DISTRIBUTED DATABASE SYSTEM FOR ROAD SAFETY INFORMATION MANAGEMENT

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CERTIFICATION

This is to certify that the research thesis was carried out by **IWU NNEKA EMMANUELA** of the department of Information Management Technology, Federal University of Technology Owerri under the supervision of **Dr (Mrs.) F. U. Eze** and is hereby admitted as having partially satisfied the requirements for the award of the degree of Master of Science in Information Technology of the University.

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I dedicate this thesis to God Almighty and to my lovely mother Late Mrs. Iwu Chisarauka Victoria.

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ABSTRACT

Implementing Distributed Database Management System is often difficult due to the disruption of highly coordinated, interdependent processes (e.g.) information exchange, communications, relationships) of providing care in Road Safety. Thus, this system creates and maintains all offender data electronically. The system captures accident victim data, vehicle registration, driving license, and offenders, at its source at the time of entry using a graphical user interface having touch screens. My motivation for carrying out this project work is due to perceived problem associated with the manual process of office filling system which is complexities of the rescue and information processes that increase the potential for errors at all steps between service delivery and final report. The system is effective, flexible, user-friendly and developed to deliver realistic benefits to FRSC**.** The researcher used the Structured System Analysis and Design methodology (SSADM). It is a system development model designed to simplify the understanding of the complexity associated with developing systems. This system model would help to create, design and maintain the proposed system because it summarizes the main steps to be taken in conjunction with the corresponding deliverables within computerized system validation framework. FRSC software would manage accident, offenders and collections for the road safety sector. FRSC would use these applications to centralize and automate essential monitoring processes including: driving license data, expiring date processing, accident data sharing, document, management, electronic claims, collections and final reporting.

CHAPTER ONE

INTRODUCTION

1.0 INTRODUCTION

Computerization often involves changing organizational report, practices, structures and work. Whether such changes are intended or not, sometimes, the economic value of computerization cannot be effectively realized without some specific changes in organizational practices and work.

Consequently, an organizational change is a central issue in the design and implementation of computerized projects. Organizations cannot exist in isolation without the use of information system. Information system is synonymous with computer system, which is seen as a set of related components working together to perform a data processing functions.

However, the objective of this study is to design and development of a distributed database in Federal Road Safety Corps, infact to develop an integrated FRSC database system software package that will keep track of all FRSC records of the accident centre. It will help the FRSC management in handling all complexities and abnormalities in FRSC database network.

The software will help to improve the communication skills within the road marshals. It will ease the sorting out of records of accident victims file both dead and injured, road offenders for observation and references. It will also enhance the administration of FRSC, accident and offenders, the vehicle registration, the driver license, the efficacy of the dead accident victims. It will make easier and faster for the management of resources allocated to the units as in managing their units.

The program will be carefully designed to work in a network system or what is called a multi user environment.

Meanwhile, the methodology used is SSADM/OOADM means structured system analysis and design methodology and object oriented analysis and design methodology. This is a system approach to analysis and design of information systems. This approach is mainly design for large-scale information system with high volume of business events. The methodology is made to specify exactly the flows and tasks of development project and gives a detailed documentation of the project.

The application package used for the development is Visual Basic programming language together with Microsoft Access as database support system, and the expected output will be generated from the inputs data after being processed using the written program. It is going to be in form of report generators. The output screen will be designed to provide interface.

1.1 Background of the Study

Under the Nigeria framework of road traffic safety policies, road administrators, police departments and the local and central governments cooperate to implement traffic safety policies. The current implement traffic safety policies. The current guidelines and manuals do not fully address the needs of those in charge in the field to carry out traffic accident counter measure projects. Insufficiency of safety references in road structure design standards is common to many countries.

To solve this problem, the Nigeria instituted the first a road safety audit system in the early 1990's. The major difference between this system and traditional safety policies is that a term of external experts perform safety assessments. This system has been deemed excellent and has spread to many other countries.

In Nigeria, in order to further reduce traffic fatalities, there is a call for the introduction of a new traffic safety policy similar to road safety audit. However, the traffic situation before the establishment of the Federal Road Safety Commission in Nigeria (FRSCN) could best be described as chaotic, unpredictable and indeed dangerous as it was characterized by unprecedented ware of road traffic accidents with attendant colossal human and material losses. Within this era, public awareness and interest in Road Safety was minimal. There was uncoordinated and haphazard licensing of drivers and vehicles as well as absence of good driving culture.

Deliberate policies and concerted effort at enforcing regulations was lacking. Quantitatively, road traffic accidents fatality index as at 1987 was 302 at 16 death per 1,000 vehicles.

As a specific response to the Road Safety question, the then Federal Military Government established the Federal Road Safety Commission in 1988 vide Decree 45 of 1988 as amended by Decree 35 of 1992 (FRSC Act Cap 141, Law of the Federation of Nigeria 1990). The critical mandate of the commission was accident prevention and loss reduction on all public roads across the country.

Meanwhile, **Navathe (2000)** described a distributed database (DDB) as a collection of multiple logically interrelated database distributed over a computer network, and a distributed database management system (DDBMS) as a software system that manages a distributed database while making the distribution transparent to the user. From the definition of **Navathe (2000)**, the elementary unit of a distributed system is a computer that is networked with other computer s; the computer being autonomous in the way it carries out its actions.

Computers are linked to one another over a communications network that enables an exchange of messages between computers. The objective of this message exchange is to achieve cooperation between computers for the purpose of attaining a common goal.

In this research, an attempt is made to design a frame work for a client server distributed database system for licensing, Road Safety Information and registration of automobiles in Nigeria.

The system consists of a relational database of autonomous decision variables which could be shared by the three level organizations, viz:

i. Vehicle Inspection Office (VIO)
ii. Federal Road Safety Commission (FRSC), and the
iii. Board of Internal Revenue

Each of these organizations is considered as an intranet connection. The database is expected to be linked by the VIO while the concept of data replication and fragmentation is adopted by other points to have access to data / records in the database.

The system is intelligent and capable of checking to detect multiple registrations, registration of stolen automobiles, malicious registration, and registration of damaged or reformed automobile and fictitious registration. The system is capable of generate reports for decision makers to enable monitoring.

