopia is as presented in figure 3.1 below.

Figure 3.1 Tax classification in Ethiopia



Sources :Overview of the structure of taxation and the need for tax reform in Ethiopia (1996)

Direct taxes consists of taxes on income, business profits and other such as capital gains, wealth and property taxes. Direct taxes are all levied directly on the persons or taxpayer receiving the income and paid either direct by the taxpayer to the tax office, or in the case of a pay-as-you earn scheme by a means of a withholding systems where the income tax is deducted by the employer from the wages and salaries of employee and transferred to the tax office.

Direct taxes constitute taxes imposed on incomes derived from the following categories:

- Employment
- Business activity
- Dividend
- Chance winnings & lottery
- Royalties
- Services rendered to persons or organizations in Ethiopia by non resident persons or organizations
- Agriculture activities
- Property and goods rent.

On the other hand, indirect taxes are taxes on goods and services. They are also referred to as commodity taxes since they are paid only when particular purchase of commodity or services are effected. These taxes comprise domestic taxes such as taxes on sales (both production and services), turnover, and value added. Excise tax, stamp duty and tax on international trade, namely export taxes and import duties also belong to the category of indirect taxes. In all these cases, the tax is paid indirectly as part of the payment for a commodity or service, and very often the tax payer is not aware of how much tax he is paying. (Alemseged, 1994).

Indirect taxes constitute:

- Excise taxes on some selected locally produced and imported goods;
- Sales taxes on a wide variety of locally produced and imported goods;
- Service sales tax on various services rendered in the economy;
- Stamp duties;
- Customs duty on a wide variety of imported goods;
- Export taxes on coffee.

What following is a brief description of each type of tax indicated in the classification above are presented as follows:

Personal income tax

Tax under this heading is charged on earnings of employees of government owned enterprises, national government department and agencies, non-government organizations, Ethiopia nationals working in international institutions, diplomatic missions and foreign embassies. Income from employment is expressed to include all payments in cash and all benefits in kind. These will specifically include housing allowances, food allowances, transportation allowances, cash indemnity, annual leave payments and bonuses.

Agricultural income tax

This refers to tax payable on any annual income derived from agricultural activities. Tax on income lower than Birr 600 per annum is collected by Peasant Associations. Farmers with income higher than Birr 600 per annum must have their income assessed by the tax office which will collect the tax.

Rural land use fee

This relates to fees payable for rural land use under the public ownership of rural lands proclamation No. 31/1975, by individuals or state farms. For the lower income farmers, the fee is collected by the Peasant Associations.

1994. The rate of tax levied on against realized from the increase in the value of capital assets, namely on shares, bonds, and urban houses.

Dividend tax

This tax is applied to shareholders of a company on the dividend earned on the shares. The tax is 10% of the declared dividend and is deducted from the dividend paid. The tax is due to be paid at the time the company makes its declarations for business profit tax purposes.

Lottery tax

Tax is imposed by proclamation No 155 of 1978 on chance winnings. Any person or organizations giving prizes as chance winnings is obliged to withhold income tax at 10% from the amount of the prize. If the prize is in kind, a valuation has to be made and the tax is applied to the value.

Sales and excise tax

Sales tax is levied on a wide range of goods and services either at the point that the goods are cleared from customs in the case of imported goods or at the point of sale by producers in the case of locally produced goods or at the point of delivery in the case of services. Similarly, excise tax is payable on locally manufactured selected products and similar imported goods at the time of production or importation.

Stamp duty

Stamp duty is fundamentally a tax on documents. Most of any importance are subject to the tax which is sometimes levied on an advolorem basis and sometimes at a fixed rate.

3.2 The Region 14 Fiancé Bureau (BOF)

✹ Establishment and Mandate

The introduction of federalism provided for the establishment of two levels of government, i.e., federal and regional government, in the country since 1992. Such a political decentralization has created a basis for fiscal decentralization as well as which brought about a revenue sharing between the federal and regional government.

The Addis Ababa City Government (Region 14) , though not a full fledged regional state, is established as autonomous government and is empowered to formulate and execute policies, strategies and plans for its economic and social development, to levy and collect taxes, and duties on revenue sources allocated to it.

Before the introduction of fiscal federalism in the country, and the establishment of the Addis Ababa City Government, i.e. prior to 1992, it was the responsibility of the Inland Revenue Authority to collect taxes from all taxpayers in the city. However, with the introduction of fiscal federalism, Region 14 Finance Bureau is reorganized to oversee the fiscal affairs of the Addis Ababa City Government. The tax related responsibility of the Bureau is to collect and administer taxes from all categories of taxpayers in the Addis Ababa City (about 99,000 taxpayers in total).

According to the proclamation No 33/1992, a proclamation which defines the sharing of revenue between the federal and national/regional government, the tax to be collected by the Addis Ababa City Government include:

a) personal income tax due from employee of the Addis Ababa Administration, employee of enterprise owned by the Addis Ababa City Government, employee other than those employed by the central government and international organizations;

b) rural land use fee;

c) agricultural income tax collected from farmers not incorporated in an organization;

d) profit tax collected from individual traders, and from enterprises owned by the Addis Ababa City Government;

e) taxes collected from rent of house and properties;

f) sales tax from individual traders;

g) income tax, royalty and rent of land collected from mining activities;

h) charges and fees on licenses and services issued or rendered by the Addis Ababa City Government;

i) urban land rent;

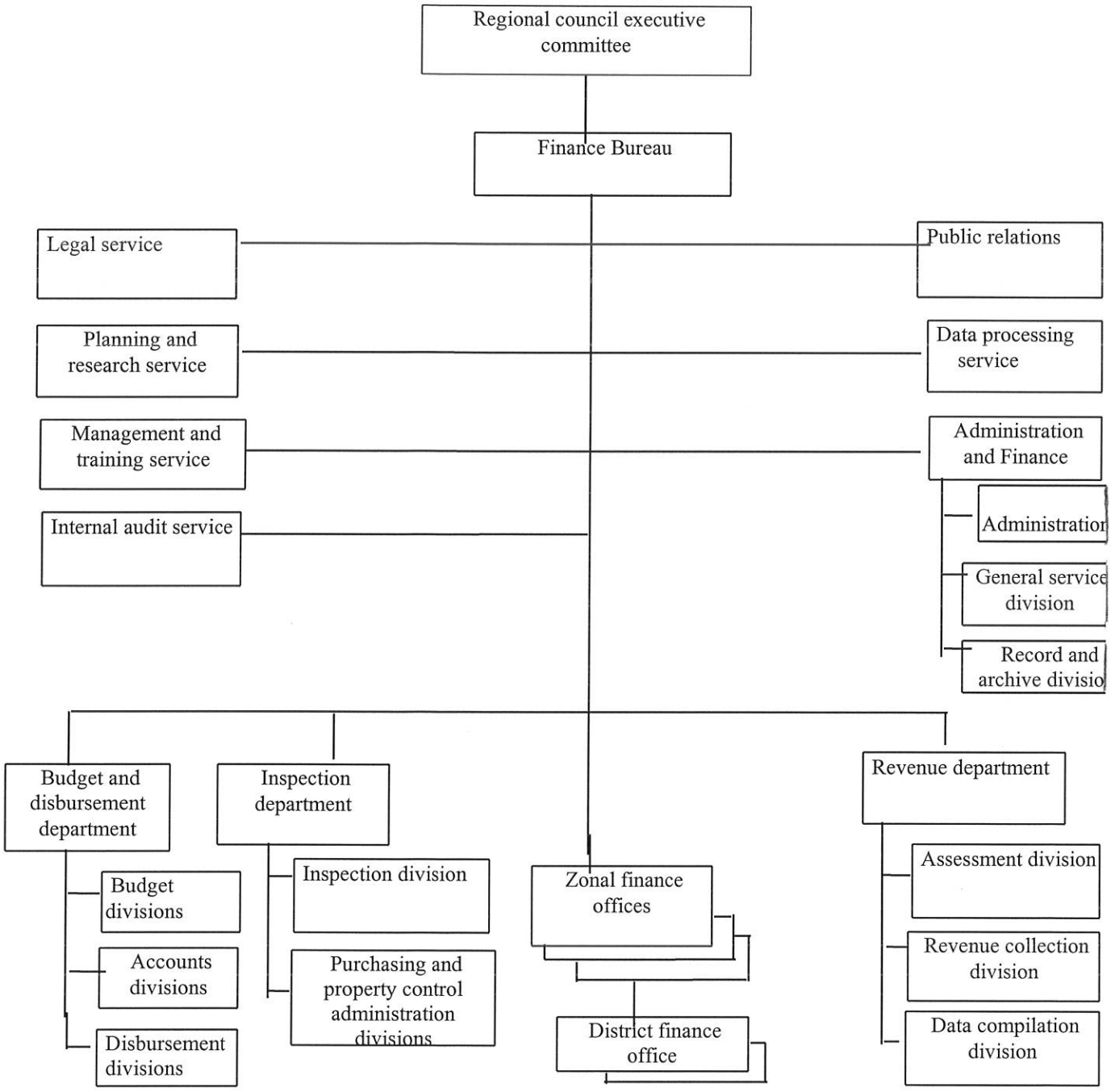
j) trade license and sanitation fee.

✹ Organizational structure

To carryout the above mentioned duties and responsibilities, the BOF is currently organized as shown in figure 3.1 below. As indicated in the organizational structure, at the head office level, the BOF has three line departments and five operational services. Likewise, each zones and districts has three line divisions and operational services, namely budget and disbursement division, inspection division, revenue division and legal, administration and finance, planning and research services.

From the organizational structure of BOF, the revenue department is the core organizational unit which is directly involved in taxation. The data processing, and the research and planning service are among the supporting units. They are organized to collect, store, process and disseminate information in the Bureau.

Fig 3.2 Region 14 Finance Bureau Organizational structure

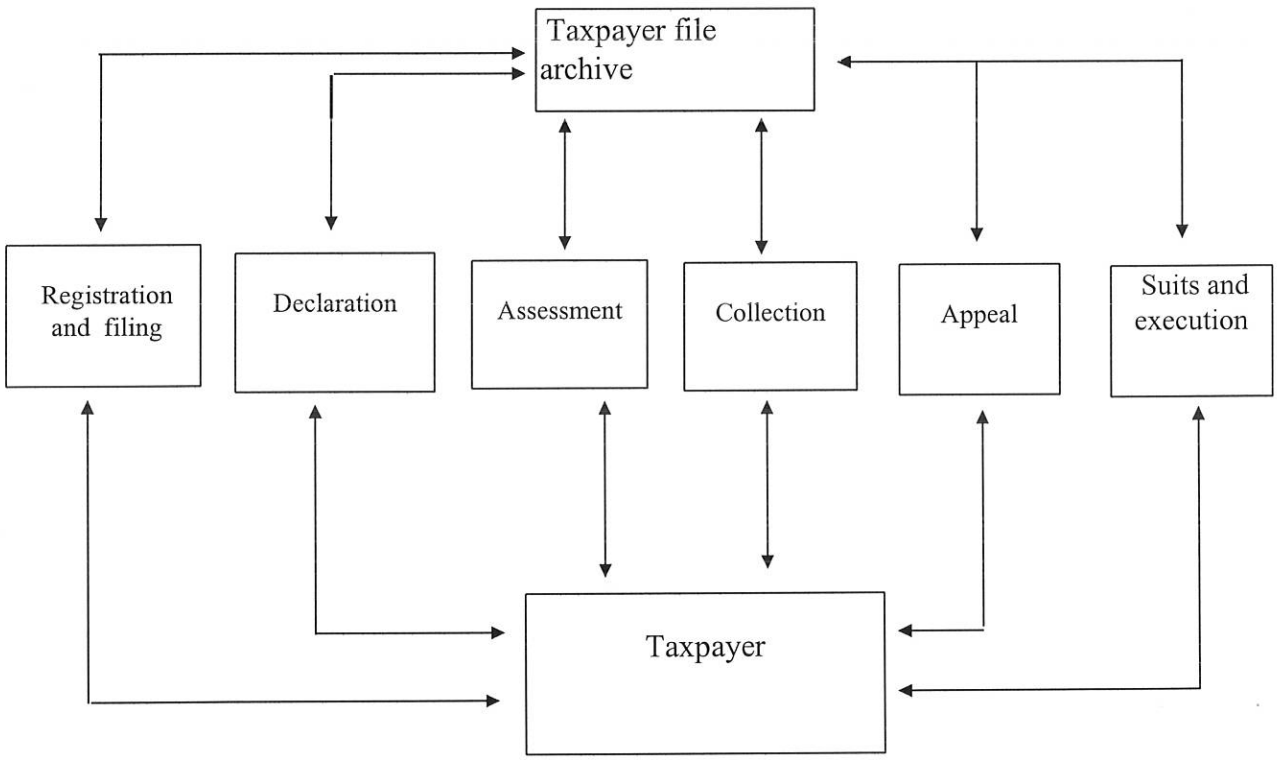


3.3 Tax Administration Mechanism

In the previous sections, the structure of taxes in Ethiopia, the establishment, mandate and organizational set up of Region 14 Finance Bureau have been presented. The purpose of this section is to describe the major tax related functions (tax administration mechanism) of Region 14 Finance Bureau to administer the taxes allocated to it.

The main tax functions of BOF are briefly presented as under.

Figure 3.3 Overview of the tax administration mechanism



Each of the major tax administration (tax functions) described above are briefly presented in the following sub sections.

3.3.1 Registration and maintaining of taxpayer's files

Every taxpayer coming within the charge to tax for the first time is obliged to register with the Bureau. According to the law, registration must be made within 30 days of

commencing to trade or acquiring a source of income. Figure 3.3 shows the taxpayer registration process at the Bureau.

When seeking to register, taxpayers produce the following documents:

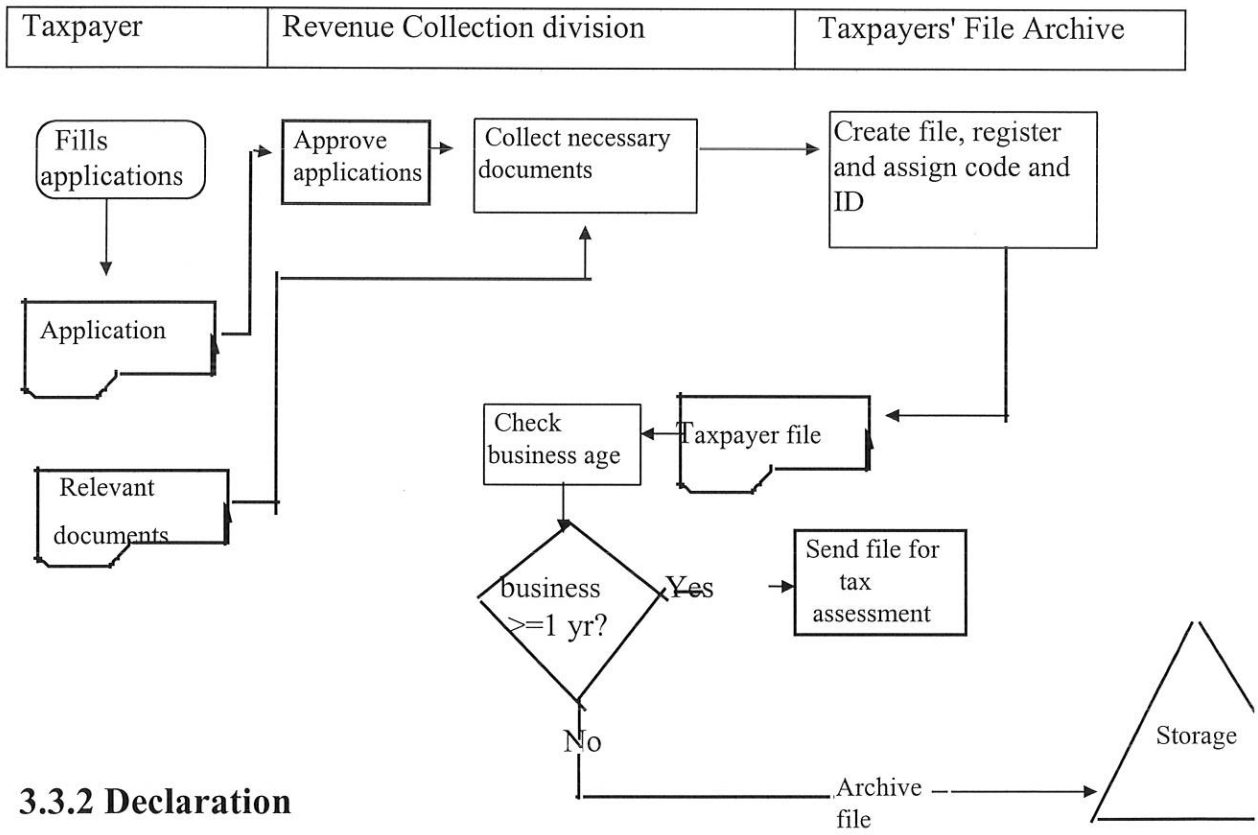
. a license from the region 14 trade bureau;

. a copy of memorandum and article of association of the company;

. a copy of the constitutions of the organization for an entity that isn't a company;

. two passport photograph of contact person.

Figure 3.4 - Taxpayer registration process



3.3.2 Declaration

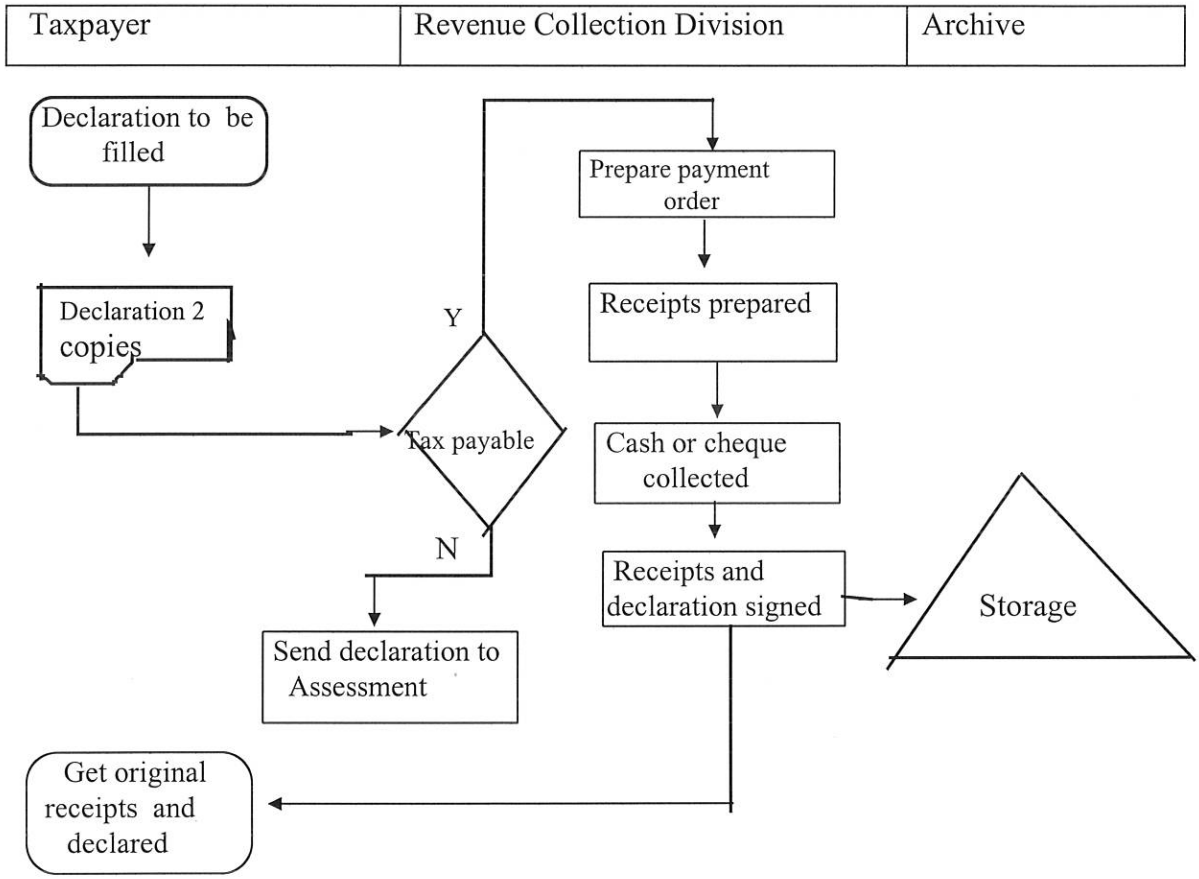
Legislation makes taxpayer responsible for declaring and paying the right tax. The declaration is the key document and it is the taxpayer's statement of the tax liability that is believed to be due. It fixes the amount of tax to be paid within the time limit for making

declaration and is expected to be correct and taxpayer must take responsibility for its correctness. The processes involved in tax declaration are presented in figure 3.4 below. Declarations are required for the following taxes at the time indicated.

Table 3.1 Tax declaration time schedule

Types of declaration	Time limit
Business profit tax	4 months from end of accounting period
Sales tax	30 days from end of month
Excise tax	30 days after transaction
personal income tax	30 days from end of month

Figure 3.5 - Declaration process



3.3.3 Assessment

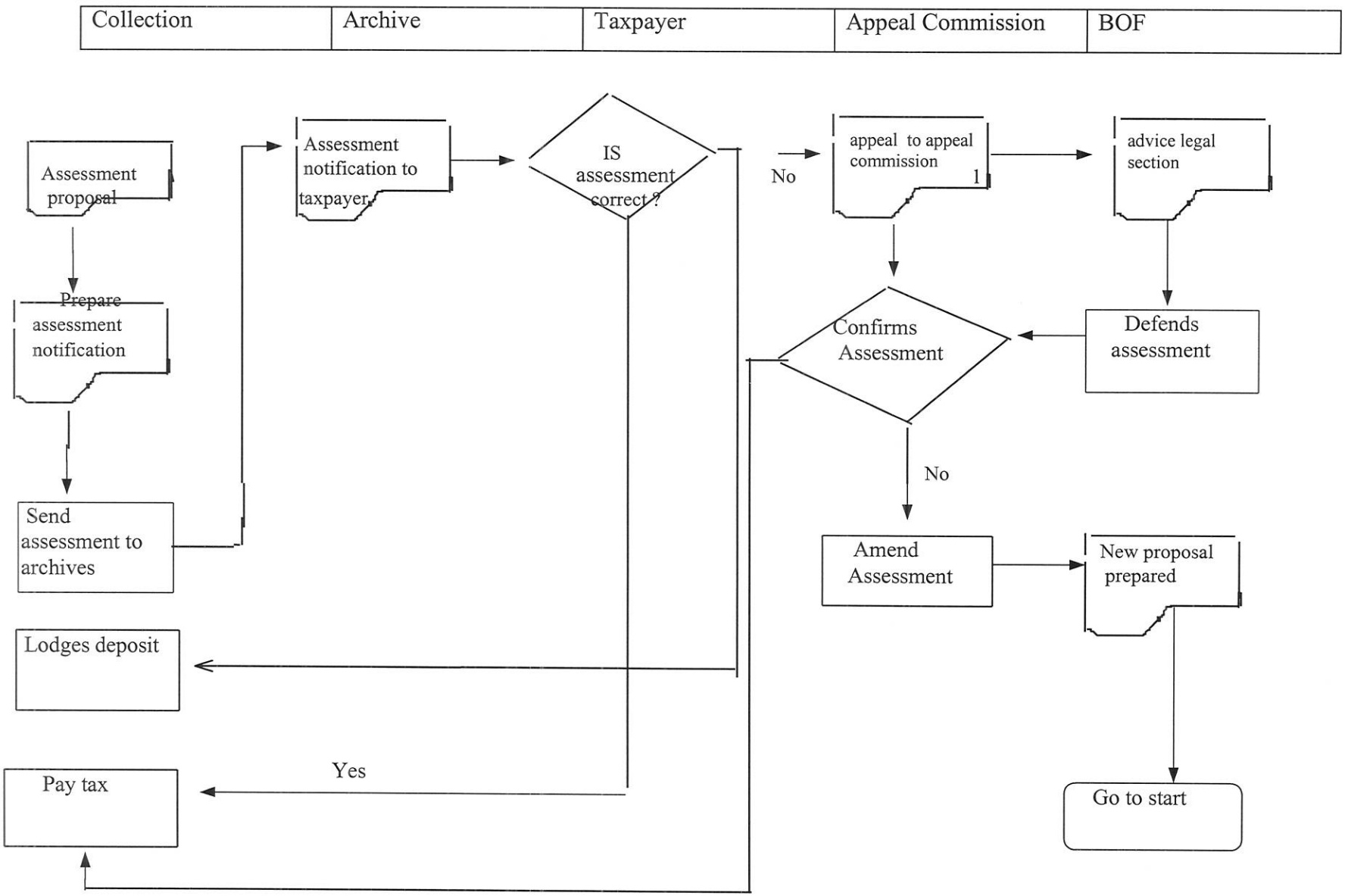
The tax legislation puts the responsibility of declaring and paying taxes on the taxpayer. To ensure that taxpayers pay the right amount, however, the BOF has the power to assess

and notify the taxpayer of any additional liability and to enforce the collections. The current practice requires BOF to assess the liabilities of all taxpayer. Although this in principle applies to all types of taxes, currently, it is specifically used to the major types of taxes, such as profit tax, sales tax, tax from rental income, and tax from employment.

Under the Ethiopian tax system liability is assessed either on basis of book of accounts and records, or by estimation. Those taxpayers that are obliged to keep books of accounts and records are required to submit them to the tax office for inspection up on request. If they do so, and their books of accounts and records come up to the satisfaction of the tax office, their tax liability is assessed on the basis of such books of accounts and records. Conversely, if the tax payer either fail to submit their books of accounts and records or the office rejects them for any reason, assessment of tax liability is done by estimation. Tax liability is also assessed by estimation in respect of all tax payers that are not bounded by law to keep books of accounts and records. Assessment on estimation is made on the basis of daily estimated income, purchase and sales information, and presumptive tax rate.

Once an assessment of tax liability is done, it is made into form of what is often called, an assessment notification which is a formal notification to a taxpayer of the amount of tax liability. Such assessment notification is due with in 30 days of the receipt by the taxpayer. If payment is not received within 30 days from date of assessment, the papers are referred o the legal service. The legal service will arrange for a summon to be issued through the court. The tax assessment process is presented in figure 3.5 below.

Figure 3.6 Assessment and Appeals process



3.3.4 Collection and accounting for tax payment

Tax payments to BOF normally arises on declaration, receipt of assessment notification and payments on account or installment payment. Hence, based on the tax assessment notification or tax declaration, the tax office :

- prepares official tax receipts;
- obtains payment;
- issues official tax receipts; and
- sends copies of the cash receipts, declaration, assessment notification to taxpayer files.

3.3.5 Grievance mechanism

Any tax system consists of an appeal mechanism. Tax is in effect an extraction of a portion of the property of the taxpayer. As income and other benefits derived in cash or in kind from an economic activity are the property of the individual or the corporate body, their extraction must be legal and just. This could only be ensured by allowing taxpayers to appeal wherever they considers their interest is interfered with or aggrieved (Tamre, 1994).

Up on receipt of an assessment notification, the taxpayer is obliged to settle accounts with the tax office with in one month. If the taxpayer feels unhappy about the way the tax liability is assessed, there are two options open for airing grievances. From the survey, it is noted that most taxpayers appeal because some of the expenses are not held by the auditors in accordance with the books of accounts and supporting documents submitted.

First the taxpayer may opt for an administrative means. In such cases, an application for a review of the assessment notification is made to the tax office and usually a three man committee examines the validity of the taxpayer's claims. The process may involve going into the files of the taxpayers and inspecting the premises where activities are carried at. If the findings warrant revision of the assessment, assessment is revised and new assessment notification is prepared.

If the taxpayer opts for the legal remedy, i.e., to exercise the right to appeal, the appeal is lodged to a special tribunal, Tax Appeal Commission. The taxpayer may appeal by giving written notice to the appeal commission within 30 days of the issue of the assessment. An amount totaling 75% of the tax assessed or 50% of the tax assessed for the previous year whichever is less must be paid at the time of the appeal. Failure to pay 75% or 50% of the previous year, invalidates the appeal. Such structure facilitates speedy decisions on tax disputes and helps to develop the tax payers confidence in the tax system.

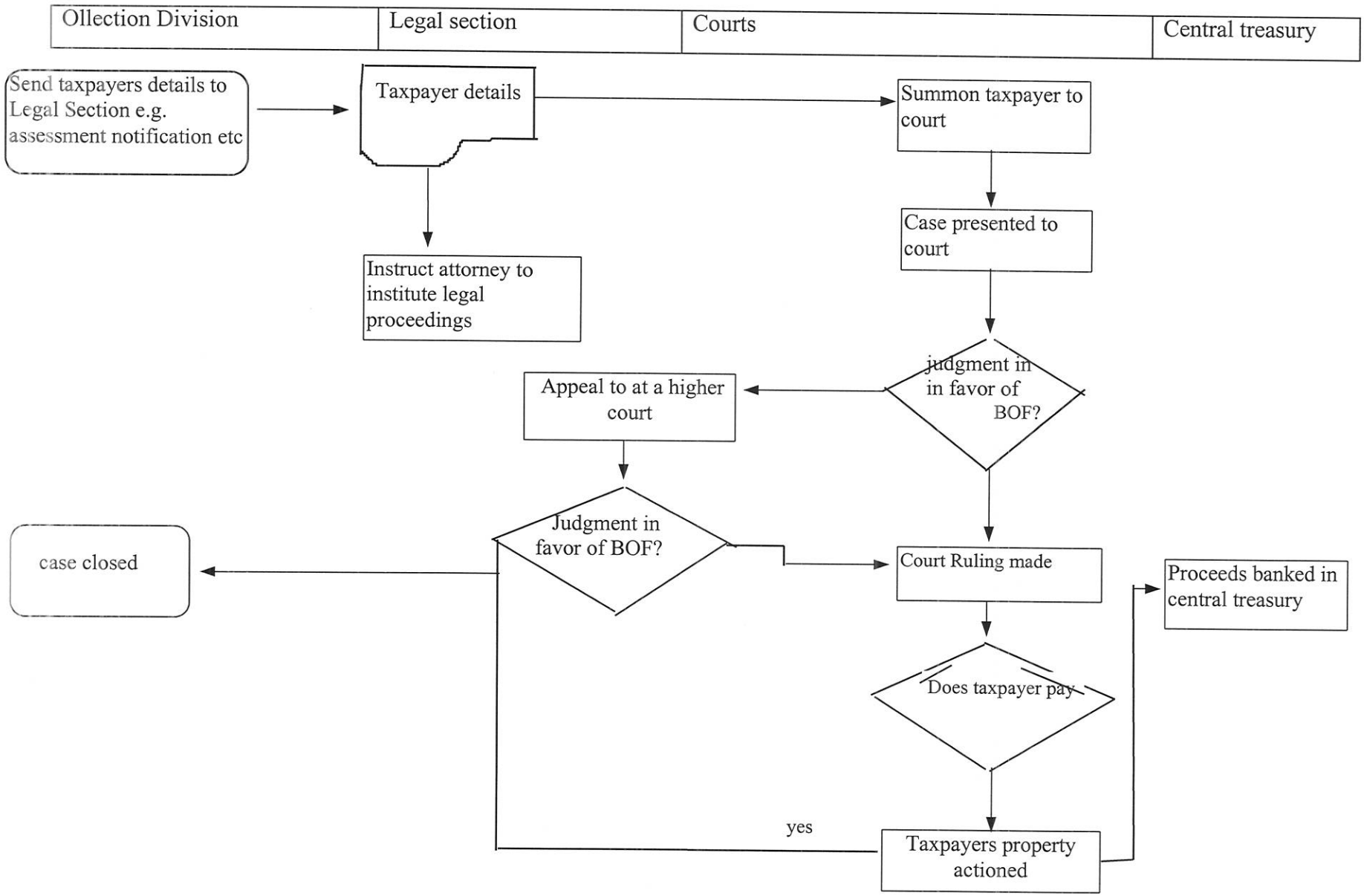
3.3.6 **Enforcement and execution**

The execution process starts just from expiry of 30 days from the date of issuance of assessment notification. After 30 days, the taxpayer neither pays the tax due nor appeals, the tax office lodges an appeal of enforcement (execution) to the appropriate court of law.

The court then takes legal action so as to enforce payment of the tax outstanding. This may be done by auctioning for sale of the property of the defaulter, the proceeds of which first goes to the settlement of the tax liability. The court may also make arrangements to intercept debt to the defaulter by a third party to channel it to the tax debt redemption. The enforcement process is presented in figure 3.7 below.

3.3.7 **Data compilation**

The BOF has extensive power to require government department, wholesalers and distributors to provide information about their transaction with other business. Customs Authority, banks, wholesalers, and distributors are common sources of either purchase or sales information on taxpayers. The process of gathering data is currently handled by the Data Compilation Division of the Bureau. The Division sends a request to various government organizations, wholesalers and distributors to collect purchase and sales information (transaction) on taxpayers. The information assists in establishing a base for an assessment, especially business profit tax determination.


Ollection Division
Legal section
Courts
Central treasury
Send taxpayers details to Legal Section e.g. assessment notification etc
Taxpayer details
Summon taxpayer to court
Case presented to court
Instruct attorney to institute legal proceedings
judgment in in favor of BOF?
Appeal to at a higher court
Judgment in favor of BOF?
case closed
Court Ruling made
Proceeds banked in central treasury
Does taxpayer pay
yes
Taxpayers property actioned

3.4. The Existing Information Handling System : General Characteristics

3.4.1 Current process

The existing process common to most BOF tax related activities is highly characterized by:

- **Manual methods** - there are no computerized or automated processing modules in BOF, implying high dependence on paper and many low level tasks;
- **High consistency** - processes are well defined, generally carried out consistently and centered around standard forms and reports;
- **Emphasis on supervisory controls** - significant time and effort is spent on authorization and validation.
- **Emphasis on detail** - figures for assessment and management reporting are calculated in as much detail as possible in manual methods.

Related advantages and disadvantages are briefly summarized in the following table:

Table 3.1 - Impact of current process

General characteristics	Advantage	Disadvantage
Manual, paper based	. low cost . easy to understand . easy to maintain . no need for retrain staff	. many low level repetitive tasks . high error risk . inefficient . high risk of corruption and fraud . no solution to physical file storage problems . the operation will continue to be labor intensive
Standard, consistent application	. reduces risk of error . well defined tasks	. inflexible
Emphasis on controls and supervision	. reduces risk of error, corruption and fraud . ensures consistent application	. inefficient . limited added value
Emphasis on detail	. controls errors . improve accuracy	. may miss the big picture on management information tasks too long to calculate. . management decisions delayed while detail is gathered.

With the present manual system of data handling, there is a high rate of committing error during extraction of data from reports, standard forms and files. This is because cross validation of data stored on paper with source documents is a time consuming process. At times, when data sharing among departments or individuals is required that data has to be copied by hand one after the other, a copy error made at one time can be propagated through all process and badly distort the profile of information.

3.4.2 **Efficiency**

Efficiency refers to the relationship between inputs and output. Improvement can be made by increasing the output for a given level of input or by decreasing inputs for a given level of output. A closer look at the process reveals considerable scope for change. For example,

- the process of registering a new taxpayer involves 27 tasks and 13 documents across five divisions;
- the declaration process involves 23 tasks and 13 documents ;
- assessors may have to wait for several weeks for a taxpayer file from archives if it has already been signed out to others;
- taxpayers requiring clearance certificate must wait between one and eight hours on the average for the file to be located and the calculation completed;
- overall outstanding income receivable is calculated from original documents approximately once a year . This process generally requires the staff of collection division around two months even for providing estimates;
- totals of tax paid and tax owed by taxpayers must be calculated manually as this requires searches to be made for receipts across several files of up to 150 pages each;
- a taxpayer making a payment must visit a collection officer to authorize its payments, a cashier to accept the payments, another staff member to validate the payment, another collection officer to confirm the receipts and the archive to store the documents.

3.4.3 **Data storage and retrieval**

The common data storage media at BOF is paper. Various standard forms and reports used as a source of information are archived for later references. Most staff members are

computer illiterate and are not able to use electronic media for data storage. And those with little exposure were short of computing resources.

Problems of data storage and retrieval at BOF is not only that the storage media is paper, but also that when the Bureau is engaged in some kind of extracting and consolidating tax related information, the task is left to the expert doing the job to extract the required data from the taxpayer files and documents. What is more, when this is done, there is no common filing system that provides for the storage and availability of data compiled for future use by others. Hence, the paper can easily go into a dust bin shortly after the job is concluded. Which means, there is very little hope that data consolidated by staff of one department is used by another.

Unfortunately, if a job requiring the same data is brought to another department some other time, persons assigned to do the job will have to dig into the same files and compile the required data. Obviously, this creates data duplication and wasting of resources.

Moreover, in most of the zonal and district offices, there is an acute shortage of storage for taxpayer's files. Files are stored in cabinets, on shelves, but increasingly on the tops of cabinets, and in some zonal offices on the floor and wherever there is a small amount of space. The consequence is that prolonged retrieval times, loss of data due to damage to files stored on the floor or compressed too highly on shelves, and inefficiency of the BOF staff.

The efficiency with which the BOF can process taxpayers related request is directly related to speed and ability to retrieve files from the records system. Files are retrieved when there

is new correspondence regarding a taxpayer or subject matter, during audit, tax collection, clearance or at the request of a BOF staff member. Taxpayer's files must be signed out to individual authorized staff only. Other requests must wait sometimes for more than a month.

The followings are the major causes identified for delays in retrieval of files:

- storage system in use;
- misfilling;
- mistakes in initial registration;
- volume of taxpayer's file and large number of taxpayers;
- request for a single file by more than one department/sections simentenously.

3.4.4 **Information Content and sources**

According to the survey, information needs of the various users for managing tax related activities can be classified into the following major categories on the basis of specific purpose.

- information for formulation revenue plan;
- information for determining tax liability;
- information for instituting legal proceeding;
- information for follow-up of audit, collection, declaration, appeal, suits and execution status;
- information for registering taxpayers.

To satisfy the above mentioned information needs, various types of forms and reports are maintained at the BOF. The major categories of information required together with related forms are summarized in what follows.

Taxpayers registration information

Taxpayers registration information is permanent information held in the taxpayer's files. It consists of information on taxpayer personal details and nature of business. Taxpayer registration information is required to determine the number and class of taxpayers and to keep permanent records of personal and business details of each taxpayer. Tax auditors, planners, attorneys, and tax collectors make use of such information. The data items tracked for registration of taxpayers consists of the following:

Table 3.3 - Data items of taxpayer registration

Data items	Uses
- Personal details - Business details: - business name; - business type; - business address; - permit number; - issuing authority; - date of commencement	- To keep permanent records of the taxpayer personal details - To keep permanent records of the business details of the taxpayer

Information on declaration

Declaration is the first step in the tax process. Each taxpayer is required to declare and pay taxes. Tax auditor, collector, and attorney make use of declaration information. To identify the amounts of taxes declared and that the taxpayer make declaration within a specified period of time, the following types of data are required:

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Table 3.4 - Data items of tax declaration

Data items	Uses
- Taxpayer's details - Date of declaration - Declaration number - Types of taxes - Tax period - Total taxable income - Declared tax	- To know the particular taxpayer made the declaration - To know whether the declaration is made within the due date - To identify the declaration - To know the types of taxes the declaration is made for - To know the tax period for which the declaration is made - To determine the tax - To know the amount of tax declared

Information on assessment

Assessment is the process of determining and notifying the tax liability to a taxpayer. Information on tax assessment is required to know the total amount of tax receivable and to follow up its collections. The data required for generating tax assessment related information consists of the following items:

Table 3.5 - Data items of tax assessment

Data items	Uses
-Assessment number -Assessment notification date -Tax period -Types of taxes -Total taxable income -Calculated tax -Penalties -Total tax due -Prepaid tax -Outstanding tax liability	- To identify the assessment notification - To follow up whether the payment is made with in the due date - To know the period for which the assessment is issued - To know the types of tax the assessment is issued - To determine taxes - To know the taxes to be paid - To calculate the total taxes to be required - To know the total tax receivable - To determine outstanding tax liability - To know the amount to be collected

Information on tax collection

Tax collection normally arises on declaration, receipt of assessment notification and payments on account or installment payments. Data required for generating tax collection information are:

Table 3.6 - Data item of tax collections

Data items	Uses
-Types of taxes - Tax period - Cash receipt number - Date of collection - Declaration number - Assessment number - Court reference number - Amount	- To know the types of taxes collected - To know the tax period the collection is made - To identify the specific collection - To identify whether the payment is made within the due date - To identify collection made on declaration - To identify collection after assessment notification issued - To identify collection made after court decision - To account the amount collected

Information on tax appeal

Appeal is made, whenever the taxpayers disagree with the assessment, to the appeal commission which is an independent body. The data required in identifying and generating appeal related information consists of the following items:

Table 3.7 - Data items of tax appeals

Data items	Uses
- Taxpayers details - Tax type - Tax amount - Date of assessment - Name of attorney - Date of judgment - Prepaid amount	- To know the taxpayer who made appeal - To collect necessary data to defend the cases - To know the disputed amount - To check whether the appeal is made within the due date - To know the attorney who held the cases - To follow up collections - To know if the required prepayment is made before appeal

Information on tax suits

When the taxpayer neither pays the tax due nor appeals, the tax office lodges suits to the appropriate court of law. As a great number of tax cases pass through this process every year, a separate record is required to maintain information related to suits. Data required for tax suits

include:

Table 3.8 - Data items of tax suits

Data items	Uses
- Taxpayer details - Assessment notf. date - Tax amount - Date of suits - Suits number - Name of court - Date of court appointment - Name of attorney - Date of judgment	- To institute legal proceeding - To calculate the period delayed - To know the amount under legal proceedings - To know the date the suit is instituted - To identify the particular suit - To know the court the cases are held - To follow up the cases - To know the attorney handled the cases - To start execution process -

Information on tax execution

The execution process is initiated to enforce payment of outstanding tax liability. This may done by auctioning for sale of property of the defaulter, the proceeds of which first goes to the settlement of tax liability. Date required for generating execution information include:

Table3.9 - Data items of tax execution

Data items	Uses
- Taxpayer name - Date of execution - Name of court - Suits number - Date of appointment - Name of attorney - Date of judgment - Amount collected	- To institute execution - To know the date the execution process starts - To know the court in which the execution is instituted - To identify the particular cases - To follow up the cases status - To know the attorney held the cases - To enforce payment - To report amount collected due to execution

Information on purchase, sales, import and export items

Before assessment of tax is finalized, third party information is obtained. This information assists in establishing a base for an assessment, especially business profit tax determination. Usually, data is compiled on commission agent, import and export items, domestic purchase and sales information. The data required for generating each types of information consists of the following items:

a) Information on commission agent

Table 3.10 - Data items compiled on commission agent

Data items	Uses
- commission agent name	- To know the taxpayer for whom the date is compiled
- tax period	- To know the tax period for which the data is compiled
- commission income	- To know the commission earned to determine the tax liability
- name of bank	- To held records of the bank which provide the data

b) Information on import and export items

Table 3.11 - Data items compiled on import/export items

Data items	Uses
- importer/exporter's details	- To know the taxpayer for whom the data is compiled
- bank permit number	- To keep records of the reference number of bank permit
- duty paying value	- To find the taxable amount
- custom duty	- To find the taxable amount
- total value	- To determine the taxes required
- data compiler name	- To identify the person collecting the data
- date of compilation	- To know when the data is compiled

c) information on domestic purchase and sales

Table 3.12 - Data items of compiled on purchase and sales information

Data items	Uses
- name of taxpayer	- To identify the taxpayer for whom the data is compiled
- supplier name	- To identify from the data is compiled
- date of purchase	- To know when the transaction is effected
- invoice number	- To identify the specific transaction
- type of goods/services	- To know the list of goods or services purchased or sold
- total purchase value	- To find the taxable amount

Information on daily estimated income of taxpayers

Tax liability is assessed by estimation in respect of all taxpayers that are not bound by law to keeps books of accounts and records. In addition, tax liability is also assessed by estimation if the taxpayer either fails to submit its books of accounts and records or the tax office rejects them for any reason. Assessment on estimation is made on the basis of daily

estimated income. Data required to determine the estimated income are collected by the tax inspector. The data items consists of:

Table 3.13 - Data items on daily estimated income to taxpayer

Data items	Uses
- Purchased items -purchased quantity - purchased price - business expense - personal expense - stock item on hand - sales price	- To identify types of items purchased for sale - To identify total quantify purchased for sale - To determine the total purchase value - To know the business expense to determine daily income - To know the personal expense to determine daily income - To determine daily estimated sales - To determine estimated sales

The various types of data just mentioned originated from variety of sources. Some of these information are released with in BOF and some from external sources.