1.2 Statement of the Problem

Regardless of the limited fund available, there is need for providing the best service possible which can be used by the FRSC.

With this in mind, the system to be adopted would help to manage the FRSC in an efficient and effective manner.

The problems encountered during the research are as follows: -

(a) Unable to keep track of proportion of speeding violations compared with previous year.
(b) Inadequate proportion of record on speeding violations and vehicle mileage which exceeded the speed.
(c) Improper report on use of seat belt (by driver and front-seat passenger).
(d) Unable to give proper record on use of cycle helmets.
(e) Insufficient record on number of drink driving offences.
(f) Unable to give credible report on other traffic offences.

1.3 Objectives of the Study

The objective/aim of this study is to design code and develop a software for keeping FRSC records. The following are some of the objectives:

i. To register the offenders information
ii. Input accident victims into the database
iii. Create database tables for the vehicle registration, license registration.
iv. To links different site for FRSC information sharing.
v. Generate queries and reports on the followings; accident, road offenders, driver license, and vehicle registration.

1.4 Scope of the Study

This study is based on the information collected from the Federal Road Safety Commission, Owerri, and it is concerned specially with keeping FRSC information. The platform to be used is Microsoft Visual Basic together with Microsoft Access as a database to be used.

The target of the study is to design and develop a reliable, adaptable, easily usable and accessible FRSC record for efficient and effective services.

1.5 Significance of the Study

This work is significant because it will;

(a) Reduce the time wasted on manual record keeping and retrieval as well as reducing loss of life due to delay in retrieving accident casualties records.
(b) Facilitate FRSC administration and licensing registration management.
(c) Harmonize/standardize approach to FRSC administration and management.
(d) Significantly improve FRSC satisfactions.
(e) Markedly reduce need for licensing litigations etc.

1.6 Limitations of the Study

Following the long existence of manual method, the system cannot determine actually sufficient data, therefore most FRSC recording are wrong. Since most of the clerk or record keeping personnel are not computer literate, the manipulations of data are very difficult but it cannot be entirely eliminated because the world is geared towards on-line information services. The computerization was done only in the FRSC records.

Furthermore; due to time constraint on this project, much research cannot be carried out. Any person wishing to extend this research on FRSC information record should expand it to testing and comparing the rate of casualties in years.

CHAPTER TWO
LITERATURE REVIEW

Traffic involves movement between places. Traffic safety is a universal and life-long issue. Traffic Safety is the utmost precaution taken by transport users as a religion towards arriving safely at their points of destination. Though the FRSC came to existence in 1988, not until 2007 did the FRSC /Stakeholders' approve the collation of data on Articulated Lorries popularly known as Tankers and Trailers towards proffering solutions to the menace of these articulated lorries and other vehicles on Nigerian Highways. Roads safety activities could be truncated due to lack of up-to-date data necessary for building proper and sustainable management policies; as sound policies and decision making require accurate spatial information. Data collection, analysis, management, sharing and dissemination are still weak in our road transport planning. In order to facilitate cooperation, data management must be compatible with the road traffic safety prevailing standards.

Over the last decade, information communication technology (ICT) has totally redefined how we live, work, relax, play, learn, travel and virtually do everything; and I dare to add, how we drive. This feat has been heightened by the proliferation of internet technologies especially its web component.

The spate of advancement in this regard gives very promising prospects for the sanitization of the road transport sector within a developing economy like Nigeria.

In many developing economies including Nigeria, various factors ranging from corruption to policy non-sustainability have been blamed for the backwardness

and slow adoption ICTs in general, and its application to road safety, in particular.

The good news however is that this backwardness shall not be for too long, as advanced technology are globally being applied to many transportation problems. Information and telecommunication systems are enabling 'intelligent' vehicles to interact with other vehicles and also the road environment, thereby making the road safer as a means of mobility.

Aisagbonhi et al (2009) defined Road Safety as the combination of all measures, activities, operations, awareness and regulatory enforcements aimed at the protection of lines and properties during all phases of road mobility including periods of distress.

Road safety comprises of all guidelines, strategies and implementations focused on making road transportation effective, smooth and safe for the preservation of lives, property and services.

2.1 Vulnerable Road users

While the reduction of road fatalities is the target of road safety, special attention is usually focused on the following road users either because of their peculiar disadvantaged means of mobility, their emotional status or their conditions:

i. Learner drivers
ii. Pedestrians
iii. Athletes
iv. Disabled and physically challenged
v. Cyclists
vi. Demonstrators
vii. Rally makers

2.2 Road Safety Technology

Road safety technology is the application of technology to facilitate safe mobility, promote easier dissemination of road traffic management, ensure comfortable manipulation of road machineries, improve the efficiency of road traffic signs/alerts, promote mass awareness of safety consciousness, facilitate more effective rescue operations and improve the monitoring of the changing conditions of roads and machineries.

Some case studies around the world that can be used to understand what other nations and unions are doing to improve road traffic safety with the use of information and communication technologies:

The European Union: over 15 years ago, the EU set a target to reduce by half, the number of fatalities by 2010. in setting the target, it is believed that vehicle safety should be enticed. Therefore, it consistently proposed the systematic use of ICTs and Driver support systems to design safer and more intelligent vehicle. This resulted in the revolutionary computerized cars currently produced by major European car manufacturers including BMW and Mercedes.

New Zealand: the application of safety management system throughout New Zealand took a different turn when it set out to employ technology as one of the key aspects of the government's Road Safety to 2010 strategy. It later become a fundamental means of achieving the vision of greater degree of consistency in how the national road environment appears to road users.

Switzerland: the Swiss Federal Office for special Development predicts that the number of motor vehicle passengers in Switzerland will rise as much as 30 percent by 2030. In the light the growing volume of traffic, increasing attention is being paid to road traffic safety in both the public and private sector. For

decades has been an innovation leader in this important field, developing road safety technology for numerous applications, ranging from pedestrian guide system, tunnel transportation technologies to vehicle –to-vehicle inter-communication devices.