The external sources provide information mainly on import and export items, production and sales of manufacturers and wholesalers, income of taxpayer's, taxpayer's details, etc. The major data flow to the Bureau in this category and the sources of data are summarized in the following table.

Table 3.14 - External sources of data

SN	Data inflow from external sources	Sources of data
1	Self declaration, business documents, copies of licenses, goods declarations, sales receipts, purchase receipts, income details, audited statements	Taxpayer
2	Import and export item declaration	Custom authority
3	Purchase and sales information	Wholesalers/distributors
4	Taxpayer registration information	Trader Bureau
5	Trade vehicle details	Transport Bureau
6	Permitted foreign exchange amount and commission income by commission agent	Bank

The major portion of the information is produced from within BOF as a result of its day to day activities. The primary sources include:

- **taxpayer files** : The files contains receipts, vouchers, assessment notifications, declarations, and correspondences. Separate files are kept for each tax type, and thus taxpayers may have 3 or 4 files.
- **cash book** : summary records of tax payments by date received and used for cross-checking taxpayer declarations and for management statistics.
- **audit report** : assessment of tax due by the taxpayer based on information on taxpayer files and additional external information. These are held separately by the assessment division.
- **Data compilation** : information compiled on taxpayer's transaction from various sources including, banks, customs, municipality, wholesaler and distributors, and stored in the data compilation division of the bureau.
- **Others** : in addition, various forms, reports, business documents, registers and summary lists containing taxpayer and revenue information are maintained for various purposes.

3.4.5 Hardware and software facilities

The list of hardware and software available at the Bureau and each Zonal offices are summarized as under:

I. Hardware and operating software

1. Micro computer

. Intel 80386 with 16, 20 and 25 MHZ clock speed 1 in number with Dos 6.2;

. Pentium with 90, 100, 133 and 166 MHZ clock speed 20 in number with Dos 7.00 and window 95;

2. Printers available

. Dot Matrix printer 12 in number;

. Laser Jet 3 in number;

II. Other software packages

. Database management - FOXPRO, ACCESS, dBASE IV, dBASE v;

. Word processors - word, WordPerfect;

. Spreadsheet - Excel;

III. The existing applications are:

- payroll system - this system process monthly employee payment and generate payroll related information

- Secretarial work ;

- consolidating monthly and annual account reports;

As the above lists show, BOF has a large number of hardware resources. Based on the interview and discussion made with professionals at the Bureau, and observation made, the existing computers are used for routine clerical activities, mainly word processing. Up to now, no effort has been made to utilize the existing computer resources and develop an application program to support any of the tax related functions.

3.5 The existing tax information handling system : Analysis of problems

In the previous sections, an overview of the Ethiopian tax structure, the tax administration mechanisms and the characteristics of tax information handling have been discussed. As indicated earlier as part of this study, a survey was conducted to identify information needs and sources, perceived weakness and suggestion on ways to improve the current manual methods. As discussed in chapter one, the sample size taken is 20% of the total population of 420 professionals who are involved in tax activities. Out of 84 questionnaires(20% of the total population) which were distributed 60 (70%) questionnaires were received, and out of which, 58 questionnaires were usable. In addition to the questionnaire, interview and document analysis were employed. This section specifically provides the survey results, their analysis and interpretations.

✹ Information availability

Availability refers to the degree to which the information is ready when needed. In the questionnaire, the users (tax auditors, inspectors, planners, tax collectors, supervisors etc.) were asked to rate whether they actually found the required information when needed.

As shown in the following table, 52% of the respondents said that they are poorly satisfied with the availability of information . Another 31% claimed that they are fairly satisfied with the current information availability. Only 17% rated availability as 'Good'.

Table 3.15 - The level satisfaction of for availability of information

Ratings	Frequencies	Percent
Very good	-	-
Good	10	17
Fair	18	31
Poor	30	52
Total	58	100

When respondents were also asked to state reasons for their dissatisfaction, if there is any, their responses were grouped as follows:

Table 3.16 - Reasons cited for unavailability of information

Reasons	Responses
1. Absence of an organized system such as central database	31
2. Low level utilization of information technology	24
3. Poor information exchange with government offices, wholesalers/distributors	28
4. Difficulty in searching and locating the taxpayer's files because of the volume and large number of tax payer's and the manual nature of information services	10
5. Other	
. The taxpayer hidden his income from the tax office	1
. Absence of willingness among experts to share information among themselves	1
. Data compilation personnel have limited skill in information processing and use	1
. Lack of skilled man power	1

As shown in table 3.16 , " absence of an organized systems such as central database services", " low level of utilization of information technology ", and " poor information exchange with government offices, wholesalers/distributors " are identifies as the major causes that affected availability of information.

• Access to information

Accessibility refers to the easiness of extracting, getting or the degree of easily obtainablity of the required information. To this end, the various groups of users involved in the

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Accessibility refers to the easiness of extracting, getting or the degree of easily obtainablity of the required information. To this end, the various groups of users involved in the

taxation have been asked to rate how they can easily locate and obtain required information in their day to day activity.

As shown in the following table, 70.2% of the total respondents who answered the questions 'poorly accessible', 12.3% 'inaccessible'.

Table 3.17 - Summary of responses for accessibility

Rating	Frequency	Percent
inaccessible	7	12.3
Poorly accessible	40	70.2
moderately accessible	10	17.5
accessible	-	-
Total	57	100.00

When users were also asked to state reasons where they chose 'inaccessible' or ' poorly accessible', they responded as follows:

Table 3.18 - Reasons for inaccessible or poorly accessible

Reasons	Responses
1. Absence of finding aids such as lists, indexes, and other guides	15
2. Administrative/security protection	10
3. Misplacement of files and records	10
4. Lack of proper utilization of information technology	34
5. Long bureaucratic procedure to get taxpayer's file from the archive	-
6. Volume of taxpayer's file and large number of taxpayers	25
7. Lack of properly trained manpower in the area of information source	28
8. other:	
. Lack of cooperation of the external sources	1

(Note - Most of the respondents suggested more than one option, hence making that total of responses number more than 47)

As shown in table 3.18, lack of proper utilization of information technology have been identified as the major causes for poorly accessible or inaccessibility of information.

✹ Accuracy of information

Accuracy refers to the degree of exactness of the information obtained. The users were asked to rate the extent to which the information they get is exact and correct. Thus, the summary of the responses to accuracy have been tabulated in table 3.6. As shown, 66% and 34% of the respondents said that they are getting moderately accurate and poorly accurate information respectively. This indicates that the problem of accuracy is not a very serious problem in the existing system.

Table 3.19 - Summary of responses for accuracy

Rating	Frequency	Percent
Accurate	-	-
Moderately accurate	38	66
Poorly accurate	19	34
Inaccurate	-	-
Total	57	100

✹ Consistency of information

In the questionnaire, the respondents were asked to indicate the consistency of provision over a period of time. The responses have been grouped as shown in table 3.20.

Table 3.20 - Summary of responses for consistency

Rating	Frequency	Percent
consistent	20	35.0
moderately consistent	24	42.0
poorly consistent	10	18.5
inconsistent	3	5.0
Total	57	100.0

As shown in table 3.20, 35% and 42% of the responses claimed that they got consistent and moderately consistent information respectively. Hence, from the results, it can also be observed that inconsistency is not a serious problem.

✹Timeliness of information

When the users were asked to rate how they are satisfied in the timeliness of information provided, their responses have been summarized as shown in table 3.21.

Table 3.21 - Summary of responses for timeliness

Rating	Frequency	Percent
Very good	-	-
Good	12	20.7
Fair	11	19.0
Poor	35	60.3
Total	58	100.0

When the users were asked to state the reasons for dissatisfaction, if there is any, they responded as follows.

Table 3.22 - Reasons for untimely information

Reasons	Responses
1. Misfilling	10
2. Shortage of required manpower	24
3. The current manual methods in use	23
4. Poor delivery system linked with external sources	25
5. Absence of an organized/integrated information	31
6. Other	
. Poor cooperation from external sources	1
. Limited skill of data compilation personnel	1
. Large number of tax payers	1

(Some of the respondents suggested more than one options, hence making the total number of responses more than 46)

As can be seen from table 3.22, the major causes for untimely information are absence of an organized /integrated information and poor delivery system linked with external sources, and shortage of required manpower.

Generally, from the above analysis, we can observe that major problems were noted in accessing existing information, making information available and having information timely. The major causes cited by most respondents were:

- lack of proper utilization of information technology;

- lack of proper trained manpower in the area of information services;

- absence of an organized/integrated system;

- poor communication with external sources of information;

- limitations of the current manual methods in use;

Taken together, the major problems noted during the study are summarized as follows.

Table 23 -Summary of the problems identified

References	Identified problems
Interview and document analysis	1. All tax related activities such as tax assessment, declaration, collection, appeal, suits, and execution are maintained and processed manually. Due to the size and complexity of the data and the limitations of the manual data processing, it is difficult to generate accurate, complete, concise, and timely, reports such as: - number and class of taxpayers; - list of audit and unaudited accounts; - aging of unaudited accounts; - list of declaration and assessment by taxpayer - cases under appeal, suits, and execution; - collection and arrears status.
Interview and document analysis	2. Management of taxpayer's accounts The system for recording tax receivable is weak. Tax amount due are recorded in individual taxpayers files and not summarized. As a result, BOF finds it very difficult to traces each taxpayer's position by each type of tax efficiently and accurately.
Interview	4. Low utilization of data collected and compiled Large quantities of data are collected from different government departments, wholesalers/distributors, manufacturers about their transactions with different taxpayers. Though considerable time and effort is exerted to collect the data, the collected data is not used in providing an effective service and may even be wasting the few resources devoted to it. a) some information from government and municipal authorities, from customs, and banks are gathered automatically and stored until requested; b)auditors can ask the data compilation section to provide or obtain information but the audit is often completed before that can be obtained; c) data compilation personnel have limited skill in information

	processing and use
Interview and questionnaire	5. Generally, there is no efficient information storage and retrieval system. All activities are manual resulting in: . a lot of paper work that leads to erroneous aggregations and missing of data . delays and untimely provision of information . duplication of data in different files . a lot of man-hours are spent on routine and clerical activities . bulky files, difficult to handle and are many in numbers . loss or intentional removal of information . no consolidated, up to date management information . access to existing information is difficult . information obtained is not in most cases complete

The analysis and problems discussed above testify a demand for an organized database for storage and retrieval of tax information. The existence of a well organized database service may:

- improve the existing level of information access by reducing search efforts and time;
- improve accuracy and timeliness by reducing too much intermediate processes for recompiling and the time required for information to reach the user;
- enable to properly utilize the existing computer service;
- save time of professionals which at the moment is spent mostly on routine data processing and information searching, and
- help avoid duplication of work.

CHAPTER FOUR

THE PROPOSED DATABASE SOLUTION

4.1 Basic Considerations

In the previous chapter, an attempt was made to document the existing tax information handling situations at Region 14 Finance Bureau including the problems on the basis of the survey and document analysis. Analysis of the survey results indicated that major problems were noted in accessing existing information, making information available, and having information timely. Although the area of concern for improving the existing information services are wider within the context of the existing hardware and manpower resources, the concern in this study is to demonstrate the application of object-oriented approach for designing a tax database as one possible solution to minimize problems of access to existing information.

Thus, this chapter is a continuation of the previous discussion and aims at describing the proposed database solution for the case under references. The proposed database designed on the basis of object-oriented approach will have the advantages of, among others;

- minimizing existing information search efforts;
- providing users with well organized and summarized information;
- providing information on each taxpayer and their associated declaration, assessment, collection, appeal, suit and execution information in an integrated manner;
- save time of professionals which at a moment is spent mostly on routine data processing and information searching

- avoid duplication of work; and
- properly utilize the existing computer resources.

4.1.1 Objectives of the proposed system

- to improve the process of storing, retrieving, and disseminating tax related information and to ensure that information made available is precise, exhaustive, and accessible with minimum delay, presented in a manner more convenient to the respective users and the service is provided at the minimum cost;
- to coordinate, centralize, analyze, update, store and disseminate tax information;
- to facilitate inquiries, data updating and browsing services for processing and presentation of the information related to tax assessment/audit, collection, appeal and enforcement;
- to reduce manual activities as well as physical storage requirements; and
- to provide enhanced data storage and retrieval;

4.1.2 Requirement specification

• Performance related requirements

The existing tax information handling is done manually, and it involves a lot of processes with relatively huge amount of paper work. This has resulted in low response time. For instance, the taxpayers requiring clearance certificate wait between one and eight hours for the file to be located and the calculation completed. Similarly, calculating over all outstanding tax receivable requires more than two months by several staff in the collection division. Thus, there is a need to improve the response time by introducing a computer based database system.

- avoid duplication of work; and
- properly utilize the existing computer resources.

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The amount of paper work and the amount of labor required in all areas of processing have been huge making the efficiency of the system low with too much resource usage with small output. For instance, the tax declaration process involves 23 tasks, and 13 documents and this involves a lot of paper works. Thus, efficiency has to be maintained for proper performance.

- **Processing related requirements**

  - Provision for interactive data entry and query facilities are needed;
  - Provision for the user to direct and control the processing of the application;
  - Provision for maintaining the security and integrity of the database at all times;
  - A screen display or hard copy of all records must be available for inspection at anytime;

- **Collection related requirements**

. Maintenance of taxpayer registration;

. Maintenance of tax audit information for all types of taxes and taxpayers;

. Maintenance tax assessment, collection and arrears status information;

. Maintenance of information related to appeal, suit and execution cases;

. Maintenance of data collected and compiled from third party on purchase and sales information of taxpayers.

- **Output related requirements**

The system is expected to generate different periodic and ad-hoc reports and on screen query outputs. Some of the major outputs required are summarized below in two

categories: existing (those which are being produced within the existing system) and those which are newly identified and were difficult to produce from the existing system.

. **Existing reports**

- purchase and sales data collected from third party (wholesaler, distributor, manufacturer, bank and customs) by taxpayer;
- a list of assessment notification which aren't paid by taxpayer within 30 days of the issue of assessment notification;
- a report of tax collection status by major type of taxes;

. **Newly identified reports**

- a list of audited accounts and aging of unaudited tax account by taxpayer and types of taxes;
- a list of declaration made by tax payer and types of taxes.
- a list of assessment issued by taxpayer and types of taxes;
- outstanding tax liability by taxpayer and type of taxes;
- a list of tax payers by zone, woreda, and grade, business type etc. ;
- a report of taxes under appeal and enforcement cases by taxpayer and types of taxes;
- a list of taxpayers who failed to make declaration within a specified period of time
- a report of tax collection on the basis of declaration, assessment, appeal, and suit;

4.1.3 Design method

The method used in this study is the object-oriented data model suggested by Lorenz (1993). The following object oriented development steps recommended by the methodology have been followed.

a) write use cases - Use case is a description of the system actions up on receipt of one type of user requests. The idea is to focus on the usage of the system and the goal is to extract the real underlying requirements;

b) develop message flow diagrams for use case (optional);

c) develop collaboration diagram;

. collaboration diagrams graphically depict classes and sub systems along with indication

of other classes and subsystems they collaborate with

- identify classes
- identify class attributes
- identify responsibilities (methods)
- identify subsystems (a subsystem is a group of classes that work together provide a related group of functions)
- identify contracts (a contract is a simplifying abstraction of a group of related public responsibilities (methods) that are to be provided by subsystems and classes to their clients);

d) place classes in the inheritance hierarchy;

e) develop message flow diagrams for methods (optional);

f) implement subsystems;

g) develop function tests.

For documentation purpose, the following graphics symbols are used.

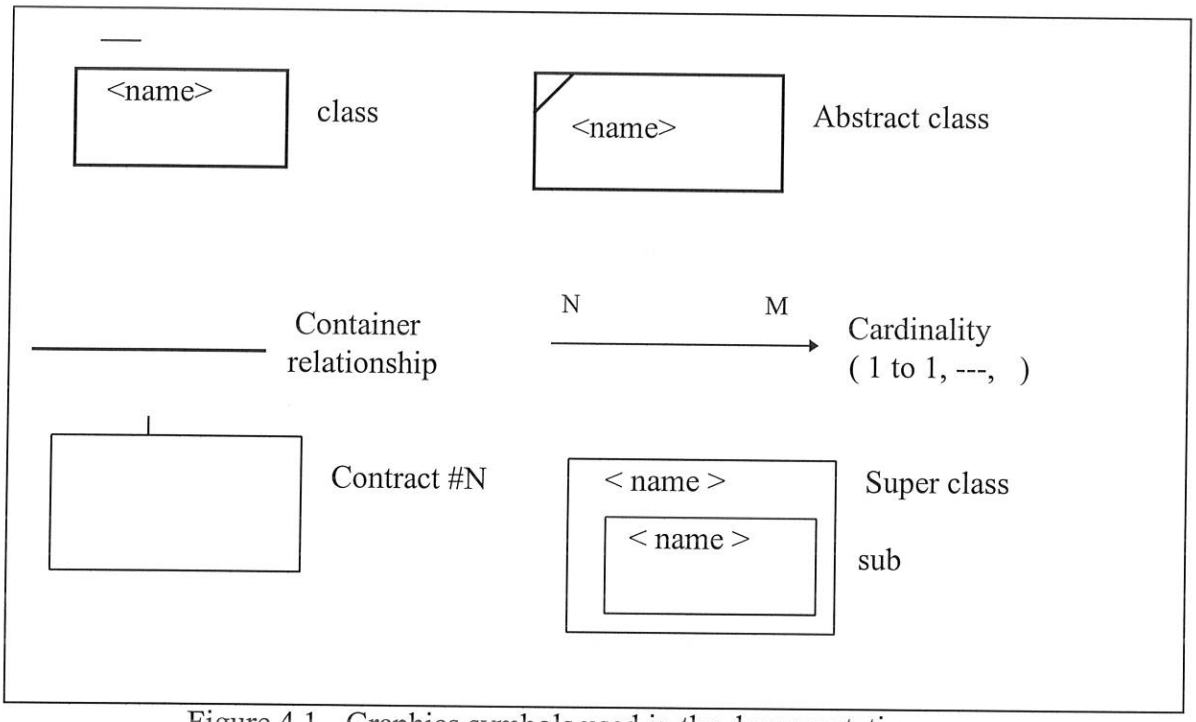


Figure 4.1 - Graphics symbols used in the documentation process

The results obtained after applying the data models suggested by Mark Lorenz on the case area (i.e. BOF) are summarized as under.

4.2 Technical Details

4.2.1 Use case of BOF

From the requirement identified above, the following use case of BOFTDS were derived for incorporation in the design. The use cases are grouped into functional (those which are major functions or components of the system) and non functional (those which are an interface of the system) as presented below:

Non functional:

- BOFTD access control;
- List choices of available databases;

Functional:

- Maintenance of taxpayers registration, audit, assessment, tax collection, appeal, suit, execution, and data compilation records;
  - create a record;
  - edit a record;
  - delete a record;
  - arrears inquiry;
  - generate a report;
- Display/list records of:
  - purchase and sales data by taxpayer;
  - aging of unaudited accounts;
  - list of audited accounts of taxpayers;
  - total collection by types of taxes and taxpayer;
  - compute tax arrears by types of taxes and taxpayer;/
  - cases under appeal, suit, and execution;
  - tax declaration by taxpayer and types of taxes;
  - tax assessment by taxpayer and types of taxes;
  - taxpayers by business types, zone, wereda etc.;

Details of each use case is presented below:

Use case - Acess control

A machine is available at different sections of the Bureau to perform record maintenance and
inquiry functions. If the user wants to get into the database, the users is prompted for his password. If the password is valid, the user is given a menu choice of actions on the screen.

Use case - List choices of available databases

< Use case - Access Control is prerequisite> If the password is valid, a user is given with a menu choice of Registration, Audit and Assessment, Collection, Appeal, Suit, Execution, and Data Compilation. Depending on the user choices and the button pressed,a list of sub menu choices of the respective database containing create, delete, edit, exit will be dispalyed. The user is allowed to then request another action or to exit.

Use case - Creat a record

< List choices of avaialble database - use case prerequisite >If create a record is pressed, a data entry form of the respective database will be displayed on the screen. The user is allowed to enter the details. If the record exists, a messege appears on the screen, the new details will not be recorded. The user is allowed to then request another action or to exit.

Use case - Edit the record

< List choices of available databases - use case prerequisite > If Edit button is pressed, the user is asked for file number of taxpayer and types of taxes. If the record matching with the file number exists, the user is prompted to enter the tax period. If the record matching the tax period exists, the respective record is displayed on the screen. The user is allowed then to change the details of the record, otherwise a message appears on the screen. The user is allowed to then request another action or to exit.

Use case - Displaye details of the record

< List choices of avaialble database Use case prerequisite > If display button is pressed, the user is asked a file number the respective taxpayer and types of taxes. If the records matching with the file number exists, detials of the respective records is displayed on the screen, otherwise a message appears. The user is allowed to then request another action or to exit .

Use case - Delete the record

< Display details of the record- Use case Prerequisite > If delete button is pressed, a message is displayed for confirmation . If yes button is pressed, the record is deleted. The user is to then request another action or to exit.

Use case - Tax arrear enquirey

< List choices of avialable database- Use case prerequisite > If arrear enquiry button is pressed,
the user is asked for the file number of the taxpayer and types of taxes, after which tax period, assessment number, assessment amount, cash receipt number, collected amount, and arrear (balance) is displayed on the screen.

Use case - Generate a report

<List choices of available database Use case prerequisite> If report button is pressed, the user is given with the menu choice of actions, 'Assessment', 'Collection', ' Appeal' , ' Suit' and ' Execution' . Depending on the user choices and the button pressed, the summary of records associated with the respective choices are displayed on the screen, and the user is allowed to print the report. The user is allowed to then request another action or to exit.

4.2.2 Class identification

On the basis of the requirement identified and following verifications with users, the following persistent and interface classes presented in table 4.1 have been identified:

Table 4.1 - A catalogue of the classes

Taxpayer registration	Data compilation	Assessment and Collection	Appeal and enforcement	Interfacing classes
Taxpayer Business	Foreign exchange Commission income Domestic purchase Custom declaration	Tax declaration Profit tax declaration Sales tax declaration Excise tax declaration Personal income tax declaration Tax assessment Profit tax assessment Sales tax assessment Excise tax assessment Personal income tax assessment Rental income tax assessment	Tax appeal Tax suit Tax execution	Input device Output device

4.2.3 Subsystem

The subsystems have been identified along major functionality boundaries rather than class collaboration and cohesion boundaries as the system is complex and identification of class collaboration exhaustively at this time would require longer time.

1. **Taxpayer registration subsystem**	
Description - Coordinate the activities related to the maintenance taxpayer registration record and report generation	
Contract	**Responsible class**
[1] Maintain taxpayers registration	taxpayer, business
[11] Process transaction	transaction

2. **Tax declaration, assessment and collection susbsystem**

Description - Coordinate the activities related to the maintenance of tax declaration, assessment, and collection records, and report generation

Contract	Responsible class
[2] Maintain tax declaration record	Tax declaration
[3] Maintain tax assessment record	Tax assessment
[4] Maintain tax collection record	Tax collection
[11] Process transaction	Transaction

3. **Tax audit subsystem**

Description - Coordinates the activities related to maintenance of tax audit records and report generation

Contract	Responsible class
[16] Maintain tax audit record	Tax audit
[2] Process transaction	Transaction

4. **Appeal and enforcement subsystem**

Description - Coordinates the activities related to the maintenance of appeal and enforcement records, and report generation

Contract	Responsible class
[5-7] Maintain appeal and enforcement of records	Appeal, Suit, Execution
[11] process transaction	Transaction

5. **Data compilation subsystem**

Description - Coordinate the activities related to collection and compilation of purchase and sales information of taxpayer from third party

Contract	Responsible class
[10] Maintain domestic purchase information	Domestic purchase
[9] Maintain custom declaration information	Custom declaration
[8] Maintain foreign exchange information	Foreign exchange

6. **Interface subsystem**
Description - Coordinate the device used by the work stations to transfer information to and
from the users

Contract	**Responsible class**
[12] Get user input	input device
[13] put out put to the user	out put device

4.2.4 Contracts

The major contracts, the server classes and their clients within the system are listed as in the following:

Contract 1 - Maintain taxpayer records

Description - The contract is to provide basic tax payer record maintenance functions including create, edit, delete and report.
Subsystem - Tax payer registration subsystem
Server - Taxpayer
Clients -Transaction, Declaration, Assessment, Collection, Appeal, Suits, Execution, Domestic , chase, Foreign exchange, Commissin income, Custom declaration

Contract 2 - Maintain tax declaration

Description - This contract is to provide functions which are basic to maintaining declaration records
Subsystem - Declaration, assessment and collection
Server - Tax declaration
Client - Transaction, Taxpayer, Tax collection

Contract 3 - Maintain tax assessment

Description - Provide basic assessment record maintenance functions
Subsystem - Tax declaration, assessment and collection
Server - Tax assessment
Clients - Transaction, Taxpayer, Tax collection, Tax appeal, Tax suit, Tax audit

Contract 4 - Maintain tax collection record

Description - Provide basic tax collection record maintenance functions
Subsystem - Tax declaration, assessment and collection
Server - Tax collection
Clients - Transaction, taxpayer, tax audit

Contract5 - Maintain tax appeal

Description - Provide basic tax appeal record maintenance funcitons
Subsystem - Appeal, suit and execution
Server - Appeal
Clients - Transaction, taxpayer

Contract 6 - Maintain tax suits records

Description - Provide basic tax suits record maintenance functions
Subsystem - Appeal and enforcement
Server - Suits
Clients - Transaction, tax payer

Contract 7 - Maintain tax execution records

Description - Provide basic tax execution record maintenance functions
Subsystem - Tax appeal and enforcement
Server - Execution
Clients- Transaction, tax payer

Contract 8 - Maintain foreign

Description - Provide basic foreign exchange record maintenance functions
Subsystem - Tax data compilation
Server - Foreign exchange
Client - Transaction, taxpayer, tax audit

Contract 9 - Maintan custom declaration

Description - Provide basic custom declaration record maintenance
Subsystem - Tax data compilation subsystem
Server - Custom declaration
Client - Transaction, tax payer , tax audit

Contract 11 - Process transaction

Description - Provide the tax registration, audit, assessment, tax collection and arrears, appeal and enforcement, and data compilation record maintenance and report generation services available at the BOFTD work stations including create, edit, delete, display, and report generation
Server - Transaction
Client - BOFTD workstation

Contract 12 - Get user input

Description - Handle input from the user
Subsystem - Interface subsystem
Server - Input device
Client - User

Contract 13 - Put output to the user

Description - Provide output functions
Subystem - Interface subystem
Server - Output device
Client - Users

Contract 14 - Verify password

Description - Make sure that the user has a valid access password
Server - User
Client - Input device

Contract 15 - Verify user

Description - Make sure that this user is yours
Server - BOF
Client - Input device

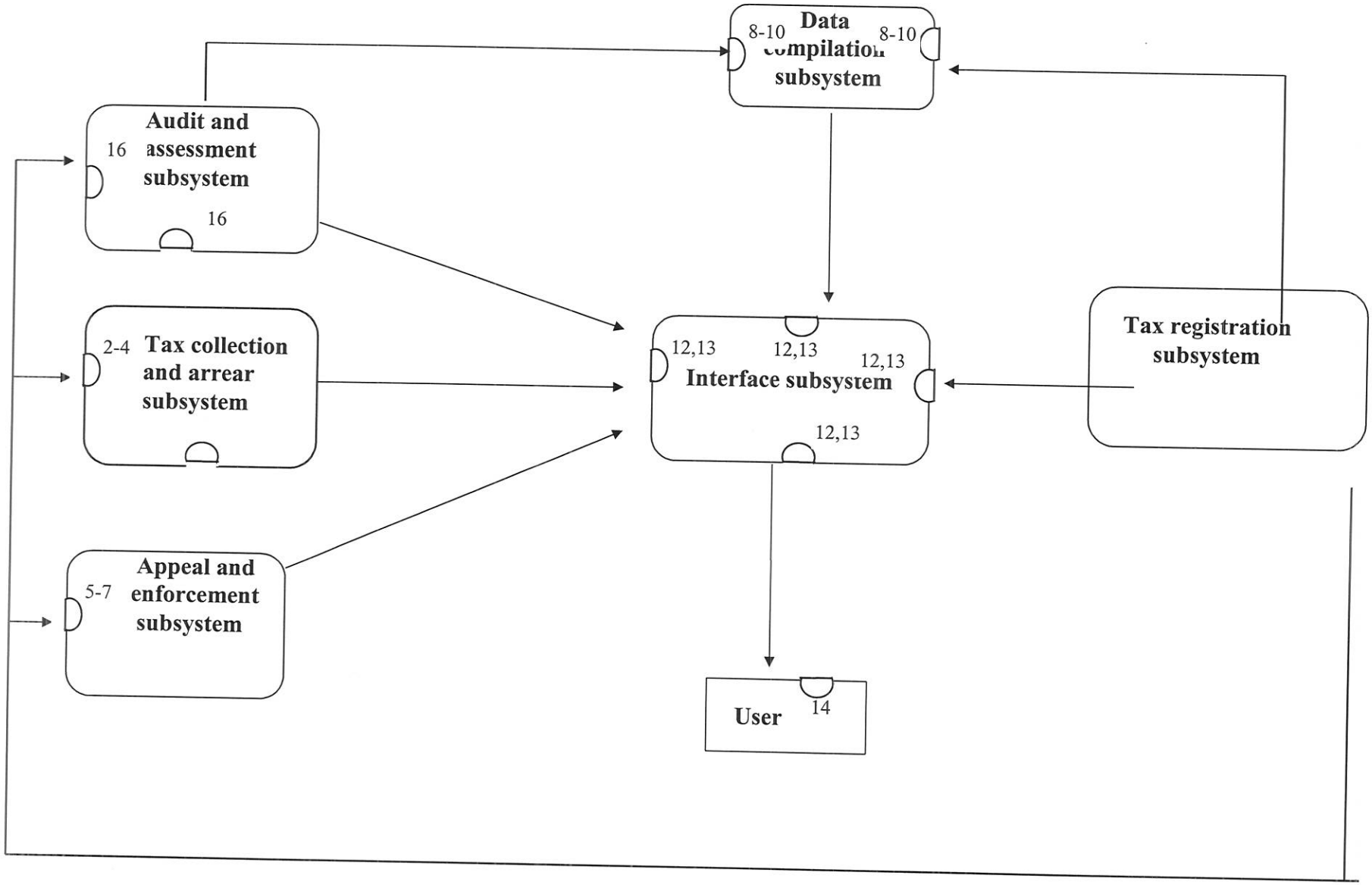
Contract 16 - Maintain tax audit

Description - Provide basic tax audit record maintenance
Subsystem - Audit
Server - Tax audit
Client - Transaction, taxpayer, tax assessment

4.2.5 Collaboration diagram

A collaboration diagram is graphically view of an OO system design that includes classes, sub systems groupings, and contracts usage. The collaboration diagram among the subsystem and collaboration with in each subsystems are depicted as follows. The numbers indicate contacts provided by a subsystem or a class.

Figure 4.2 - BOFTD Collaboration diagram



Contract 11 - Process transaction

Description - Provide the tax registration, audit, assessment, tax collection and arrears, appeal and enforcement, and data compilation record maintenance and report generation services available at the BOFTD work stations including create, edit, delete, display, and report generation
Server - Transaction
Client - BOFTD workstation

Contract 12 - Get user input

Description - Handle input from the user
Subsystem - Interface subsystem
Server - Input device
Client - User

Contract 13 - Put output to the user

Description - Provide output functions
Subystem - Interface subystem
Server - Output device
Client - Users

Contract 14 - Verify password

Description - Make sure that the user has a valid access password
Server - User
Client - Input device

Contract 15 - Verify user

Description - Make sure that this user is yours
Server - BOF
Client - Input device

Contract 16 - Maintain tax audit

Description - Provide basic tax audit record maintenance
Subsystem - Audit
Server - Tax audit
Client - Transaction, taxpayer, tax assessment