South Africa: South Africa has an advanced, full featured ecall emergency service as an in-vehicle safety system. When a car sense a major impact, such as a collision or summersault, the ecall automatically calls the nearest emergency centre by communicating its exact location through location based GPS support, and this attract rescue attention within minutes. An emergency call can also be generated manually by vehicle occupants, if the condition is practicable after the impact. The fact that rescue services immediately get accurate location allows the personnel to reach the scene of the accident without much difficulty.

Scotland: The Scotland Road Safety campaign promotes road safety education in schools and has developed a range of resources for use by teachers and pupils including, more recently, the use of information and communication technology (ICT). The Scotland Executive lately commissioned research to explore the potentials of ICT as a means of teaching road safety, to compare the extent of its use with the more traditional road safety education formats and to evaluate its potentials as a future road safety education source.

2.3 Road Safety

The name “Road safety” have conveyed that in this field the activities need to concentrate on items that properly belong to roads and, by extension, to the roads authorities, keeping a reduced scope of activities in a number of different areas, in spite of their potentially significant contributions. For example, in the UK, **Burrough, (1991)** indicates that only one-third of the target reduction will be delivered by road safety engineering measures while **Koornstra (2002)**

indicates “The contribution of local road engineering to the fatality reductions between 1980 and 2000 are estimated to be 4% for Sweden, 10% for Britain, and 5% for the Netherlands”. Whereas **TEC (2003)**, quotes a research from the Imperial College, London that indicates than the progress in medical technology and care made a significant contribution to the 45% fall of fatalities during the last 20 years, and account for 700 lives saved annually in the UK, and further puts forward that the lack of consideration of the benefits coming from the medical area, suggests that road safety is probably less effective that thought. It is remarkable that implicitly the author of the research doesn’t consider medical activities as a component of a road safety management system.

It reflects confusion between the space where this phenomenon occurs (mainly roads) and the design of the Management systems to control it, in what “Roads” is only a 11% of the activities.

ACCIDENT: The use of the word “accident” with its connotations of being and unavoidable event, weaken the resolve to intervene in order to reduce crashes and the resulting harm. **Evans (1991)** argues that the word “crash” indicates in a simple factual way what is observed, while “Accident” seems to suggest in addition a general explanation of why it occurred.

- **Cause of accidents**

Road safety recognizes that crashes, and their consequences, are multifactor events, **Ogden (1996)** indicates: “An approach based in notions of cause and blame is simplistic in the extreme”. In short, crashes have **factors** not **causes**.

Problem-solving

Old approaches emphasize the concept of **problem-solving** in Road safety, but it is more correct to recognize that Road Safety activities doesn’t solve

problems. For instance, when a safer road design is implemented, hopefully the number of crashes, or their seriousness, will go down, but they will not disappear. It is more correct to say the implementation of correct policies, programs and measures will reduce numbers or consequences of crashes, but they will not be ´´solved´´.

This realization is important, because it changes the focus from a problem that will go away if we devote enough resources to it, to a situation requiring on-going management. This management in turn requires the development of scientifically based techniques, which will enable us to predict with confidence that safety resources are well-spent and likely to be effective.

2.4 The Federal Road Safety Corps (FRSC) and Government Policy Expectations

In order to stem the level of carnage on our roads, the federal government, by Decree of 1988, set up the Federal Road Safety Commission (FRSC) and charged it with the statutory responsibility of combating road traffic accidents (RTA) in Nigeria, through the creation of road traffic regulations, educating and enlightening the people on good roads. Traffic laws and other forms of regulations have drastically reduced RTA in Nigeria. I will suggest, however, that given the pattern of road accidents in the country, the FRSC should be decentralized, with zonal or state branches to cover the major accident-prone highways and black spots. The commission should not just be interested in arresting and prosecuting traffic offenders, it should also be concerned with the identification and removal of all forms of highway hazards and obstructions that are capable of initiating road accidents.

The commission should also be properly manned with first aid specialists and equipped with ambulances and first aid materials for immediate care and conveyance of accident victims to hospitals. The commission should be able to set for itself a percentage target by which the nation's high accident rate would be reduced in the next four to five years. Actual performance would thus be assessed against such targets. It is of interest to note that 'Operation Eagle Eye' of FRSC of September – December 2007 was a well-designed programme. The programme helped reduce the level of carnage on our roads, especially during the Yuletide. The publicity given to Operation Eagle Eye made the project a great success.

There is need for more of such sensitization programmes, especially during festive periods – but should also be maintained as a core function of the commission. Nigerians should encourage the commission by domesticating Operation Eagle Eye as its functional standpoint. This will reduce the level of carnage that we daily witness on our highways. It will also improve the quality of life of the Nigerian people **(Ndikom, 2008).** The national law review commission should examine the issue of citizen's right to safety on the highway as a justiable right.

2.5 Safety Education at School

Adherence to safety rules in the science of transport is vital to the effective maintenance of road discipline among children and adults alike – but especially among children of school-going age. This is because the inculcation of values on safety education by all the stakeholders in the education sector, to a large extent, shapes the behavioural and attitudinal patterns of most pupil and students with regard to safety consciousness. It is important, therefore, that road safety education be introduced at the primary and secondary school levels, so as

to produce a disciplined society and, especially, a crop of well-behaved road users at all times.

Right from the primary school, pupils should be taught the proper way to cross major roads and highways. Such inculcation of values and virtues of safety consciousness through well-articulated safety education programmes at schools will go a long way in orientating the minds of the young ones on road usage; hence, a lot of people would be spared the agonies of road traffic accidents. By the time they get to secondary school, these principles of safety would have become a part of their lifestyle, so much that the general society and, especially, the motoring public would benefit greatly from the efforts at educating them early on safety.

2.6 Safety Control Standards

Safety control standards are very important when we focus solely on the survival of people and the motor vehicle. This plea for survival has recently become pronounced, in view of the rising rates of road accidents, in which the nation steadily loses its manpower resources. To this end, the introduction of improved education, training and enforcement can be highly beneficial in developing countries; the potential for improved road safety usage by means of education and training in Nigeria is probably greater than in that for the developed world. The distribution pattern, as it related to safety control standards, can be attributed to variations in traffic density and improvements in the alignment and quality of road networks, without corresponding changes in driving behaviour, safety provisions and procedures for monitoring motorists, and compliance with speed limits on the highways. The Nigerian society should improve on its defensive driving techniques as this will help improve safety control standards for drivers, passengers and vehicle alike.