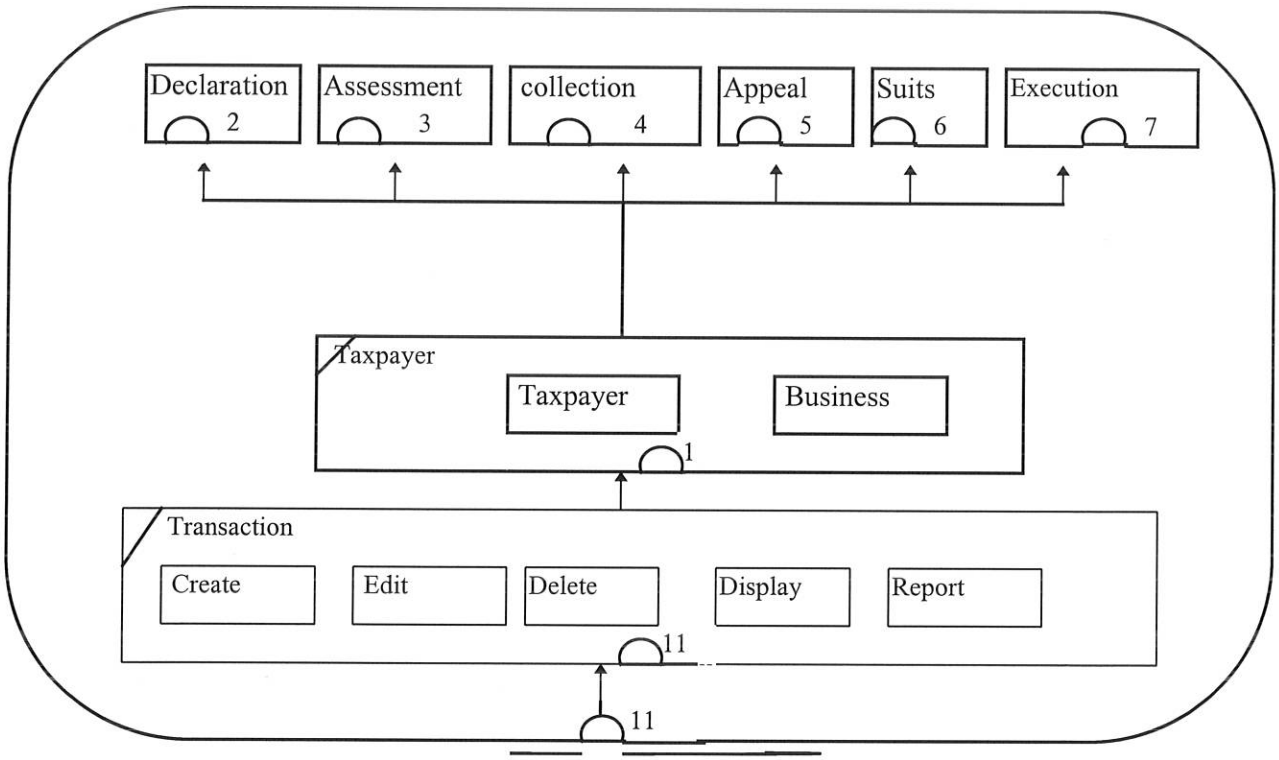


Figure 4.3 - Collaboration within tax registration subsystem

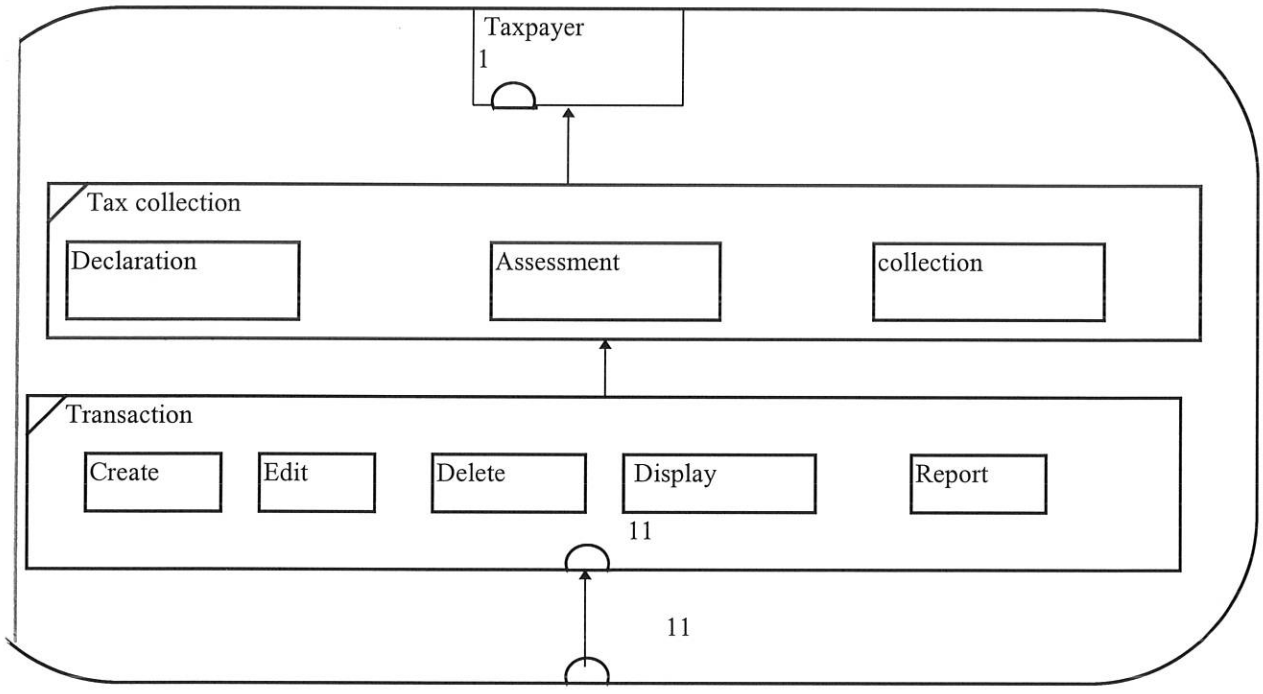


Figure 4.4 - Tax collaboration within tax collection and arrear subsystem

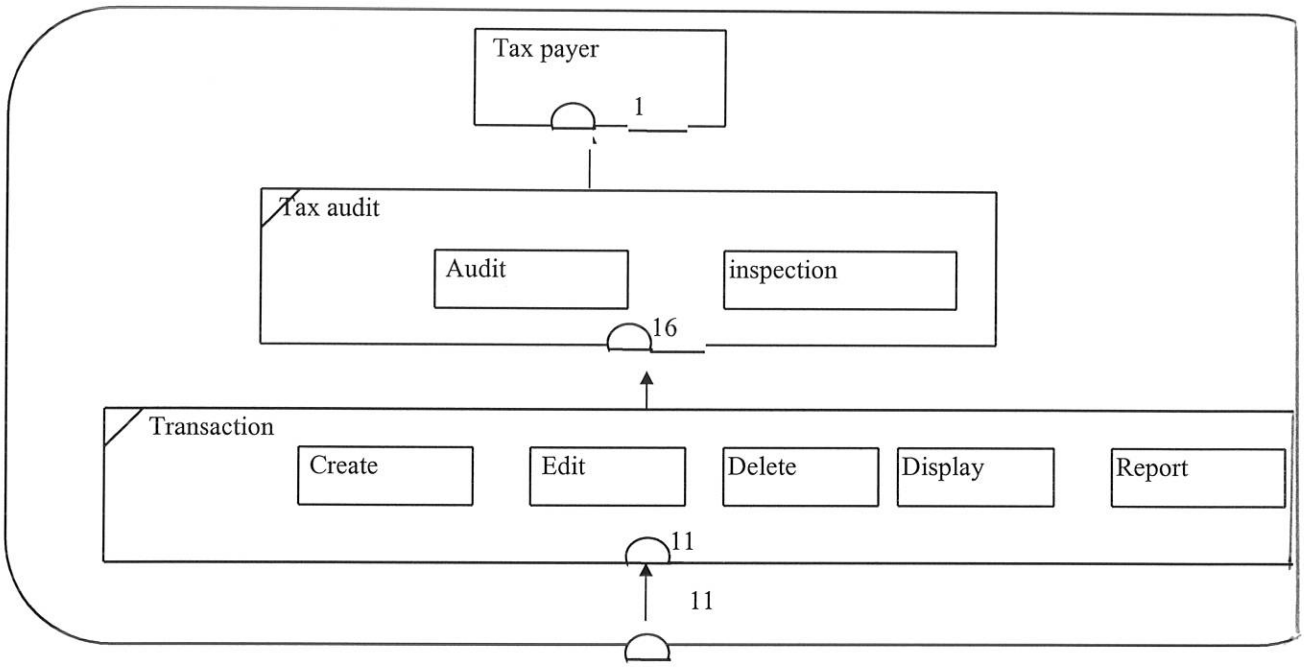


Figure 4.5 - Collaboration within audit subsystem

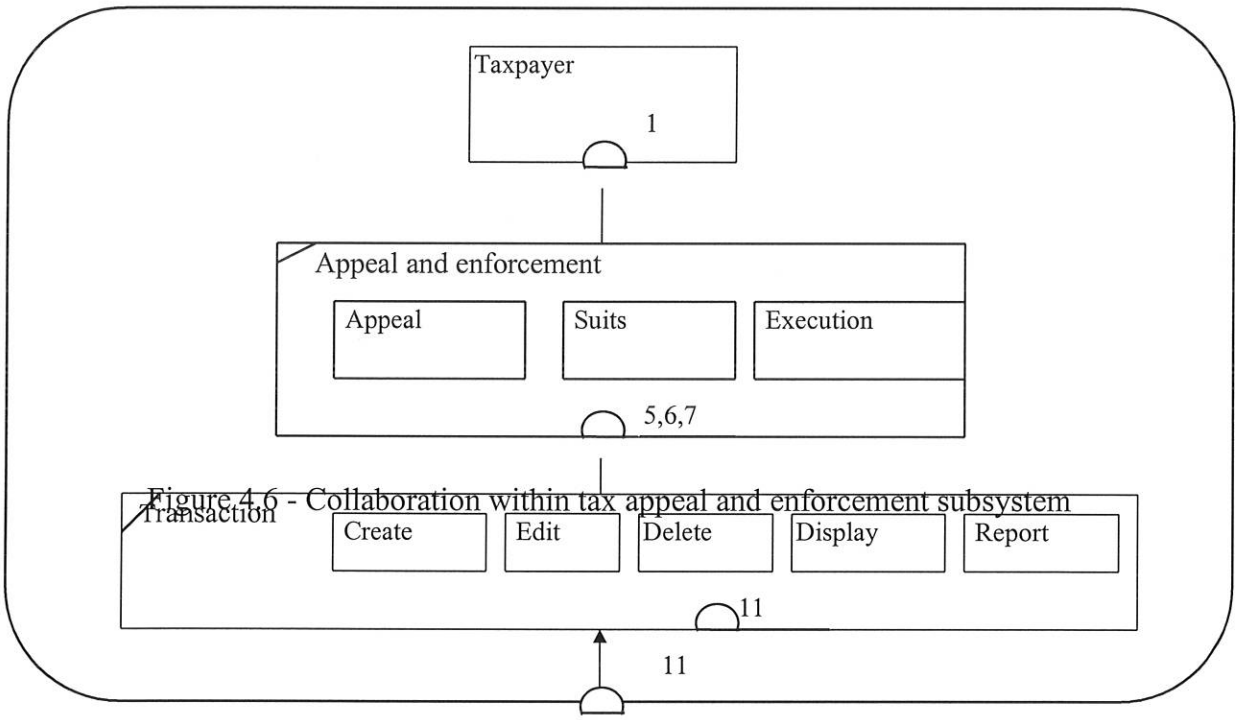


Figure 4.6 - Collaboration within tax appeal and enforcement subsystem

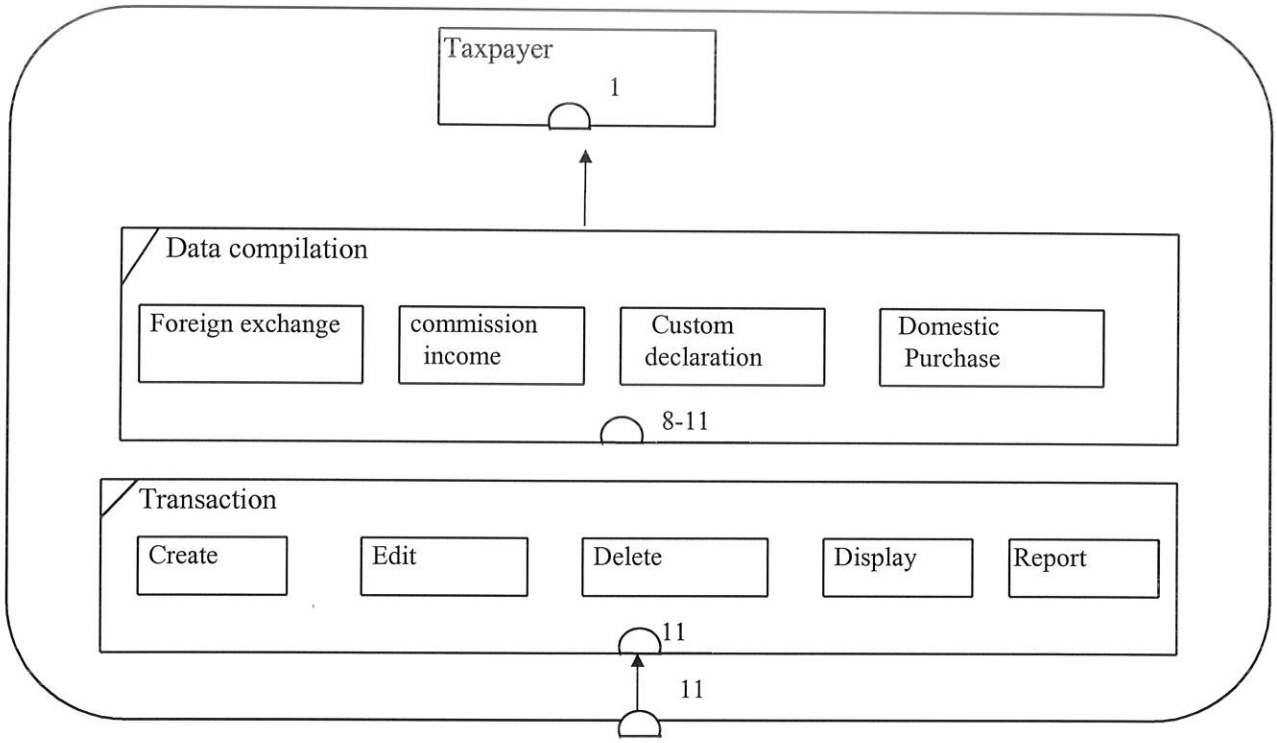


Figure 4.7 - Collaboration within Data Compilation Subsystem

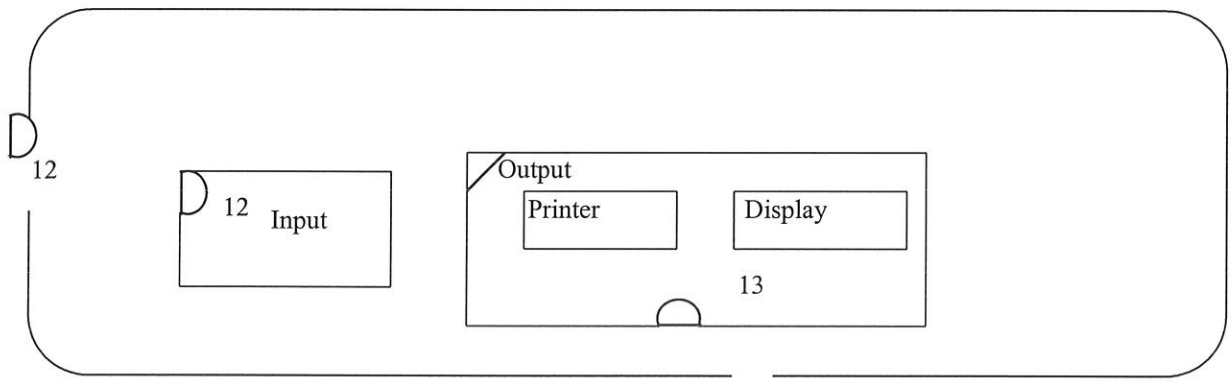


Figure 4.8 - Interface
ssubsubsystem

4.8 **Class hierarchies**

You can organize similar types of classes of objects into categories called class hierarchies. The lower level class (called sub class) can use the services of all the higher class in their hierarchy. This is called inheritance. Inheritance is simply a way of reusing services and data (Lorenz, 1993). Figure 4.9 shows inheritance hierarchies of BOFTD.

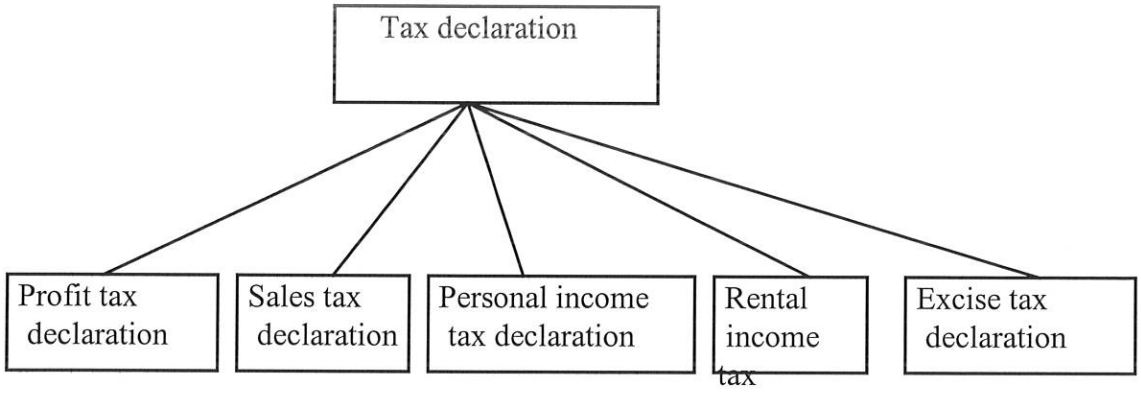


Figure 4.9 - Inheritance hierarchies of tax declaration super class

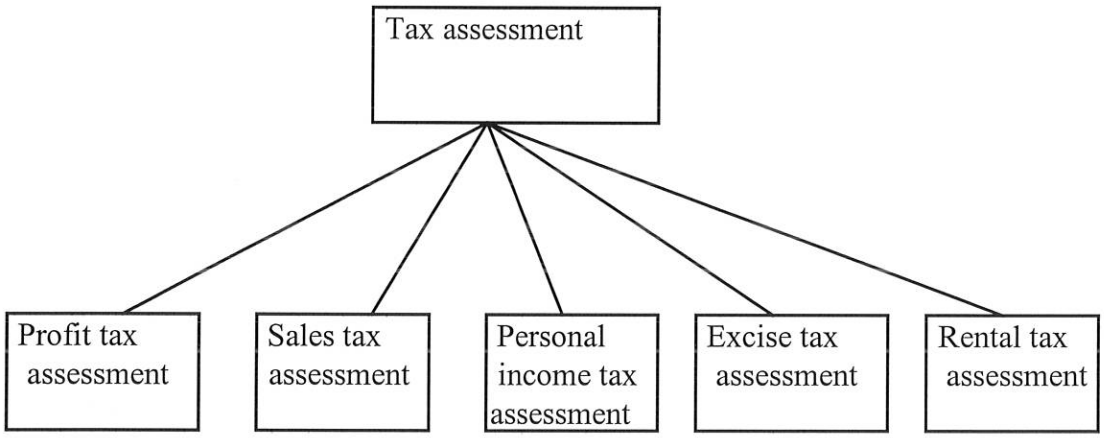


Figure 4.10 - Inheritance hierarchies of tax assessment super class

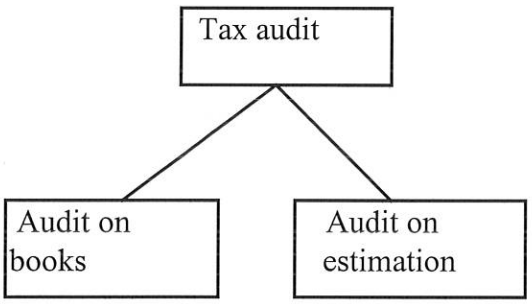


Figure 4.11 - Inheritance hierarchies of tax audit super class

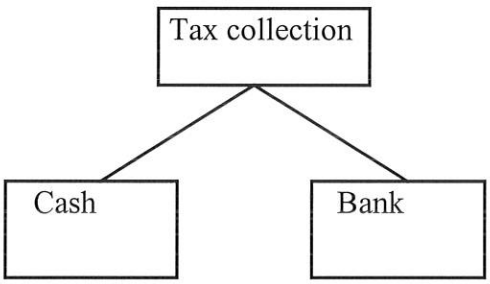


Figure 4.12 - Tax collection super class

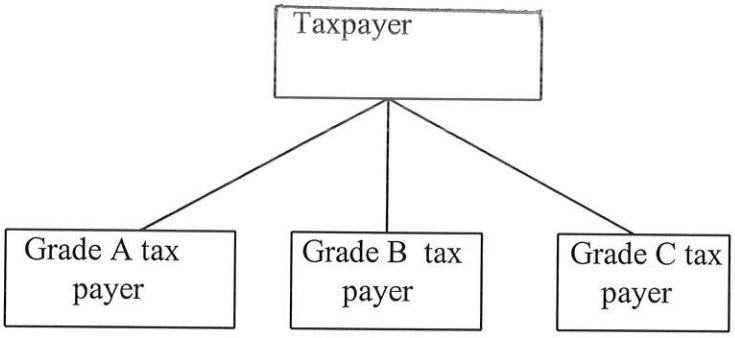


Figure 4.13 - Inheritance hierarchies of taxpaye super

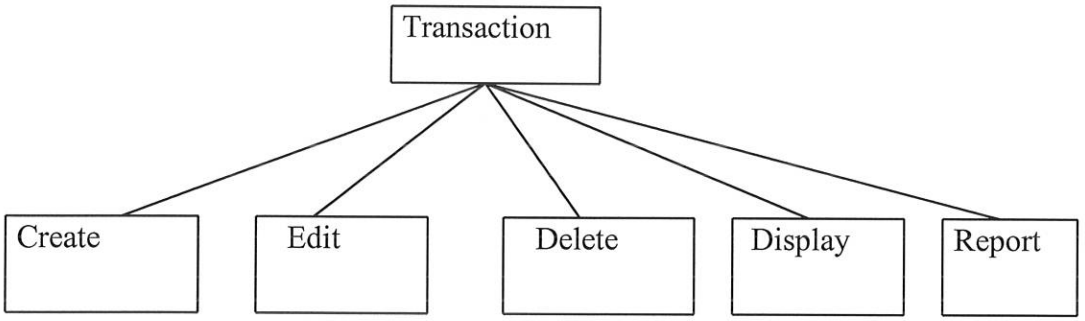


Figure 4.14 - Inheritance hierarchies of transaction super class

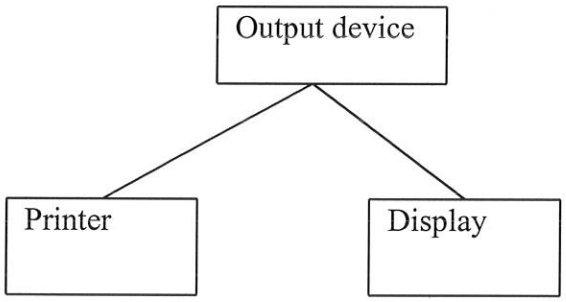
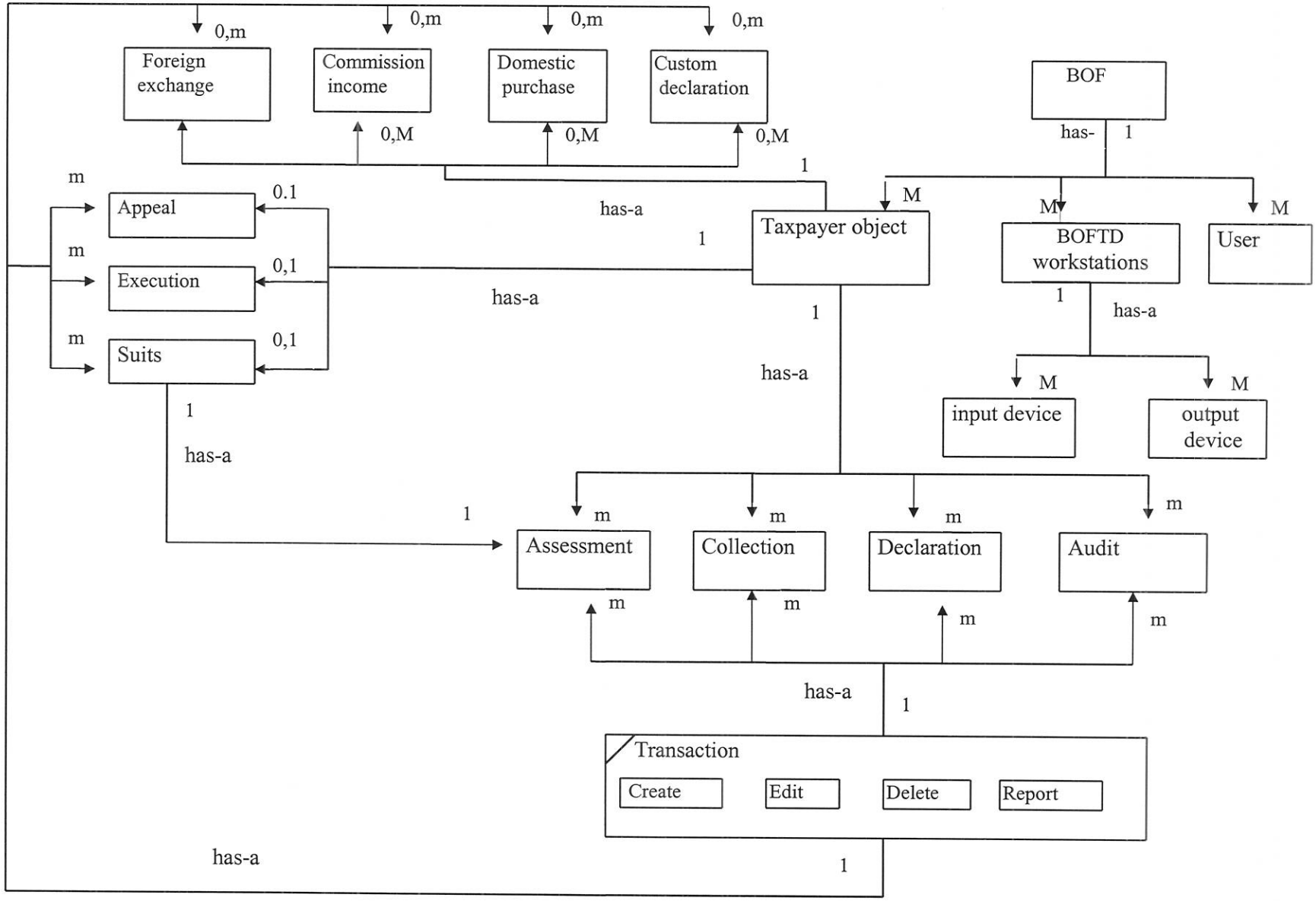


Figure 4.15 - Inheritance hierarchies of output device super class

4.9 Cardinality relationship

Cardinality is an indication of the expected number of instances of each related object types. In cardinality containment or collaboration between classes have been depicted. Figure 4.10 shows the cardinality for the relationship between the BOFTD application classes.


0,m
0,m
0,m
0,m
Foreign exchange
Commission income
Domestic purchase
Custom declaration
0,M
0,M
0,M
BOF
has-
1
1
has-a
M
M
M
Taxpayer object
BOFTD workstations
User
1
has-a
m
m
m
Appeal
Execution
Suits
0.1
0,1
0,1
has-a
1
has-a
1
has-a
M
M
input device
output device
1
has-a
1
m
m
m
m
Assessment
Collection
Declaration
Audit
m
m
m
m
has-a
1
Transaction
Create
Edit
Delete
Report
has-a
1

4.10 Class Definitions

Taxpayer class

Description - The taxpayer class is an abstract class that provides common services for all types of taxpayer objects
Superclass - Persistent object
Subclass - Grade A, Grade B, Grade C taxpayer

CONTRACT

[1] Maintain taxpayer record is implemented by the following public methods
(all the methods are listed below under responsibility)

Responsibility	**Descriptions**
FileNO	Return my file number
Name	Return my full name
Zone	Return my zone
Wereda	Return my wereda
Kebele	Return my kebele
HouseNo	Return my house number
Telephone	Return my telephone number
Nationality	Return my nationality
Business	Return my business details
Assessment	Return my assessment details
Declaration	Return my declaration details
Tax collect	Return my tax collection details
Appeal	Return my tax appeal detail if appealed
Suits	Return my tax suits if suited
Execution	Return my tax execution if executed
Foreign exchange	Return my foreign exchange details if permitted
Commission income	Return my commission income detail
Custom declaration	Return my custom declaration
Domestic purchase	Return my domestic purchase
FileNo:aFileNO	Set my FileNo to aFileNo
Name:aName	Set my Name to aName
Zone:aZone	Set my Zone to aZone
Wereda:aWereda	Set my Wereda to aWereda
Kebele:aKebele	Set my Kebele to aKebele
HouseNo:aHouseNo	Set my HouseNo to aHouseNo
Telephone:aTelephone	Set my Telephone to aTelephone
Nationality:aNationality	Set my Nationality to aNationality
Business:aFileNo	Add/Change aFileNo to my business list
Assessment: anAssessNo	Add/Change anAssessNo to my assessment list
Declaration:aDeclarationNo	Add/Change aDeclarationNo to my declaration list
TaxCollection:aCashreceptNO	Add/Change aCashreceptNo to my tax collection list
Appeal:anAppealNo	Add/Change anAppealNo to my tax appleal list when I
Suits:aSuitsNo	Add/Change aSuitsNo to my tax suits number when I am suited
Execution:anExecutionNo	Add/Change anExecutionNo to my tax execution list if I am executed

Data	Descriptions
FileNo	My file number
Name	My full name
Zone	My zonal address
Wereda	My wereda address
Kebele	My kebele address
HouseNo	My house number
Telephone	My telephone number
Nationality	My nationality
Business	My business detail
Assessment	My tax assessment detail
Declaration	My declaration detail
Taxcollection	My tax collection detail
Appeal	My tax appeal detail if appealed
Suits	My tax suits detail if suited
Execution	My tax execution detail if executed
Foreignexchange	My foreign exchange detail if permitted
Commissionincome	My commission income detail if earned
Customdeclaration	My customer declaration detail
Domestic purchase	My domestic purchase detail

Business class

Description - The business class is a data repository, maintaining the business information
Superclass - Persistent object
Subclass -None

CONTRACT

[2] Maintain business details is implemented by this class

Responsibility	Descriptions
FileNO	Return my file number
BusName	Return my business name
BusType	Return my business types
PermitNo	Return my permit number
IssAuthority	Return my issue authority
Authcapital	Return my authorised capital
Datecommence	Return my date of commence
BusZone	Return my business zone
BusWereda	Return my business wereda
BusKebele	Return my buiness kebele
BusHouseNo	Return my house number
BusTelephone	Return my telephone number
FileNo:aFileNo	Set my FileNo to aFileNo