National programs

A prerequisite for progress in this area is to introduce national programs with clear and quantifiable objectives, some examples are:

- Chile 0% growth in fatalities, (down from historical 5-7% annual growth), (CONASET, 1993)
- EU, 40% reduction in fatalities for 2010
- Denmark 40% reduction for 2000
- Finland 65% reduction for 2005
- United Kingdom 33% reduction for 2000
- USA No more than 1.0 fatality for every 100 million vehicle miles traveled (VMT) by 2008.

Sweden has developed a new concept to improve road safety called "Vision Zero". Vision Zero is conceived from the ethical base that it can never be acceptable that people are killed or seriously injured when moving within the road transport system. It centers around an explicit goal, and develops into a highly pragmatic and scientifically based strategy which challenges the traditional approach to road safety.

Vision Zero: strategic principles

- The traffic system has to adapt to take better account of the needs, mistakes and vulnerabilities of road users.
- The level of violence that the human body can tolerate without being killed or seriously injured forms the basic parameter in the design of the road transport system.
- Vehicle speed is the most important regulating factor for a safe road traffic. It should be determined by the technical standard of both roads and vehicle so as not to exceed the level of violence that the human body can tolerate.

While the concept envisages responsibility for safety amongst the designers and users of the system, the designer has the final responsibility for "fail-safe" measures.

Vision Zero: system designer has primary responsibility

- System designers are responsible for the design, operation and the use of the road transport system and are thereby responsible for the level of safety within the entire system.
- Road users are responsible for following the rules for using the road transport system set by the system designers.
- If the users fail to comply with these rules due to a lack of knowledge, acceptance or ability, the system designers are required to take the necessary further steps to counteract people being killed or injured.

2.7 Distributed Database

A distributed database system is an information processing system that contains a number of independent computers that cooperate with one another over a communications network in order to achieve a specification objective. **(Kay-Romer et al; 2006).**

According to **Kay Romer (2006),** A Distributed database bring the advantages of distributed computing to the database management domain. A distributed computing system consists a number of processing elements, not necessarily homogeneous, that are interconnected by a computer network, and that cooperate in performing certain assigned tasks.

A physical view of a distributed system includes computers as nodes of the communications network along with details about the communications network itself. In contrast, a logical view of a distributed system highlights the

application aspects. Figure I below can therefore also be interpreted as a set of cooperating processes.

The distribution aspect refers to the distribution of state (data) and behavior (code) of an application. The process encapsulates part of the state and part of the behavior of an application, and the applications semantics are achieved through the cooperation of several processes. The logical distribution is independent of the physical one.

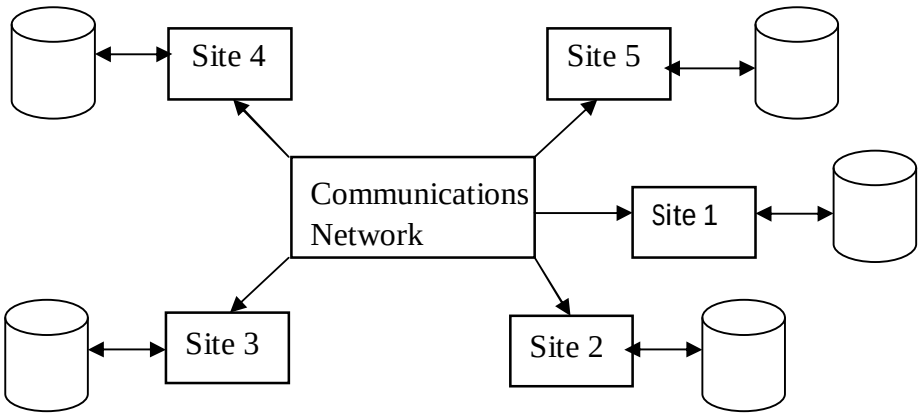


Figure I: A Distributed Database

Distributed database management has been proposed for various reasons ranging from organizational decentralization and economical processing to greater autonomy.

Navathe (2000) highlighted some of these advantages as presented below:

(a) Management of distributed data with different levels of transparency such as:

(i) Distribution or network transparency: This refers to freedom for the user from the operational details of the network. It may be divided into location transparency and naming transparency. Location transparency refers to the

fact that the command used to perform a task is independent of the location of data and the location of the system where the command was issued. Naming transparency implies that once a name is specified, the named objects can be accessed unambiguously without additional specification.

(ii) Replication transparency: In this case, copies of data may be stored at multiple sites for better availability, performance, and reliability. Replication transparency makes the user unaware of the existence of copies.

(iii) Fragmentation transparency: two types of fragmentation are possible.

- Horizontal fragmentation distributes a relation into sets of tuples (row).
- Vertical fragmentation distributes a relation into sub-relations where each sub-relation is defined by a subset of the columns of the original relation.

A global query by the user must be transformed into several fragment queries. Fragmentation transparency makes the user unaware of the existence of fragments.

(b) Increased reliability and availability: These are two of the most common potential advantages cited for distributed databases.

Reliability is broadly defined as the probability that a system is running (net down) at a certain time point, whereas availability is the probability that the system is continuously available during a time interval. When the data and database management system (DBMS) software are distributed over several sites, one site may fail while other site continues to operate.

Only the data and software that exists at the failed site cannot be accessed. This improves both reliability and availability. Further improvement is achieved by judiciously replicating data and software at more than one site.

In a centralized system, failure at a single site makes the whole system unavailable to all users. In a distributed database, some of the data may be unreachable, but users may still be able to access other parts of the database.

(c) Improving performance: - A distributed DBMS fragments the database by keeping the data closer to where it is most often needed. Data localization reduces the contention for CPU and I/O services and simultaneously reduces access delays involved in wide area networks. When a large database is distributed over multiple sites, smaller databases exist at each site.

As a result, local queries and transactions accessing data at a single site have better performance because of the smaller local databases.

In addition, each site has a smaller number of transactions executing than if all transactions are submitted to a single centralized database.