PermitNo:aPermitNo	Set my PermitNo to aPermitNo
IssuAuthority:anIssuAuthority	Set my IssuAuthority to anIssuAuthority
AuthCapital: anAuthCapital	Set my AuthCapital toanAuthCapital
DateCommence: aDateCommence	Set my DateCommence to aDateCommence
BusZone:aBusZone	Set my BusZone to aBusZone
BusWereda:aBusWereda	Set my BusWereda to aBusWereda
BusKebele:aBusKebele	Set my BusKebele to aBusKebele
BusHouseNo: aBusHouseNo	Set my BusHouseNo to aBusHouseNo
BusTelephone:aBusTelephoe	Set my BusTelephone to aBusTelephone

Tax declaration class

Description - The tax declaration class is an abstract class that provides common services for all types of tax declaration objects
Superclass - Persistent object
Subclass - None

CONTRACT

[ ] Maintain tax declaration record is implemented by the following public method (all the methods are listed below under responsibility)

Responsibility	**Descriptions**
FileNo	Return my file number
DecDate	Return my declaration date
DecNo	Return my declaration number
Taxperiod	Return my tax period
TaxType	Return my tax type
TaxableIncome	Return my taxable income
CalcuTax	Return my calculated tax
ReceiptNo	Return my cash receipt number
prepaid	Return my prepaid
FileNo:aFileNo	Set my FileNo to AFileNo
DecDate:aDecDate	Set my DecDate to aDecDate
DecNo:aDecNo	Set my DecNo to aDecNo
TaxPeriod:aTaxPeriod	Set my TaxPeriod to aTaxPeriod
TaxType:aTaxType	Set my TaxType to aTaxType
ReceiptNo: aReceptNo	Set my ReceiptNo to aReceiptNo
PrePaid: aPrePaid	Set my PrePaid to aPrePaid

Profti tax declaration class

Description - The profit tax declaration class is a data repository, maintaining the profit tax declaration
Superclass - Tax declaration
Subclass - None

CONTRACT

[3] Maintain profit tax declaration record is implemented by the following public method
(all the methods are listed below under responsibility)

Responsibility	**Descriptions**
FileNo	Return my file number
TaxableIncome	Return my taxable income
GrossInocome:aGrossIncome	Set my GrossIncome to aGrossIncome
Cost:aCost	Set my Cost to aCost
GrossProfit:aGrossProfit	Subtract aCost from my aGrossIncome
TaxableIncome:aTaxableIncome	Subtract anExpense from my
aGrossProfit	
Rate:aRate	Set my Rate to aRate
CalcuTax	Multiply aRate by my aTaxableIncome

Sales tax declaration class

Description - The sales tax declaration class is a data repository, maintaining the sales tax declaration
Superclass - Tax declaration
Subclass - None

CONTRACT

[5] Maintain sales tax declaration is implemented by the following public method
(all the methods are listed below under Responsibility)

Responsibility	**Descriptions**
FileNo	Return my file number
Totalsales	Return my total sales
SalesTrate	Return my sales tax rate
SalesTax	Return my sales tax
Totalsales:aTotalsales	Set my Totalsales to aTotalsales
SalesTrate:aSalesTrate	Set my SalesTrate to aSalesTrate
SalesTax:aSalesTax	Multiply aSaleaTrate by aTotalsales

Personal income tax declaration class

Description - The personal income tax declaration class is a data repository, maintaining the personal income tax declaration
Superclass - Tax declaration
Subclass - None

CONTRACT

[4] Maintain personal income tax declaration is implemented by the following public method
(all the methods are listed below under responsiblity)

Responsibility	Descriptions
FileNo	Return my file number
TotalSalary	Return my total salary
PerIncomeTax	Return my personal income tax
TotalSalary:aTotalSalary	Set my TotalSalary to aTotalSalary
PerIncomeTax: aPerIncomeTax	Set my PerIncomeTax to aPerIncomTax

Excise tax declaration class

Description - The excise tax declaration class is a data repository, maintaining the excise tax declaration
Superclass - Tax declaration
Subclass - None

CONTRACT

[7] Maintain excise tax declaration is implemented by the following public method (all the methods are listed below under responsibility)

Responsibility	Description
FileNo	Return my file number
ProdCost	Return my production cost
TaxRate	Return my tax rate
ExciseTax	Return my excise tax
ProductCost:aProductCost	Set my ProductCost to aProductCost
TaxRate:aTaxRate	Set my TaxRate to aTaxRate
ExciseTax:anExciseTax	Multiply aTaxrate by my aCost

Data	Descriptions
ProdCost	My production cost
TaxRate	My excise tax rate
ExciseTax	My calucalted excise tax

Rental income tax declaration class

Description - The rental income tax declaration class is a data repository class, maintaining the income tax declaration
Superclass - Tax declaration
Subclass - None

CONTRACT

[6] Maintain personal income tax declaration is implemented by the following public method

Responsibility	Descriptions
FileNo	Return my file number

RentalIncome	Return my rental income
TaxRate	Return my tax rate
FileNo:aFileNo	Set my FileNo to aFileNo
TaxRate:aTaxRate	Set my TaxRate to aTaxRate
RentIncome:aRentIncome	Set my RentIncome to aRentIncome
RentTax:aRentTax	Set my RentTax to aRentTax

Tax assessment class

Descriptions - The tax assessment class is an abstract class that provides common services for all types of tax assessment objects
Superclass - Persistent object
Subclass - None

CONTRACT

[ ] Maintain tax assessment record is implemented by the following methods
(all the methods are listed below under Responsibility)

Responsibility	**Descriptions**
FileNo	Return my file number
AuditNo	Return my audit number
AssDate	Return my assessment date
AssNo	Return my assessment number
TaxPeriod	Return my tax period
TaxType	Return my tax type
FileNo:aFileNo	Set my FileNo to aFileNo
AuditNo: aAuditNo	Set my AuditNo to aAuditNo
AssDate:anAssDate	Set my AssDate to anAssDate
AssNo:anAssNo	Set my AssNo to anAssNo
TaxPeriod:aTaxPeriod	Set my TaxPeriod to aTaxPeriod
TaxType:aTaxType	Set my TaxType to aTaxType

Profit tax assessment class

Description - The profit tax assessment class is a data repository, maintaining the profit tax assessment
Superclass - Tax assessment
Subclass - None

CONTRACT

[ ] Maintain profit tax assessment is implemented by this class

Responsiblity	**Descriptions**
FileNo	Retun my file number
TaxableIncome	Return my taxable income
CalcuTax	Return my calculated tax
Penality66	Return my Penality66 if there is penality 66
Penality67	Return my Penality67if there is penality67
Penality68	Return my Penality68 if there is penality68

TotalTax	Return my total tax due
Prepaid	Return my Prepaid tax
OutStandtax	Return my outstanding tax liability
FileNo:aFileNo	Set my FileNo to aFileNo
TaxableIncome:aTaxableIncome aTaxableIncome	Set my TaxableIncome to
CaclcuTax:aCalcuTax	Set my CalcuTax to aCalcuTax
Penality66: aPenality66	Set my Penality66 to aPenality66
Penality67: aPenality67	Set my Penality67 to aPenality67
Penality68:aPenality68	Set my Penality68 t aPenality68
TotalTax; aTotalTax	Set my Penality66, Penality67, Penality68 to my aCalcuTax
Prepaid:aPrepaid	Set my Prepaid to aPrepaid
OutStandtax:anOutStandtax	Set my OutStandtax to anOutStandtax

Sales tax assessment

ccccass

Description - The sales tax assessment class is a data repository, maintaining the sales tax assessment

Superclass - Persistent object

Subclass - None

CONTRACT

[ ] Maintain sales tax assessment is implemented by the following methods
(all the methods are listed below under Responsibility)

Responsibility	**Descriptions**
FileNo	Return my file number
SalesTax	Return my SalesTax
Penality66	Return my Penality66
Penality67	Return my Penality67
TotalStax	Return my total sales tax
FileNo:aFileNo	Set my FileNo to aFileNo
SaleTax:aSalesTax	Set my SalesTax to aSalesTax
Penality66:aPenality66	Set my Penality66 to aPenality66
Penality67:aPenality67	Set my Penality67 to aPenality67
Penality68:aPenality68	Set my Penality68 to aPenality68
TotalStax:aTotalStax	Add aPenality66, aPenality67, aPenalaity68 to my TotalStax

Tax collection class

Description - The tax collection class is an abstract class that provides common services for all types of tax collection classes
Superclass - Persistent object
Subclass - Cash, Bank

CONTRACT

[10] Maintain tax collection class is implemented by the following public methods (all the methods are listed below under responsiblity)

Responsiblity	**Descriptions**
FileNo	Return my file number
TaxType	Return my tax type
TaxPeriod	Return my TaxPeriod
DecNo	Return my declaration number
AssNo	Return my tax assessment number
CourtNo	Return my court number
FileNo:aFileNo	Set FileNo to aFileNo
Date:aDate	Set my Date to aDate
DecNo:aDecNo	Set my DecNo to aDecNo
AssNo:anAssNo	Set my assNo to anAssNo
CourtNo:aCourtNo	Set my CourtNo to aCourtNo
TaxType:aTaxType	Set my TaxType to aTaxType
TaxPeriod:aTaxPeriod	Set my TaxPeriod: aTaxPeriod

Cash class

Description - The cash class is a data repository maintaining the cash collection
Superclass - Tax collection
Subcalss - None

CONTRACT

[ ] Maintain cash collection is implemented by this class

Responsiblity	**Descriptions**
FileNo	Return my file number
ReceiptNo	Return my cash receipt number
Amount	Return my amount
FileNo:aFileNo	Set my FileNo to aFileNo
ReceptNo:aReceiptNo	Set my ReceipNo to aReceiptNo
Amont:anAmount	Set my Amount to anAmount

Bank class

Description - The Bank class is a data repository maintaining payments made at Bank
Superclas - Tax Collection
Subclass - None

CONTRACT

[ ] Maintain bank collection is implemented by this class

Responsiblity	**Descriptions**
FileNo	Return my file number
BankaccN	Return my bank account number
Amount	Return my amount
FileNo:aFileNo	Set my FileNo to aFileNo
BankaccN:aBankaccN	Set m;y BankaccN to aBankaccN
Amount:anAmount	Set Amount to anAmount

Tax audit class

Description- The tax audit class is an abstract class that provides common services for all types of tax audit classes
Superclass - Persistent object
Subclass - None

CONTRACT

[ ] Maintain tax audit record is implemented by the following public methods
(all the methods are listed under Responsblity)

Responsiblity	**Descriptions**
FileNo	Return my file number
AuditNo	Return my audit number
Date	Return my date
TaxPeriod	Return my tax period
TaxType	Return my tax tye
FileNo:aFileNo	Set my FileNo to aFileNo to aFileNo
AuditNo:anAuditNo	Set my AuditNo to anAuditNo
Date:aDate	Set my Date to aDate
Taxperiod:aTaxperiod	Set my Taxperiod to aTaxperiod
TaxType:aTaxType	Set my TaxType to aTaxType

Book audit class

Description - The audit on books class is a data repository, maintaining book audit class
Superclass - Tax audit class
Subclass - None

CONTRACT

[ ] Maintain book audit record is implemented by the following public methods
(all the methods are listed below under Responsiblity)

Responsiblity	**Descriptions**
FileNo	Return my file number
Cost	Return my cost
GrossProfit	Return my gross profit
Expenses	Return my Expenses
TaxableIncome	Return my taxable income
CalcuTax	Return my calculated tax
FileNo:aFileNo	Set my FileNo to aFileNo
Cost:aCost	Set my cost to aCost
GrossProfit:aGrossprofit	Set my GrossProfit to aGrossProfit
Expenses:anExpenses	Set my Expenses to anExpenses
TaxableIncome:aTaxableIncome aTaxableIncome	Set my TaxableIncome to
CalcuTax:aCalcuTax	Set my CalcuTax to aCalcuTax

Tax inspection class

Description - The tax inspection class is a data repository, maintaining the tax inspection information for all types of inspection objects
Superclass - Tax Audit
Subclass - None

CONTRACT

[ ] Maintain tax inspection record is implemented by this class

Responsiblity	**Description**
FileNo	Return my file number
Puritem	Return my purchase item
Purquantity	Return my purchase quanitity
PurPrice	Return my purchase price
Saleitems	Return my sales items
SaleQuant	Return my sales quantity
saleprice	Return my sales price
Houserent	Return my house rent
Electric	Return my electricity expenses
Water	Return my water expenses
Telephone	Return my telephone expenses
Transport	Return my transport expenses
Postage	Return my postage expenses
Salaries	Return my salaries

Perexpenses	Return my personal expenses
EstIncome	Return my estimated income
CalcuTax	Return my calculated tax
FileNO:aFileNo	Set my FileNo to aFileNo
Puritem:aPeritem	Set my Peritem to aPeritem
Purquantity:aPurquantity	Set my Purquantity to aPurquantity
PurPrice:aPurPrice	Set my PurPrice to aPurPrice
SaleItem:aSaleItem	Set my SaleItem to aSaleItem
Salequant: aSalequant	Set my Salequant to aSalequant
Saleprice; aSaleprice	Set my Saleprice to aSaleprice
Houserent: aHouserent	Set my Houserent to aHouserent
Electric:anElectric	Set my Electric to anElectric
Water:aWater	Set my water to aWater
Telephone:aTelephone	Set my Telephone to aTelephone
Transport:aTransport	Set my Transport to aTransport
Postage:aPostage	Set my Postage to aPostage
Salaries:aSalaries	Set my Salaries to aSalaries
PersonExpense:aPersonExpense	Set my PersonExpense to aPersonExpense
EstIncome:anEstIncom	Set my EstIncome to anEstIncome
CalcuTax:aCalcuTax	Set my CalcuTax to aCalcuTax

Tax suit class

Description - The tax suits class is a data repository, maintaining the tax suits information for all types of tax suits objects
Superclass - Persistent object
Subclass - None

CONTRACT

[6] Maintain tax suits record is implemented by this class

Responsiblity	**Descriptions**
FileNo	Return my file number
SuitNo	Return my suit number
AssNo	Return my assessment number
AssDate	Return my assessment date
TaxPeriod	Return my tax period
TaxType	Return my tax type
TaxAmount	Return my tax amount
NameCourt	Return my court name
Appointement	Retrurn my Appointement date
Attorney:	Return my Attorney name
FileNo:aFileNo	Set my FileNo to aFileNo
SuitNo:aSuitNo	Set my SuitNo to aSuitNo
AssNo:anAssNo	Set my AssNo to anAssNo
AssDate:anAssDate	Set my AssDate to anAssDate
TaxPeriod:aTaxPeriod	Set my TaxPeriod to aTaxPeriod
TaxType:aTaxType	Set my TaxType to aTaxType
TaxAmount:aTaxAmount	Set my TaxAmount to aTaxAmount
NameCourt:aNameCourt	Set my NameCourt to aNameCourt
Appointement:anAppointement	Set my Appointement to anAppointement
Attorney:anAttorney	Set my Attoney to anAttorney

Tax appeal class

Descriptions - The tax appeal class is a data repository, maitaining the tax appeal information for all types of tax appeal objects
Super class - Persistent object
Subclass - None

CONTRACT

[5] Maintain tax appeal reocrd is implemented by this class

Responsiblity	**Descriptions**
FileNo	Return my file number
Dateappeal	Return my date of appeal
AppealNo	Retrun my appal reference number
Attorney	Return my attorney name
Date	Retrun my date of judgement
Taxperiod	Return my tax period
Taxtype	Return my tax type
Taxamount	Return my tax amount
FileNo:aFileNo	Set my FileNo to aFileNo
Dateappeal:aDateappeal	Set my Dateappeal to aDateappeal
AppealNo:anAppealNo	Set my AppealNo to anAppealNo
Attorney:anAttorney	Set my Attorney to anAttorney
DateJudge:aDateJudge	Set my DateJudge to aDateJudge
Taxperiod:aTaxperiod	Set my Taxperiod to aTaxperiod
TaxType:aTaxType	Set my TaxType to aTaxType
TaxAmount:aTaxAmount	Set my TaxAmount to aTaxAmount

Create class

Description - The create class services adding of new records. This transaction is created by the transaction class. This transaction is a transient object.
Superclass - Transaction
Subclass - None

[11] Process transaction is implemented by the following public methods

Responsiblity	**Descriptions**
Create TaxpayerObject:aFileNo	Create aTaxpayerObject with aFileNo
write objectDetails:aFileNo	Write its details for its objects
Create TaxDeclaration:aDecNO	Create a tax declaration with declaration number
write taxdeclaration details:aDecNo	Write its details for its declaration
Create Taxassessment :anAssNo	Create a tax assessment with an assessment number
write assessment details:anAssNo	Write its details for its assessment
Create TaxAppeal: anAppealNo	Create a tax appeal with an appeal number
Write tax apeal details:anAppealNo	Write its details for its appeal
Create TaxSuits:aSuitNo	

Delete Class

Description - The delete class services the deleting of the taxpayer object's record. This transaction is created by the transaction class. This transaction is a transient object

[11] Process transaction is implemented by the following methods
a) DeleteObject:

Responsiblity	**Descriptions**
ConfirmDelete	Ask the user for confirmation to delete
DeleteObject:aFileNo	Delete an object with identification:aFileNo

Edit Class

Description - The edit class services the editing of object's information. This transaction is created by the by the transaction. This transaction is a transient object

CONTRACT

[11] Process transaction is implemented by the following public methods
a) Change ObjectDetail

Responsiblity	**Descriptions**
CofirmChange	Ask the user for confirmation to update
Change ObjectDetail:aFileNo	Change the details for an Object with the identificatio :aFileNo

Report class

Description - The report class services the object's retrieval using a certain characterstics. This transaction is created by the transaction class. This transaction is a transient object.
Superclass - Transaction
Subclass - None

CONTRACT

[11] Process transaction is implemented by the following public methods
a) similaryObjectDetetail:

Responsiblity	**Descriptions**
SimilarObejectDetail:aFileNo	List for the user all object's with name: an ObjectNam

User class

Description - The BOF class manages the overall tax functions includig keeping track of taxpayers. There is one and only one instance of this class.
Superclass - Persistent object
Subclass - None

CONTRACT

[ ] Verify user is implemented by the following public method
a. ValidatePassword:

Responsiblity	**Descriptions**
ValidatePassword:aPassword for user:aUser	Compare aPassword to the user's password. Return true if it is equal, false it is not.

BOF Class

Description - The BOFTD Workstation class is the the class responsible for providing tax management services available for th user, creating the appropriate transactions. There is one instance of this class for each workstations.

Super class - Object
Subclass - None
Contracts - None

Responsiblity	**Descriptions**
aCreateTransaction	Intiate the appropriate transaction
aFilenumber	Get the file number the user wants to take action
anObjectinformation	Get the object name to list all objects with the same name

BOFTD Workstation Class

Description - The user class is a data repository, maintaining users information. There is one instance of this class for each user of the system
Superclass - Persistent object
Subclass - None

CONTRACT

[ ] Verify user is implemented by the following public methods:
a. Validate password

Responsiblity	**Descriptions**
Valid PassWord:aPassWord	Return true if PassWord equals my PassWord, false otherwise

Data	**Descrptions**
UserId	My identification number
password	My password

CHAPTER FIVE

Prototype development

5.1 Features and capabilities

It is not possible to obtain all the information one needs to create a complete logical model just by conducting interviews, and studying the present system. Some process are difficult to explain. Another problem is that many people have difficulty in conceptualizing their needs. In such cases, prototyping is a powerful alternative or supplement to logical modeling.

In this study, prototyping is used to clarify some of the features of the proposed database system. As such it is not used to provide full versions of all data files or to support all the procedures, and functionality of the proposed system. It, however, is constructed in a way which demonstrates the most pertinent characteristics of the proposed system.

Stain (1992, 408) cites the following advantages of prototyping :

- It enables the user to physically sit down and use the system, finding glitches he or she might not have thought of without a working model;
- It makes the system more flexible to change because users are dispatched to change their minds about what they want.

In this study, a prototype of the proposed tax database was constructed as a means to explain how the system could be implemented. Due to shortage of time, the prototype is limited to taxpayer class. However, all the proposed classes and subsystems have similar database structure, and process, inputs and output requirement.

The prototype is developed using dBASE V for windows. dBASE V for windows though it is primarily a relational database management system and doesn't provide any object-oriented facility for persistent class implementations, it provides object-oriented features for interfacing purposes. It provides some features for creating and using objects and classes, and declare sub classes from super classes, and encapsulating methods, there by enabling object oriented design and development. Most of the classes identified in the design stage are implemented using forms. A form is one of the standard class provided by dBASE V and used to build the user interface of an application. In addition, dBASE V programming facility has been used for developing user interface and other procedures used for data entry, file maintenance and query processing.

The taxpayer registration class was implemented by declaring them as sub class of the Base Form Class and other classes such as declaration, assessment, collection, tax suit and audit classes are contained in taxpayer class. The taxpayer class is derived from the standard FORMClass. The following source code, which is extracted from the program shows the declaration of the taxpayer object class.

```
Class TAXPAYERFORM OF FORM
Set procedure to Buttons.CC additive
```

```
this.width = 100.833
this.ColorNormal = " W + 0X400040"
this.View = " Taxpayer.qbe"
this.Text = " Taxpayer "
this.top = "0.1758"
this.HelpId =""
this.HelpFile=""
this.Height=19.8818
this.left = 0.833


.....

End class
```

The taxpayer object contains entry field for entering and displaying values for the fields such as taxpayer name, business name, business type etc., which are common to other classes. Other attributes, such as declaration, assessment, collection, audit are implemented using Buttons to refer to the instance of Class Declaration, Assessment, Collection and Audit.

Although the classes are implemented, the actual data is stored in relational tables. Because dBASE is basically relational database management system, it has been necessary to separate the data from the object and store them in tables. The procedure are mostly associated with object definition related to forms, i.e. used for interfacing and manipulation of tables.

For the prototype, the following tables have been created, taxpayer, declaration, assessment, collection, and audit. The tables are used to supply and store data from entry

```
this.width = 100.833
this.ColorNormal = " W + 0X400040"
this.View = " Taxpayer.qbe"
this.Text = " Taxpayer "
this.top = "0.1758"
this.HelpId =""
this.HelpFile=""
this.Height=19.8818
this.left = 0.833


.....

End class
```

The taxpayer object contains entry field for entering and displaying values for the fields such as taxpayer name, business name, business type etc., which are common to other classes. Other attributes, such as declaration, assessment, collection, audit are implemented using Buttons to refer to the instance of Class Declaration, Assessment, Collection and Audit.

Although the classes are implemented, the actual data is stored in relational tables. Because dBASE is basically relational database management system, it has been necessary to separate the data from the object and store them in tables. The procedure are mostly associated with object definition related to forms, i.e. used for interfacing and manipulation of tables.

For the prototype, the following tables have been created, taxpayer, declaration, assessment, collection, and audit. The tables are used to supply and store data from entry

fields defined in the corresponding forms. In addition, a query has been created to bring together all the information from different tables and supply to taxpayer class.

To run the prototype program, assuming windows 95 is being used, one has to

- Click the start button from the Task Bar of window 95;
- Select the program sub menu from the start menu;
- Click on the icon labeled BOFTDS

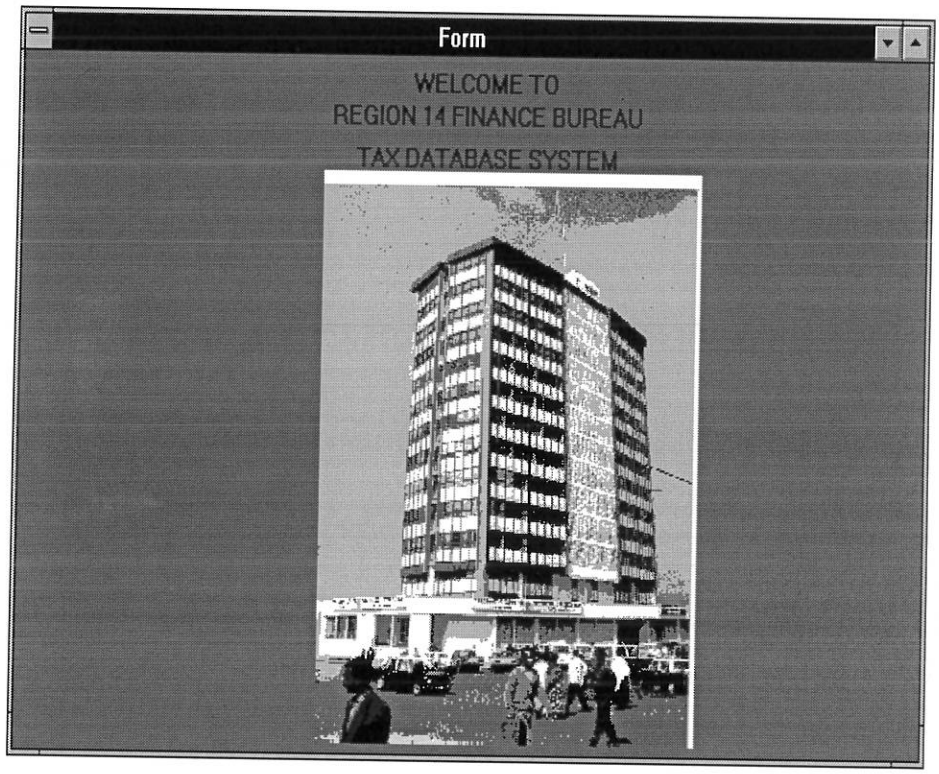


Figure 5.1 The welcome screen of BOFTDS

The program will automatically load dBASE V and starts the application. The welcome screen appears displaying the building in which Region 14 Finance Bureau (BOF) is housed. The users can close the welcome window by clicking any where outside the window. At the beginning, the system will present the main menu. The main menu consists

of three menus in the menu bar, File, Databases and 'Report'. From these options, ' Registration ' of the 'Database Menu' and ' Exit' from 'Files' menu and the 'report' menu can be selected, the other modules are not fully developed in this version. When Registration Menu is clicked, two cascading sub menu of "By taxpayer" and "All" will be displayed.

When 'By taxpayer menu' is clicked, the following taxpayer registration data entry form appears. The taxpayer data entry form displays information about taxpayer and their associated business.

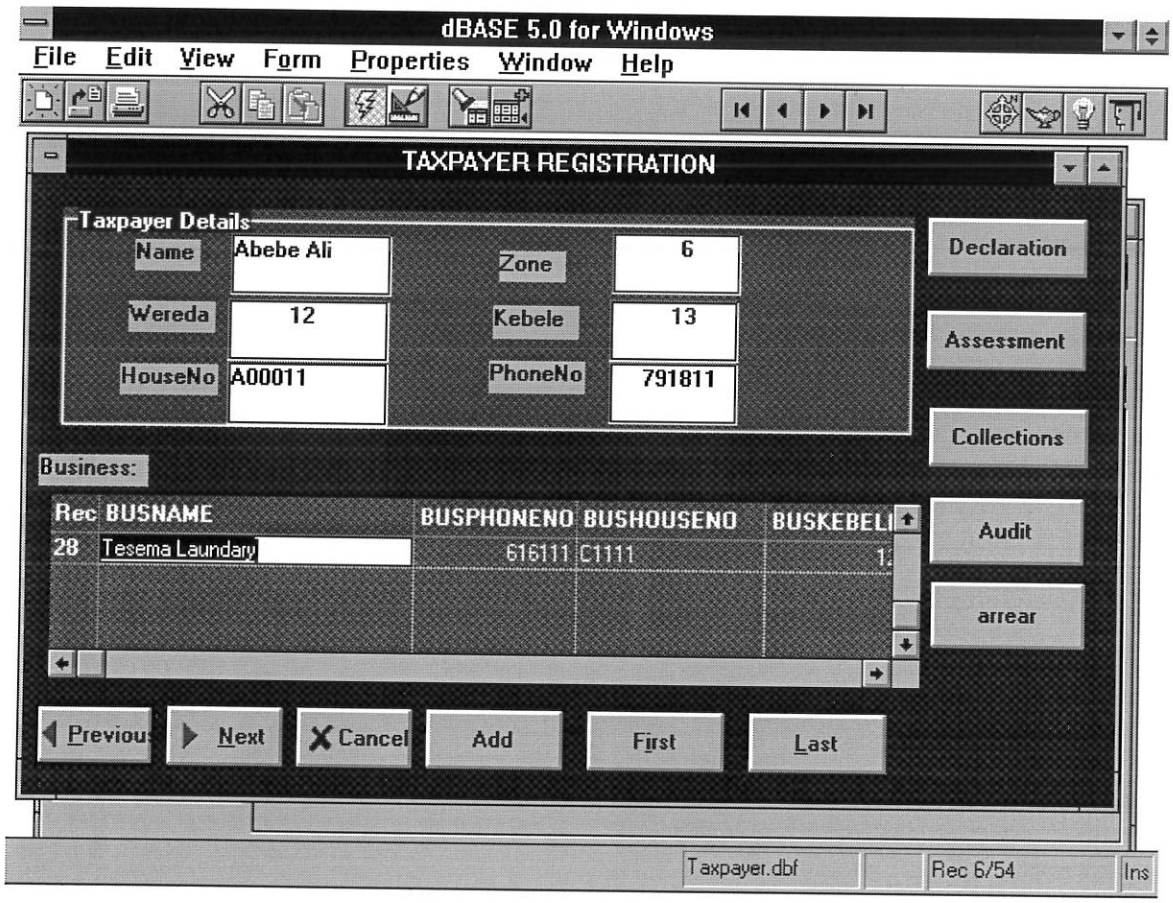


Figure 5.3 Taxpayer Data Entry Form

The taxpayer form uses two tables, taxpayer.dbf and business.dbf linked in one to many relationship. Each taxpayer can have more than one business and each business is

associated with one taxpayer. The tables are linked by taxpayer name which is common to both tables.

The data entry form allows users to display and enter data, and also performing tasks like adding records and navigating through recording using Add, Previous, Next, Start, Last buttons and scroll bars. In addition , it also contains buttons such as declaration, assessment, collection, audit and arrears for displaying related information from other classes. When one finishes, one can choose cancel to close the form and return to the menu screen.

Some of the tasks can also be performed by using dBASE standard menu, which is automatically displayed when this form appears. Using the standard menu a user can perform various data entry and editing functions such as adding, deleting, searching for taxpayer records, etc. For example, in addition to scrolling through records, one can quickly find the record he/she wants by searching for the value in the field selected using the find option of the form menu. When this option is selected, the application displays the Find dialog box, as shown in figure 5.4 below, which enables to search using any of the fields available for taxpayer objects. One can also choose the search parameters among others, " Any where in Field" which allows to search for records whose fields have the search term any where inside it. For instance, one can quickly find a specific taxpayer file number by selecting the file number field and typing the number of the file you want to find.

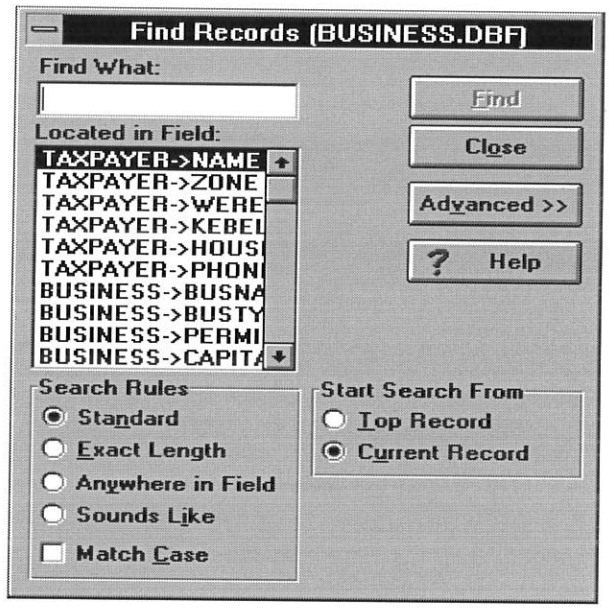


Figure 5.4 Taxpayer search screen

If one wants to view the tax declaration made by a particular taxpayer, he or she can click on the declaration button which opens a form that displays the respective tax declaration details as shown in Figure 5.5 below. Using this form, the user can add, edit and navigate through records as taxpayer object may have many declarations.

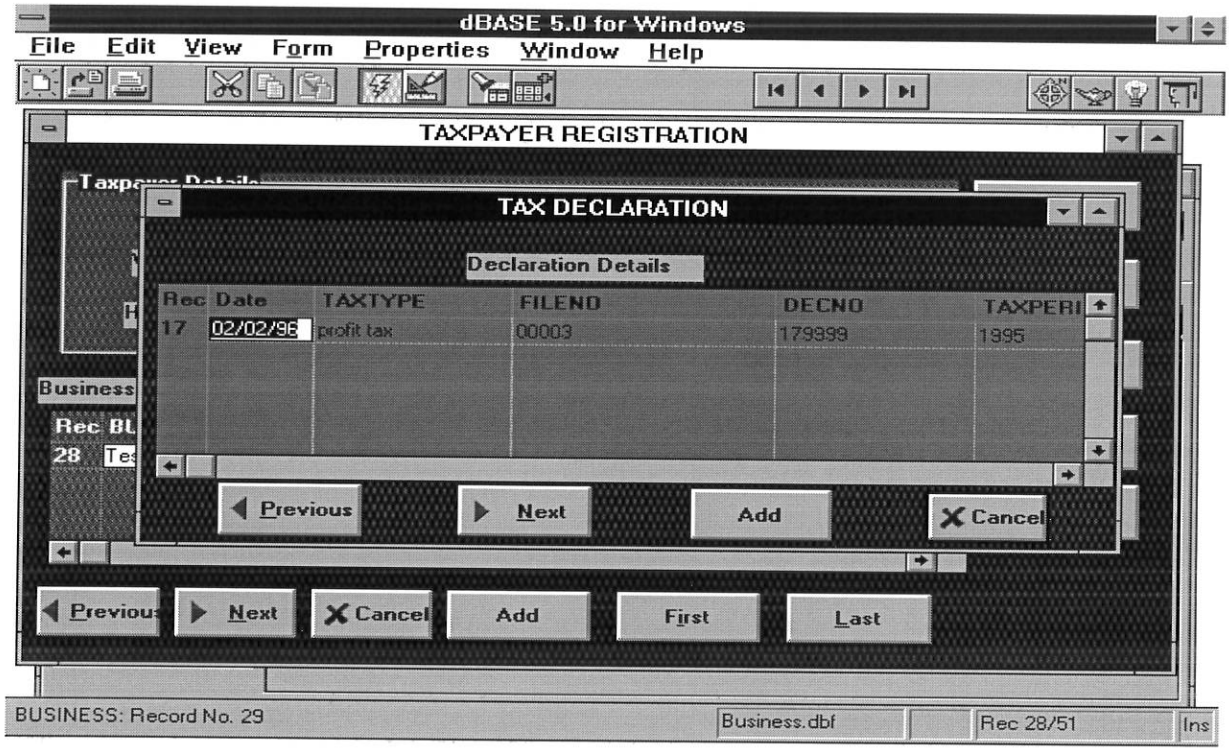


Figure 5.5 Tax declaration data entry form

Similarly, assessment, collection, audit and arrears information of a particular taxpayer can be accessed by clicking the corresponding buttons (see figure 5.6, 5.7, 5.8, 5.9 and 5.10 below).

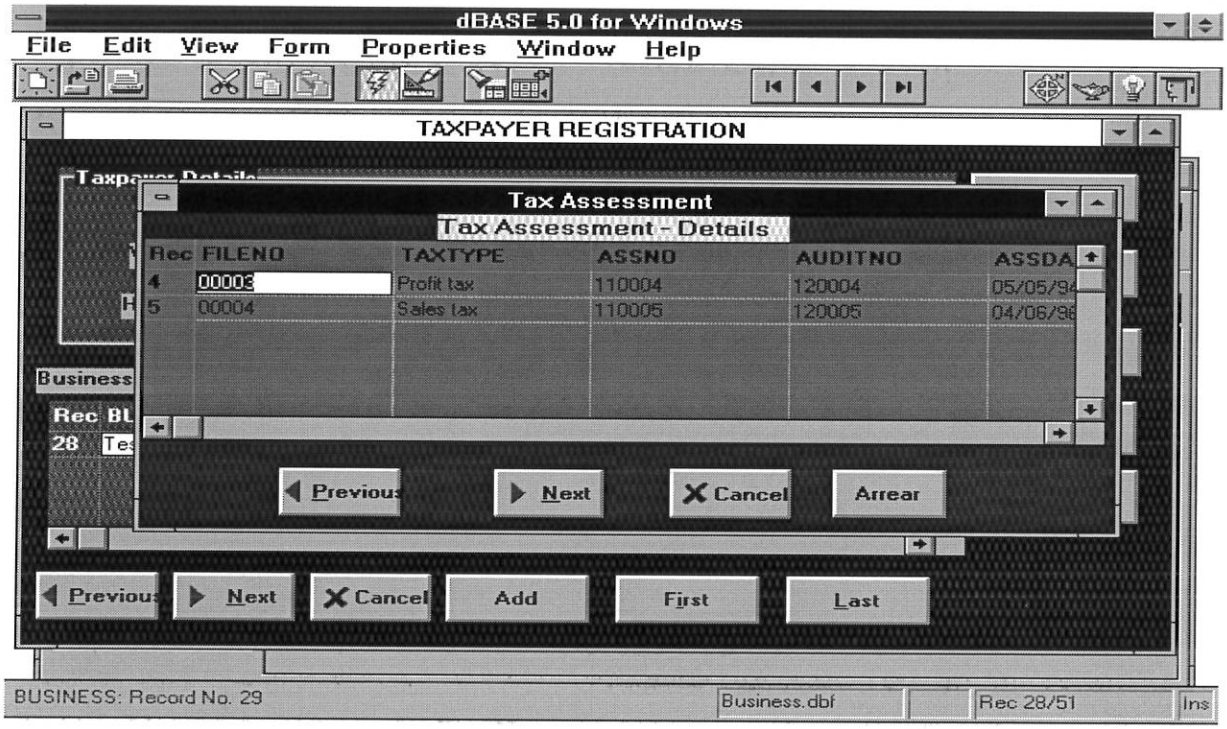


Figure 5.6 tax assessment data entry form

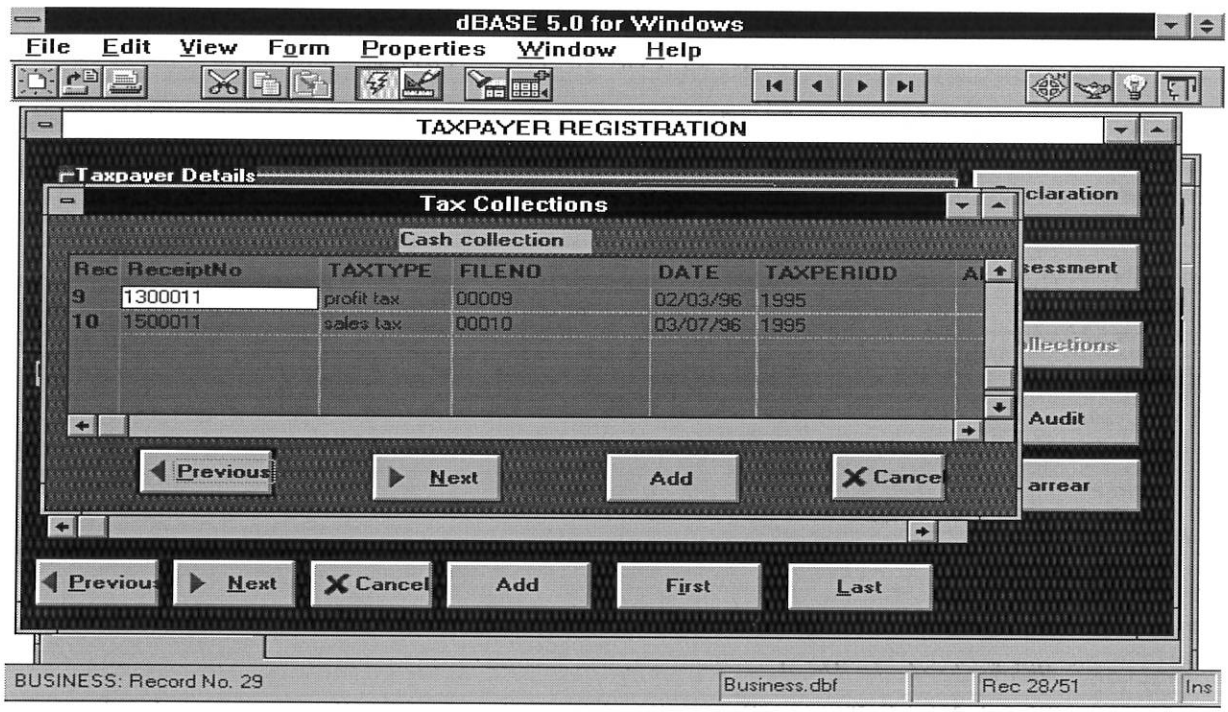


Figure 5.7 tax collection data entry form

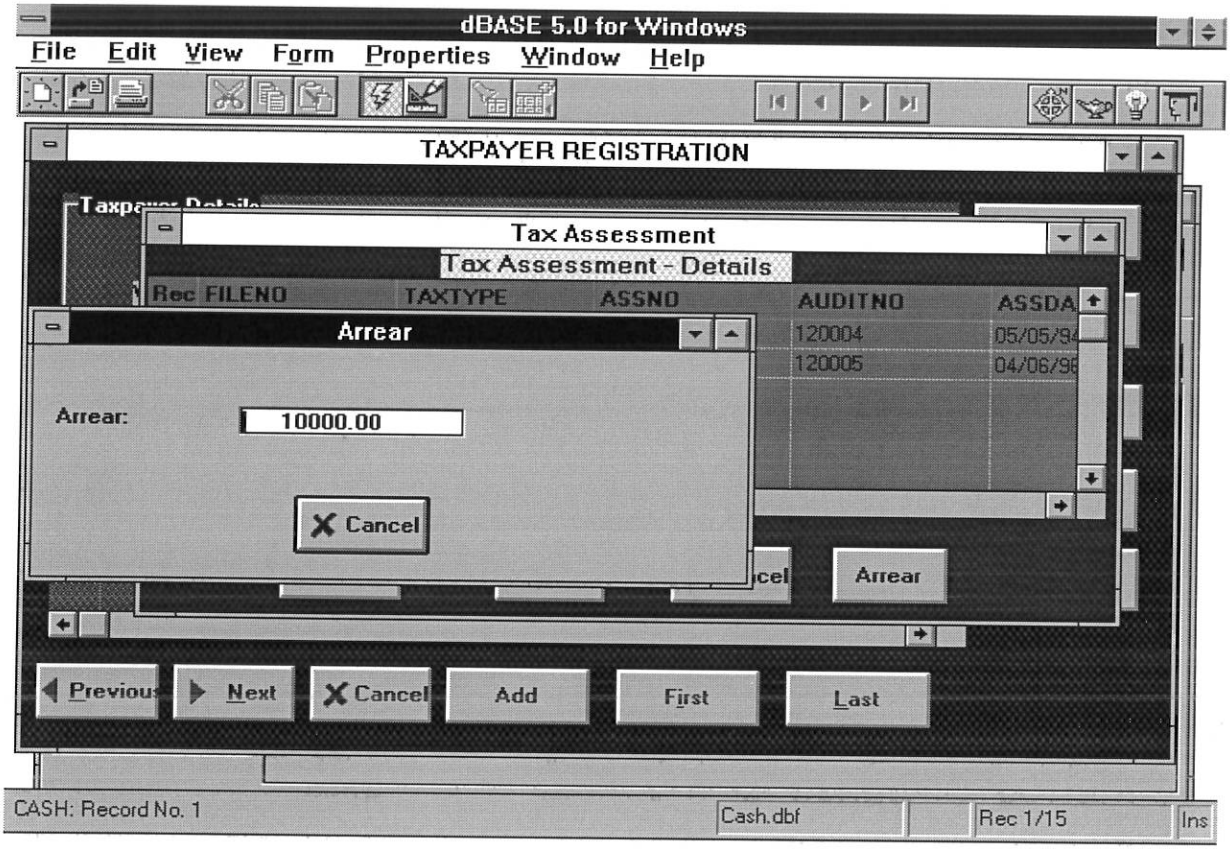
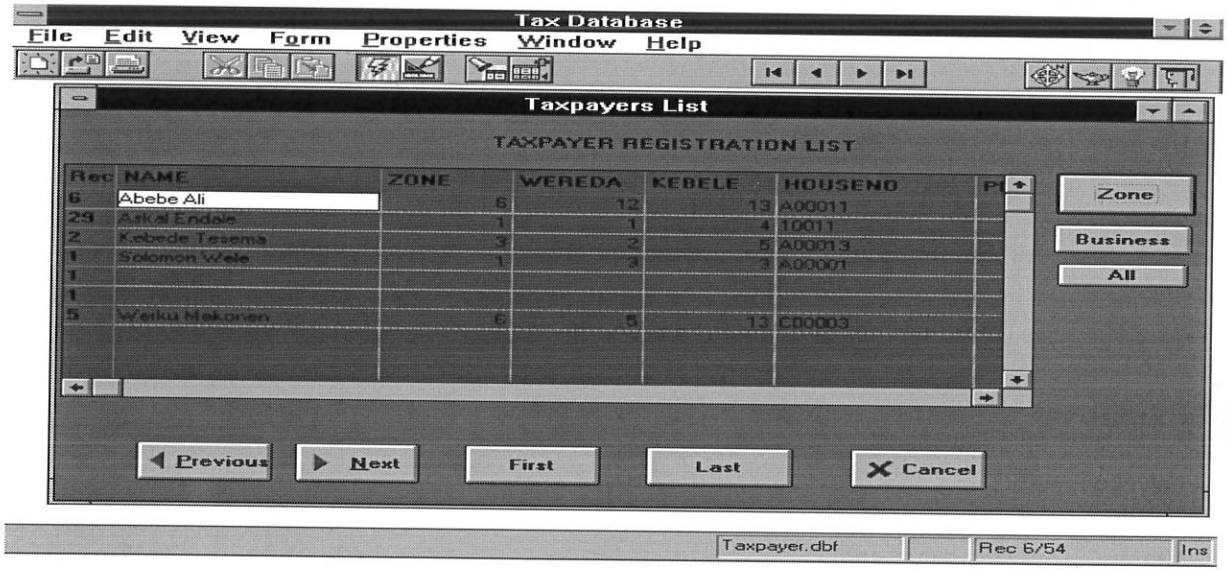