Moreover, inter-query and intra-query parallelism can be achieved by executing multiple queries at different sites or queries by breaking up a query into a number of sub-queries that executes in parallel. This contributes to improved performance.

(d) Easier expansion: in a distributed environment, expansion of the system in terms of adding more data, increasing database sizes, or adding more processors is much easier.

In Navathe (2000), the term distributed database management system can describe various systems that differ from one another in many respects. The main thing all such systems have in common is the fact that data and software are distributed over multiple sites connected by some form of communication network. The first factor considered is the degree of homogeneity of the DDBMS software.

If all servers (or individual local DBMSs) use identical software and all users (clients) use identical software, the DDBMS is called heterogeneous. Another factor related to the degree of homogeneity is the degree of local autonomy. If there is no provision for the local site to function as a stand-alone DBMS, then the system has no local autonomy. On the other hand, if direct access by local transactions to a server is permitted, the system has some degree of local autonomy. At on extreme of the autonomy spectrum, we have a DDBMS that 'look like' a centralized DBMS to the user. A single conceptual schema exists, and all access to the system is obtained through a site that is part of the DDBMS which means that no local autonomy exists. At the other extreme we encounter a type of DDBMS called federated DDBMS (or a multi-database system). In such a system, each server is an independent and autonomous centralized DBMS that has its own local users, local transactions, and DBA and hence has a very high degree of local autonomy.

The term federated database system (FDBS) is used when there is some global view or schema of the federation of database that is shared by the applications. On the other hand, a multi-database system does not have a global schema and interactively constructs one as needed and interactively constructs one as needed by the application. Both systems are hybrids between distributed and centralized systems and the distinction we made between them is not strictly followed.

In a heterogeneous FDBS, one server may be a relational DBMS, another a network DBMS, and a third an object or hierarchical DBMS; in such a case it is necessary to have a canonical system language and to include language translators to translate sub-queries from the canonical system language to the language of each server. The type of heterogeneity present in FDBS may arise from several sources, viz, differences in data models, differences in constraints

and differences in query languages. Semantic heterogeneity occurs when there are differences in the meaning, interpretation, and intended use of the same or related data. Semantic heterogeneity among component database systems (DBSs) creates the biggest hurdle in designing global schemas of heterogeneous databases.

There are three alternative approaches to separating functionality across different DBMS related processes; these alternative distributed DBMS architectures are called client-server, collaborating server, and middleware.

A client server system has one or more client processes and one or more server processes, and a client process can send a query to any one of the server process.

Clients are responsible for user-interface issues, and servers manage data and execute transactions. Thus, a client process could run on a personal computer and send queries to a server running on a mainframe.

In a collaboration server system, we can have a collection of database servers, each capable of running transactions against local data, which cooperatively execute transactions spanning multiple systems. When a server receive a query that require access to data at other servers, it generates appropriate sub-queries to be executed by other servers and puts the results together to complete answers to the original query. Ideally, the decomposition of the query should be done using cost-based optimization, taking into account the costs of network communication as well as local processing costs.

Middleware: The middleware layer is capable of executing joins and other relational operations on data obtained from the other servers, but typically does not itself maintain any data.

2.8 Database and Road Safety planning in Nigeria

Data refers to qualitative or quantitative attributes of a variable or set of variables. Data are typically the results of measurements or observations of a set of variables. Data are often viewed as the lowest level of abstraction from which information and then knowledge are derived. To achieve a comprehensive planning for sustainable road safety management in Nigeria, a road safety database is required. This paper advocates for a veritable database, reliable, accurate and up-to-date information about people, vehicle, the road, the driver, environment, population growth rate, travel needs, available transport modes, modal split, car ownership ratio, land use, trip generation and attraction. Such information, which can be stored, retrieved, updated, maintained, processed and shared serve as the pivotal element on which a comprehensive analysis can be made. The paper therefore highlights the relevance of database for worthwhile safety programme. This paper makes a case for road safety database in Nigeria which identifies data integration, central control, data independence, concurrent sharing of safety data and the requirements for the database which include operational data, data constraints and database transactions, as well as presenting a sustainable technique for database implementation and consequent comprehensive procedure for road safety programme in Nigeria.

Data Management/ Data Management Plan

Data management is the development, execution and supervision of plans, policies, programmes and practices that control, protect, deliver and enhance the value of data and information assets.

It includes all activities associated with data other than the direct use of the data. It may include:

- data organization;
- backups;
- archiving data for long-term preservation;
- data sharing or publishing;
- ensuring security of confidential data; and
- Data synchronization.

A data management plan is a document that describes what data will be created, what policies will apply to the data, which will own and have access to the data, what data management practices will be used, what facilities and equipment will be required, and who will be responsible for each of these activities.

Data Management Plan Function

- Co-ordinates the collection, collation and processing of data received from field commands.
- Ensures quality control of all information and data emanating from the commission.
- Keeps the record of personnel, result and researches and other related matters.

Policy Thrust for the FRSC on Data Management

One of the main objectives of data management is to create an updateable database that will help in further understanding the trend of accidents and traffic misbehaviour and how the menace can be curbed. Others are:

- Develop an up-to-date database for all rescue services/resources nationwide.
- Develop a Central Databank for all road traffic crashes.
- Implement an e-licensing scheme.

- Build adequate human capacity
- Develop performance matrix for all departments
- Develop a support database for national policies development

New Developments (FRSC Database)

- The Vehicle License process is being reviewed and re-engineered
- The process of overhauling the National Driver's Scheme is in progress
- The drivers License database has been cleaned and updated with 2.4 million records
- On-line verification of Drivers License will commerce soon to deal with the issue of fake/multiple drivers license
- 12 VSATs installed in the Zonal Commands and another 85 to be deployed in all the license processing centres/Sector Commands

FRSC Call/Data Centre

The establishment of the Call/Data Centre is to facilitate the Field operations, rescue activities and on-line verification of the driver's licenses. Equally, 45 V-SAT facilities were installed in Field Commands while 1000 telephone lines under the Close User Group (CUG) were incorporated into the system at the National Headquarters and Field commands. All these resulted in the improvement of FRSC's response time to emergencies which was about 50minutes in 2007 and now reduced to about 20 minutes, while her road coverage level rose to 41%. See Figure 1 showing relationship between road traffic calls and calls on crashes. Plate 1 and 2 show the pictorial view of FRSC staff on duty at the call centre, while Plate 3 and 4 show the international standard

2.9 The Road Safety Management System

The latest evolution of the road safety management system which is recommended for use by the World Bank is shown below. Safety is produced just like other goods and services and the production process is viewed as a management system with three levels: institutional management functions which produce interventions, which in turn produce results. This road safety management system model derives from New Zealand's Comprehensive 2010 target setting framework which linked desired results with interventions and related institutional implementation arrangements **(Land Transport Safety Authority, 2000).** The New Zealand framework was adopted by the European Transport Council **(Wegman, 2001)** which highlighted its results management framework, and it was further elaborated by the sunflower project **(Koornstra et al, 2002)** which located the institutional implementation arrangements in the broader context of country "Structure and Culture". The first World Bank guideline concerning the implementation of the World Report recommendations **(Bliss, 2004)** used the framework to introduce prototype safety management capacity review tools. This updated guideline refines these tools and further defines the organizational manifestation of the sunflower project "structure and culture" in terms of seven institutional management functions.

They comprise safety designs, standards, and rules and as well as a combination of activity to secure compliance with these such as information, publicity, enforcement and incentive.

2.10 The Evolution of Road Safety Management

In the World Report on Road Traffic injury prevention **(WHO 2004)** and the follow up World Bank Transport Note Progressive shifts in road safety management thinking and practices in high-income countries have been evident.

Since the 1950s there have been four significant phases of development, which have become progressively more ambitious in terms of the results desired.

Phase 1 - Focus on driver interventions

In the 1950s and 60s safety management was generally characterized by dispersed, uncoordinated, and insufficiently resourced institutional units performing isolated single functions **(Koornstra et al, 2002).** Road safety policies placed considerable emphasis on the driver by establishing legislative rules and penalties and expecting subsequent changes in behaviour, supported by information and publicity. It was argued that since human error contributed mostly to crash causation it could be addressed most effectively by educating and training the road user to behave better. Placing the onus of blame on the road traffic victim acted as a major impediment to the appropriate authorities fully embracing their responsibilities for a safer road traffic system **(Rumar, 1999).**

Phase 2 - Focus on system-wide interventions

In the 1970s and 1980s, these earlier approaches gave way to strategies which recognized the need for a systems approach to intervention. Dr. William Haddon, an American epidemiologist, developed a systematic framework for road safety based on the disease model which encompassed infrastructure, vehicles and users in the pre-crash, in-crash and post crash stages **(Haddon, 1968).** Central to this framework was the emphasis on effectively managing the exchange of kinetic energy in a crash which leads to injury to ensure that the thresholds of human tolerances to injury were not exceeded. The focus of policy broadened from an emphasis on the driver in the pre-crash phase to also include in-crash protection (both for roadsides and vehicles) and post crash care. This broadened it to a system-wide approach to intervention and the complex interaction of factors which influence injury outcomes. It underpinned a major

shift in road safety practice which took several decades to evolve. However, the focus remained at the level of systematic intervention and did not directly address the institutional management functions producing these interventions or the results that were desired from them.

Phase 3 - Focus on system-wide interventions, targeted results and institutional leadership.

By the early 1990s good practice countries were using action focused plans with numerical outcome targets to be achieved with broad packages of system-wide measures based on monitoring and evaluation. On-going monitoring established that growing motorization need not inevitably lead to increases in death rates but could be reversed by continuous and planned investment in improving the quality of the traffic system. The United Kingdom, for example, halved its death rate (per 100,000 head of population) between 1972 and 1999 despite a doubling in motorised vehicles. Key institutional management functions were also becoming more effective. Institutional leadership roles were identified, inter-governmental coordination processes were established and funding and resource allocation mechanisms and processes were becoming better aligned with the results required. Developments in Australasian jurisdictions (e.g. Victoria and New Zealand) further enhanced institutional management functions concerning results focus, multi-sectoral coordination, delivery partnerships, and funding mechanisms **(WHO, 2004; Bliss, 2004; Wegman *et al.*, 2006; Trinca *et al.*, 1988).** Accountability arrangements were enhanced by the use of target hierarchies linking institutional outputs with intermediate and final outcomes to coordinate and integrate multi-sectoral activities. This phase laid the foundation for today's best practice and reflects the state of development found in many higher performing countries today.

Phase 4 - Focus on system-wide interventions, long-term elimination of deaths and serious injuries and shared responsibility.

By the late 1990s, two of the best performing countries had determined that improving upon the ambitious targets that had already been set would require rethinking of interventions and institutional arrangements. The Dutch Sustainable Safety **(Wegman *et al.*, 1997 and 2008)** and Swedish Vision Zero **(Tingvall, 1995;** Committee of inquiry into road traffic responsibility, 2000) strategies re-defined the level of ambition and set a goal to make the road system intrinsically safe. The implications of this level of ambition are currently being worked through in the countries concerned and elsewhere. These strategies recognize that speed management is central and have re-focused attention on road and vehicle design and related protective features. The 'blame the victim' culture is superseded by 'blaming the traffic system' which throws the spotlight on operator accountability. These examples of Safe System approaches have influenced strategies in Norway, Finland, Denmark, Switzerland and Australia.

Today the growing view is that road safety is a system-wide and shared multi-sectoral responsibility which is becoming increasingly ambitious in terms of its results focus. Sustaining the level of ambition now evident in high-income countries requires a road safety management system based on effective institutional management functions that can deliver evidence-based interventions to achieve desired results. Achievement of the ultimate goal of eliminating death and serious injury will require continued application of good practice developed in the third phase of targeted programmes coupled with innovative solutions which are yet to be determined based on well-established safety principles.

This road safety management system model derives from New Zealand's comprehensive 2010 target setting framework which linked desired results with interventions and related institutional implementation arrangements (Land Transport Safety Authority, 2000). The New Zealand framework was adopted by the European Transport Safety Council **(Wegman, 2001)** which highlighted its results management framework, and it was further elaborated by the Sunflower Project **(Koornstra *et al.*, 2002)** which located the institutional implementation arrangements in the broader context of country 'structure and culture'. The first World Bank guideline concerning the implementation of the World Report recommendations **(Bliss, 2004)** used the framework to introduce prototype safety management capacity review tools. This updated guideline refines these tools and further defines the organizational manifestation of the Sunflower Project 'structure and culture' in terms of seven institutional management functions.