Figure 5.8 tax arrears screen

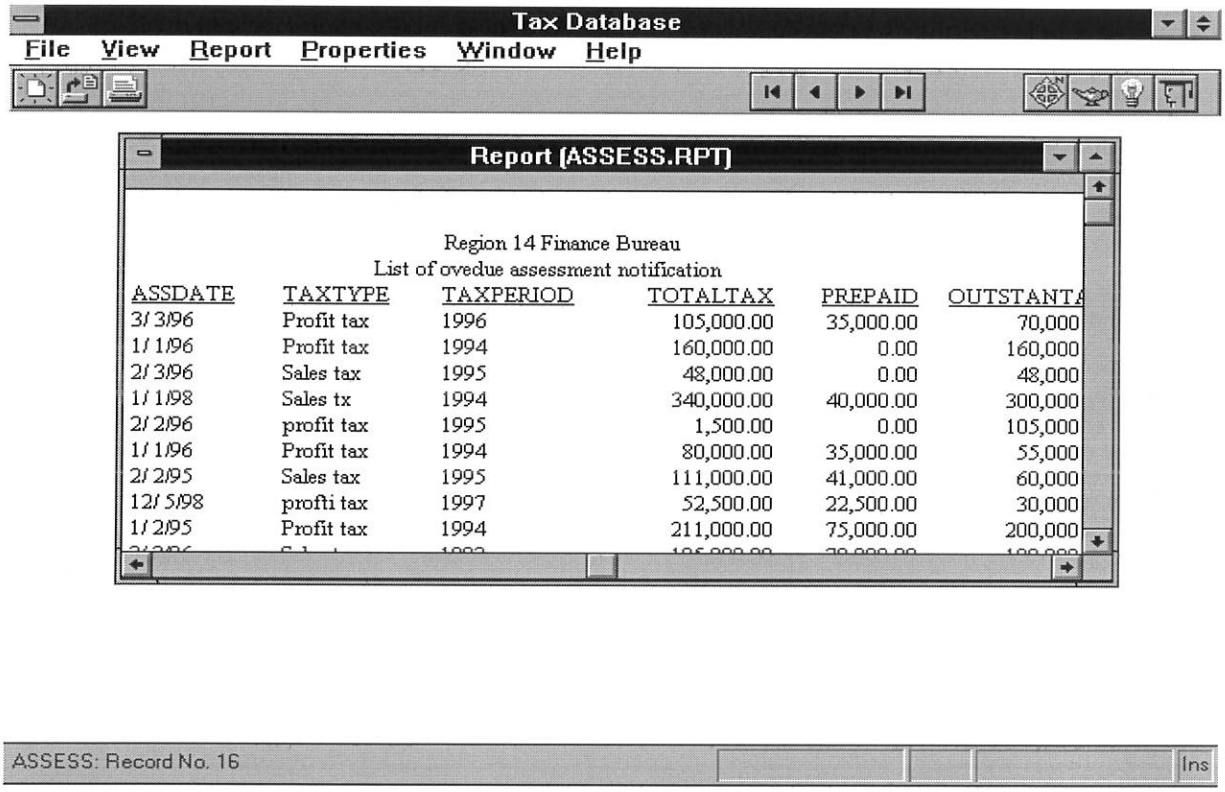
The user can also open a form containing all taxpayer registration list by clicking "All" menu from " Registration" menu which displays the following taxpayers registration list.



The taxpayer registration list contains information on all taxpayers personal and business details. The data entry form contains various controls which are used to display and enter data , and also performing tasks like adding records and navigating through records. It also contains buttons such as Zone, Business and All for displaying related information from other classes.

If one wants to view the list of taxpayers by zone, he or she can click the zone button which opens a query that prompts the user to enter the zone number which he/she wants to be displayed and then a form is opened which displays the taxpayers in the particular zone. Similarly, if one wants to get the taxpayer list by types of business, he can click on business button and enter the name of type of business which opens a form that displays the list of taxpayer in the particular business.

The system is also designed to generate various printed outputs. Selection of the report menu initiates the report generation process. For instance, the following are some of the layouts of the reports that the system will generate.



To summarize, the prototype was developed keeping the user's requirement and the recommended features discussed in chapter four, in mind. As such it provides the following features:

. easy to learn menu driven interface, clicking buttons and query;

. provides each taxpayer personal and business details information;

. a list of declaration made by each taxpayer;

. a list of assessment notification issued to each taxpayer;

. a list of collection made from each taxpayer;

. a list audited years of the taxpayers account;

. calculating tax arrears by tax type of each taxpayer;

. a list of all taxpayers in the city and a list of taxpayers by zone, and business type;

. produce a sample report of overdue assessment notification and a list of declarations.

5.2 Users Comment on the Prototype

The prototype constructed was demonstrated to selected few staff members of the Bureau in order to consider their comments and suggestions for improving the prototype. To this end, users' reaction sheet (check list) was prepared and used (See appendix 3).

The comments made by the users participated are summarized as below. Comments on the existing features and capability, users say that such system if fully developed and operational,

- may help to save the time of professionals which at a moment is spent mostly on routine data processing and information searching;
- may help in avoiding the duplications of work, for instance, consolidating similar reports in different time and department from the taxpayer's files;
- will generate easily the information required for monitoring the tax declaration, assessment and collection efforts;
- may avoid a lot of paper work that leads to erroneous aggregations and missing of data;
- may avoid delays and untimely provision of information;
- will enables to know the number, class and details description of taxpayers easily;

- may reduce the man-hours spent to locate and retrieve taxpayer's file and various forms, reports and documents which contains taxpayer and revenue information;
- may reduce the risk of losing or intentional removal of document from taxpayer's files;
- may help to improve the efficiency of the tax operations;
- may provide users with well organized and summarized information.

With regard to their needs for some additional features to be incorporated in the prototype, they have asked for facilities that can help them,

- navigate through records while adding records with in declaration, assessment, collection, audit as these are frequently required functions;
- display tax arrears amount break down by tax types and budget year;
- have a tax declaration, assessment, and collection data entry form for entering data in batch ;
- display declaration, assessment and collection of each taxpayer by the budget year and types of taxes independently;
- prepare statistical reports;
- display a list of taxpayers that fail to declare within a specified period of time;
- maintain taxpayer identification number as part of taxpayer personal details;
- have special buttons for deletion;
- maintain information of penalty;
- generate a report containing information of assessment, payment, arrears, and penalty , etc., for every individual taxpayer.

of taxpayers, the manual method of processing may no longer be desirable and could not cope with processing of such large volume of data.

Some of the problems observed that contributed to the inefficiency and inadequacy of the existing information handling include the following.

- A lot of paper works that lead to erroneous aggregations and missing of data.
- Delays and untimely provision of information.
- Duplication of data in different files
- Too many receipts, vouchers, transactions which are difficult to handle.
- Loss or intentional removal of information/documents.

The results of the analysis also indicated that accessing information has been a serious problem. According to the survey the major causes to this problems may be attributable to: lack of proper utilization of information technology, lack of proper trained man power in the area of information service, absence of integrated system and poor communication with external sources.

The findings of the survey also further revealed that the level of application of information technology at the Bureau was perceived to be very low. Despite the existence of some computers in the different departments of the Bureau, they are mostly used for secretarial services.

With regard to solving the existing problems, a database system is proposed. Here an attempt was made to explore the features and capabilities of object-oriented approaches in the context of developing tax information handling system. It was found that an object-oriented approach are more suitable than the conventional database features, especially, in flexibility. Classes in an object-oriented systems are literally independent of one another. A class can be renewed or modified without causing a rippling effect in the system. Object-oriented design specifications are easily changeable and updatable. Thus, using an object-oriented approach, the study has attempted to outline the basic classes and their relationships required in building the database.

As part of the objectives of this study, a prototype of the proposed system was developed to demonstrate some of the features. dBASE V which is available at the Bureau and at SISA, where the research was carried out was used to implement the prototype database together with its interfaces. The prototype constructed was also demonstrated to the staff of the Bureau. They comment that if such a system is fully developed will alleviate most of the present information access problems at the Bureau.

6.2 **Recommendations**

Based on the findings, the study strongly recommends that the following issues be considered in the development and implementation of operational tax database system, if the Bureau is to fully benefit from the solution suggested.

1. Further problems analysis and requirements definition is recommended to establish a strong base for an operational solution.
2. Object-oriented approach is advised to be used for reviewing this work before any implementation attempt is made. The object-oriented approach is very flexible and provide benefits such as more realistic modeling, faster design, modularity, reusability, stability, easier maintenance, reliability, flexibility, and high user communication. Thus it is important that this be used in the actual conduct of the work.
3. In a conventional relational databases system, data is stored in the database without being chained to a particular application. But in a pure object-oriented database management system, a particular data stored in a database is not accessible without using the method of the class to which the data structure belongs. This features enhance the security of the tax database. Customarily, tax information is the most vulnerable type of information. Hence, the acquisition of pure object-oriented database is recommended.
4. Since working language at the Bureau are both Amharic and English, incorporation of such multilingual features be considered in the actual design of the proposed

database. Therefore, work towards establishing such an interface is recommended.

5. Since any system development requires continuos iterations(in terms of object-oriented technology) before it is fully implemented, the design proposed still requires more refinements. Hence, it is recommended that continuos work be done to refine it further.

6. The study further recommends the decentralization of the tax database system in the actual implementation. Development of such system would largely facilitate to meet the information requirement of each zonal offices and ensure better services.

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APPENDIX 1 - QUESTIONNAIRE

A Survey of Information Needs and Problems

Introduction

I am conducting a research on " Application of object oriented approach for the development of tax databases: A case with Region 14 Finance Bureau".

My study, among other things, involves the investigation, analysis and study of the existing tax information handling and management with a view to come up with a proposal and recommendation for establishing an object oriented tax database which will improve the information handling activities at the Bureau.

Based on the results of the survey, a prototype database will be designed to show how the required information can be stored and retrieved for use. Thus, your contribution will be invaluable for the successful accomplishment of the project. I would appreciate if you would take a few moments of your valuable time to answer this questionnaire. Thank you in advance in anticipation of your cooperation.

II. General directions

Please, put on " √ ' mark on the space provided to indicate your response where applicable. In case where responses other than mark are required, please write your responses in the space provided. You may use additional paper where the space provided in not enough.

1. Identification information
   Department name _____
   Profession _____
   Position _____

2. What are the specific activities you are currently engaged in ?
   _____
   _____
   _____

3. Which of the following types of information/data do you frequently use/need in order to carry out the activities ? For each type of data you required, please specify the type of information (data) items that often you require

Information category	**Details of information items**
[ ] Taxpayers details	_____
[ ] Income of taxpayers	_____
[ ] Earning capacity of taxpayers	_____
[ ] Import and export item information	_____

[ ] Production and sales information of manufacturer and wholesalers

[ ] Taxpayers registration information

[ ] Prepaid tax, assessment, collection, arrears status

[ ] Other, pleas specify_____

4. Which of the following sources do you use in order to get the information you need ?
   - [ ] Declaration
   - [ ] Assessment notification
   - [ ] Taxpayers files
   - [ ] Account book
   - [ ] Audit report and assessment proposal
   - [ ] Data compilation
   - [ ] Taxpayer's financial statements
   - [ ] Tax proclamation and operation manuals
   - [ ] Routine monthly collected reporting of revenue data
   - [ ] Any other source(please specify)_____

5. Do you obtain data for your activity from other government, non-government and private organization? Yes[ ], No [ ], if yes, please indicate the organization together with the information you obtained

Organization	Types of data collected

6. How fast do you get the taxpayer's files when you ask for them from the archive for some purpose such as auditing, preparing reports etc.
   - [ ] Very fast
   - [ ] Fairly fast
   - [ ] Not fast at all
   - [ ] Others_____

7. If your response for (Q.6) is " Not fast at all " what in your opinion is (are) the possible cause(s) ?
   - [ ] Misfiling
   - [ ] Storage system in use
   - [ ] Loss of records
   - [ ] Mistakes in initial registration
   - [ ] Improper tracking

[ ] Absence of finding aids such as lists, indexes, and other guides
[ ] Lack of proper matching of finding aids with the physical location of the files
[ ] Volume of taxpayer's file and large number of taxpayers
[ ] Because a single file is requested by more than one department/sections simentenously
[ ] Other (please specify) _____

8. How do you rate the availability of information at your work place ?
[ ] Very good
[ ] Good
[ ] Fair
[ ] Poor

9. If you have felt the availability of information is fail or poor, what do you think the reason(s) could be ?
[ ] Absence of central database service and poor manual system
[ ] Low level of utilization of information technology
[ ] Poor information exchange with government offices, wholesalers/distributors
[ ] Low level of recognition for the role of information
[ ] Difficulty in searching and locating the taxpayer's file because the volume and large number of taxpayers file
[ ] Other, please specify_____

10. How do you rate the timeliness of the information you are getting ?
[ ] Very good
[ ] Good
[ ] Fair
[ ] Poor

11. If your response for (Q. 10) is " poor " or " fair ", what in your opinion the reason(s) could be ?
[ ] The current manual system in use
[ ] Poor delivery system linked with external sources
[ ] Absence of an organized/integrated information
[ ] Other, please specify_____

12. How do you rate the accessibility of the available information ?
[ ] Accessible
[ ] Moderately accessible
[ ] Poorly accessible
[ ] Inaccessible

13. If your response for (Q. 12) is ' poorly accessible ' or ' inaccessible ', what in your opinion is(are) the possible cause(s) ?
[ ] Lack of proper utilization of information technology
[ ] Lack of efficient retrieval system
[ ] Long bureaucratic procedure to get taxpayer files from the archive
[ ] Volume of taxpayer's file and large number of taxpayers
[ ] Absence of finding aids such as lists, indexes and other guides
[ ] 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?

[ ] Consistent
[ ] Moderately consistent
[ ] Poorly consistent
[ ] Inconsistent

15. If your response in (14) is " inconsistent " or " poorly consistent ", what do you think the reason(s) could be ?
[ ] Absence of an organized/integrated information system within the Bureau
[ ] Low level of application of information technology
[ ] Duplicated external information sources
[ ] Loss of records
[ ] Other, please specify_____

16. How do you rate the accuracy of the information you are receiving ?
[ ] Accurate
[ ] Moderately accurate
[ ] Poorly accurate
[ ] Inaccurate

17. If you feel that the information you get is " inaccurate" or " poorly 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
[ ] Loss of records
[ ] Duplication of records/documents in the taxpayer's files
[ ] Other, please specify_____

18. Do you use computers in your daily activity ? yes[ ], No[ ]. If your response is ' yes ' for what purpose do you use the computer ?
[ ] Word processing
[ ] Consolidating financial reports
[ ] Statistical analysis
[ ] Records management
[ ] Others, please specify_____

19. According to your experience, what additional activities should be done by using computers ?_____
_____

20. What are the information related provisions problems you are currently facing in your work ?

_____
_____
_____

21. What improvements do you suggest to improve the provision of information ?

_____
_____
_____

22. Would you please put in priority the tax related activities(information needs) you want to be computerized?

First priority

i)_____
ii)_____
iii)_____

Second priority

i)_____
ii)_____
iii)_____

Third priority

i)_____
ii)_____
iii)_____

23. Other suggestions or any other relevant information

_____
_____
_____

Thanks for your cooperation

Please mail the completed questionnaire and any information to :

Mesfin Wolle
SISA
Addis Ababa University
P. o.box 1176
Addis Ababa

Appendix 2 - INTERVIEW GUIDE

APPENDIX 2- DISCUSSION GUIDE

ADDIS ABABA UNIVERSITY
SCHOOL OF INFORMATION STUDIES FOR AFRICA
DISCUSSION GUIDE FOR THE HEADS OF REVENUE DEPARTMENT, LEGAL SERVICE, AND HEAD OF ZONAL FINANCE OFFICES

INTRODUCTION

This discussion guide is aimed at gathering facts, identifying problems which are specific to the information handling practices of the Bureau and the major causes of the problem. Your assistance in providing the correct information is highly appreciated and the responses will make the results of the study more appropriate in improving the information handling activities and services given to users.

1. What are the major tasks and documents involved in your department ?
2. What steps or procedures are carries out to accomplish your major tasks ?
3. Please describe the flow of works and documents involved in your department/sections ?
4. What data is generated and stored on completion of each tasks ?
5. What methods do you use to store and process data ?
6. Please describe the names of the departments from which you receive source documents and with which you have work relationship.
7. Please state the various reports you prepare on daily, monthly, quarterly or annual basis.
8. What are the information technology resources available in your department/sections?
9. What are the problems you are currently facing in your work ?
10. What requirements do you suggest regarding the quantity and quality of work you are currently performing ?

APPENDIX 3 - PROTOTYPE USERS' REACTION

Name_____

Departement_____

Position_____

No	Major functions/facilities of the prototype	Users comment by comparing with the existing system	Further improvement suggestions
1	1. <u>Displaying taxpayer data entry form</u> 1.1 The taxpayer data entry for will be displayed by clicking the 'Taxpayer' menu items from the man menu 1.2 The taxpayer data entry form contains personal and business details information of each taxpayer 1.3 The taxpayer data entry form allows to edit records and also performing tasks like adding records and navigating through records using Add, Previous, Next, Last button and scroll bars 1.4 The taxpayer data entry form contains buttons, such as Declaration, Assessment, Collection, Audit and Arrears button for displaying related information from other files a) By clicking 'Declaration' button, a list of declaration made by the respective taxpayer will be displayed b) By clicking ' Assessment' button, a list of associated assessment notifications issued to the respective taxpayer will be displayed c) By clicking ' Collection' button , a list of collection made from the		

No	Major functions/facilities of the prototype	Users comment by comparing with the existing system	Further improvement suggestions
2	respective taxpayer will be displayed d) By clicking ' Audit' button, a list of audited years of the respective taxpayer will be displayed e) By clicking ' Arrears' button, arrears amount of each types of tax will be displayed		
3	<u>Taxpayers registration list</u> 2.1 produce a list of all taxpayer in the city. It contains both personal and business details information 2.2 Produce a list of taxpayers by zone, and business type		
4	<u>Generating a report</u> 3.1From the main menu, under the report menu items, when 'Assessment' is chosen, overdue assessment notification report will be displayed 3.2 Similarly, when a 'Declaration' menu item is chosen, a report of declaration list will be displayed <u>Searching</u> Using dBASE standard menu, one can search using any of the fields available for taxpayer objects using the Find option of the form menu		

II. Please include any additional suggestions and your impression of the prototype demonstrated, especially features not incorporated in the prototype _____

_____

DECLARATION

The thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged

Mesfin Wolle

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

Tesfaye Birru
May 16, 1997