Institutional management functions: The seven identified institutional management functions are the foundation on which road safety management systems are built. They are essential for the production of interventions which, in turn, achieve road safety results and for this reason they must receive the highest priority in road safety planning and policy initiatives. The institutional management functions relate to all government, civil society and business entities that produce interventions and ultimately results.

Interventions: Broadly, these comprise system-wide strategies and programmes of interventions to address safety targets. Interventions cover the planning, design and operation of the road network, the entry and exit of vehicles, and users into the road network, and the recovery and rehabilitation of crash victims. They seek to manage exposure to the risk of crashes, prevent crashes, and reduce crash injury severity and the consequences of crash injury.

They comprise safety designs, standards, and rules and well as a combination of activity to secure compliance with these such as information, publicity, enforcement and incentive.

The road safety management system has a number of generic characteristics that allow for its universal application to all countries, irrespective of their development status or road safety performance.

2.11 Generic characteristics of the Road Safety Management System

It places an emphasis on the production of road safety, and recognizes that safety is produced just like other goods and services. The production process is viewed as a management system with three levels: institutional management functions which produce interventions, which in turn produce results. Much of the day to day road safety discussion is concerned with interventions alone, and use of the management system opens up the discussion to the important and often neglected issues of institutional ownership and accountability for results.

It is neutral to country structures and cultures which will shape the way institutions function and the goals to be set and achieved. Any country can use this framework and adapt their road safety initiatives to it.

It accommodates evolutionary development. This is illustrated by the evolving focus on results that has been evident in high-income countries through to its ultimate expression in the Safe System approach. In any particular period of development the system can be used to review road safety management capacity and prepare related strategies and programs.

It applies to any given land use/transportation system and takes as given the current and projected exposure to risk arising from that system. However, it can

also manage the land use/transport trade-offs by considering these as options in the desired focus on results and addressing them with interventions concerning the planning, design, operation and use of the road network and the entry and exit of vehicles and road users to this network.

It takes the road network as its frame of reference and locates the deaths and injuries that are avoidable. The three broad categories of intervention are defined in terms of the road network and have strong spatial dimensions. This distinguishes the system from earlier frameworks that emphasized safer roads, safer vehicles, and safer people, without locating them specifically in the network contexts where deaths and serious injuries occur.

Consideration of all elements of the road safety management system and the linkages between them becomes critical for any country seeking to identify and improve its current performance levels.

2.12 Institutional management functions

The seven institutional management functions provide the foundation on which road safety management systems are built: they produce the interventions to achieve the desired long and medium-term road safety results (expressed as visions and performance targets) which have been agreed across the road safety partnership at national, regional and local levels. These functions are delivered primarily by all the government agencies producing interventions, but they are also delivered in government partnerships with civil society and business entities to achieve the desired focus on results. Without effective institutional management a country has little chance of implementing successful road safety interventions and achieving desired results .

2.13 Strengthen the Road Safety Management System

All countries should commit to ensuring an effective road safety management system and in particular seek to achieve a strong results focus through their institutional management arrangements. This results focus requires clear identification of: a lead agency; the core group of government ministries and agencies to be involved; their roles and responsibilities; and the performance targets in terms of institutional outputs and intermediate and final outcomes to be achieved within a defined strategy.

In EU countries, the typical lead agency structure lead department is the Ministry of Transport or Road Authority (see the example of the Swedish Road Administration) which undertakes much of the work itself as well as delegating aspects of its work to other organizations, including provincial and local governments, research institutes or professional associations.

2.13.1 Motoring, Road user and Consumer Organizations

User organizations typically mount strong national campaigns to improve mobility and safety. In recent years, together with safety organizations, motoring and consumer organizations have played a key role in improving car occupant safety standards. International Testing representing consumer and FIA/AIT representing motorists has played an important role in European New Car Assessment Programme which was initiated by the British and Swedish governments.

2.13.2 What Vehicle manufacturers can do:

- Ensure that all motor vehicles meet safety standards set for high-income countries – regardless of where the vehicles are made, sold or used – including the provision of seat-belts and other basic safety equipment.

- Begin manufacturing vehicles with safer vehicle fronts, so as to reduce injury to vulnerable road users.
- Continue to improve vehicle safety by ongoing research and development.
- Advertise and market vehicles responsibly by emphasizing safety.

The business sector often contributes financial support to road safety activity. For example, organizations funded by the insurance industry make a valuable contribution to road safety. Folksam Research, Sweden and the Insurance Institute for Highway Safety in the United States play a key role in providing objective information about the crash performance of new car and other safety issues. Data collection managed by the Motor Traffic Insurers Bureau (VALT), in Finland which investigates every fatal crash occurring nationally and carries out safety studies, feeds directly into national public information and policy. The insurance industry in Austria contributes a large share of the funding of the Austrian Road Safety Board.

In view of the fact that a large proportion of road traffic injuries are occupational in nature, companies can play a role in improving road safety through in-house safety policies and fleet policies. The Swedish Road Administration and the Swedish Work Authority have been particularly active in engaging employers in work-related road safety.

2.13.3 Parliamentary relations at central, regional and local levels

In European Union countries both the European Parliament and national Parliaments play a key role in road safety.

Well-informed all-party Parliamentary committees and groups on road safety have been associated with major developments in road safety policy in Australia and Europe:

- Parliamentary Committees are appointed by the Parliament and have a formal remit within the Parliamentary process. These can be stand-alone road safety committees, or transport committees which give high priority to road safety. They usually comprise around 8-10 Parliamentarians from all parties. E.g. the Joint Standing Committee on Road Safety in Victoria, Australia and the Swedish Parliament's Transport Committee.
- Parliamentary Groups are usually registered with Parliament, have to conform to certain rules, but they are not formally part of Parliament. They comprise Parliamentarians from all parties, road safety experts and representatives from a range of organizations. E.g. the British Parliamentary Advisory Council for Transport Safety (PACTS)

These bodies have several functions:

- Champion road safety within Parliament, the media and the community
- Promote effective action to Government
- Consider a broad spectrum of issues and views and seek expert and community opinion
- Parliamentary Committees can conduct hearings and publish recommendations to which Governments must respond within a specific timescale
- Legislate for road safety using Private Members' procedures and Parliamentary time
- Approve casualty reduction targets.

2.14 Parliamentary initiatives on Road Safety

Sweden's Parliamentary Transport Committee played a key role in enshrining the Vision Zero policy in legislation and introducing numerical fatality reduction targets to 2007 to encourage fast action.

In the Netherlands, the Standing Committee on Transport, Public Works and Water Management played a similar role in ensuring that Sustainable Safety and casualty reduction targets were covered by legislation.

The all-party British Parliamentary Advisory Council for Transport Safety played a national co-ordinating role in the introduction of compulsory front seat belt wearing in the early 1980s through Private Members' legislation.

2.15 Legislation

All countries active in road safety aim to ensure that appropriate legislation is in place to meet the road safety task set out and agreed within the national road safety strategy. Typically, a comprehensive framework for the road traffic system safety will have evolved over many years. The 'legislation' function involves:

- Reviewing the scope of the legislative framework periodically
- Developing legislation needed for the road safety strategy with due consideration to cost-effectiveness, practicality and public acceptability
- Consolidating legislation
- Securing legislative time for road safety

This function ensures that legislative instruments for road safety are well-matched to the road safety task. Road safety legislation typically addresses land use, road, vehicle, and user safety standards and rules and their compliance, as well as post impact medical care. A mixture of specialist legislative and technical expertise is needed within government to develop and consult on

enforceable standards and rules with due consideration to cost, effectiveness, practicality and public acceptability.

The road safety ‘promotion’ function has, traditionally, comprised Government-backed publicity campaigns aimed at road users to create awareness of road safety problems and to influence attitudes. Road safety promotion today has a much broader role within the road safety management system. It aims to create a supportive climate for achieving results and implementing effective intervention by all those with responsibilities for traffic system safety, across many sectors of Government and society. It promotes the need for results, the means by which they can be achieved and the core business responsibilities of the key stakeholders at a high level.

In good practice, the ‘promotion’ function is addressed by the following:

- Promoting a far-reaching road safety vision
- Championing and promotion at a high level
- Multi-sectoral promotion of effective intervention and shared responsibility
- Leading by example with in-house road safety policies
- Developing and supporting safety rating programmes Carrying out national advertising
- Encouraging promotion at local level.

The role of representatives of independent research organisations, the non governmental sector and Parliament is vital in high-level championing where government is seen to be slow to act.

2.16 Monitoring and Evaluation

Monitoring and evaluation completes the management loop in a country results-based management system and comprises systematic performance of all the elements of the road safety management system.

Monitoring and evaluation' function is addressed by 3 main functions:

- Establishing and/or supporting a range of data systems to set and monitor final and intermediate outcome and output targets.
- Transparent review of the national road safety strategy and its performance along the dimensions of results, interventions and institutional management functions.
- Making any necessary adjustments to interventions and institutional outputs needed to achieve the desired results.

Periodic monitoring and evaluation of road safety targets and programs is essential to assess performance and to allow adjustments to be made. The establishment and sustainable funding of transport registries for drivers and vehicles, crash injury databases and periodic survey work to establish performance and exposure data is typically the responsibility of several different Government agencies - transport, police, and health. In some countries, Government insurance departments or organizations and university departments also share responsibility. The organization of independent inspection, audit and review are also part of this function.

2.17 The Client-server Registration and Licensing Distributed Databases

(www.akamaiuniversity.us) The primary types of system architectures for information processing include: Service Oriented Architecture (SOA), distributive (Client-server), and centralized information systems processing more commonly associated with mainframe and mid range computers.

The client-server architecture is considered in this case. This is a network architecture in which each computer or process on the network is either a client or a server. Servers are powerful computers or processes dedicated to managing disk drives (file servers), printers (print servers), or network traffic (network servers). Clients are PCs or work stations on which users run applications.

Clients rely on server for resources, such as files, devices, and even processing power. Interaction between client and server might proceed as follows during the processing of an SQL query.

(a) The client parses a user query and decomposes it into a number of independent site queries. Each site query is sent to the appropriate server site.

(b) Each server processes the local query and sends the resulting relation to the client site.

(c) The client site combines the results of the sub-queries to produce the result of the original submitted query.

In this approach, the SQL server has also been called a transaction server (or a database processor (DP) or a back-end machine). The interaction between client and server can be specified by the user at the client level or via a specialized DBMS client module that is part of the DBMS package. For example, the users may know what data is stored in each server, break down a query request into site sub-queries manually, and submit individual sub-queries to the various sites. The resulting tables may be combined explicitly by a further user query at the client level. The alternative is to have the client module undertake these actions automatically.

In a typical DDBMS, it is customary to divide the software modules into three levels:

(a) The server software is responsible for local data management at a site, much like centralized DBMS software.
(b) The client software is responsible for most of the distribution information from the DDBMS catalog and processes all requests that require access to more than one site. It also handles all user interfaces.
(c) The communications software (sometimes in conjunction with a distributed operating system) provides the communication primitives that are used by the client to transmit commands and data among the various sites as needed.

This is not strictly part of the DBMS, but it provides essential communication primitives and services.

The client server is responsible for generating a distributed execution plan for a multi-site query or transaction and for supervising distributed execution by sending commands to servers.

These commands include local queries and transactions to be executed, as well as commands to transmit data to another clients or servers. Hence, client software should be included at any site where multi-site queries are submitted. Another function controlled by the client (or coordinator) is that of ensuring consistency of replicated copies of a data item by employing distributed (or global) concurrency central techniques.

The client must also ensure global the atomicity of global transactions by performing global recovery when certain sites fail.

2.18 Office File Management Information System in FRSC

A management information system (MIS) is an information system that in addition to providing all necessary transaction processing for the FRSC or organization provides information and processing support for management and decision functions.

Gordan (2002), in his books "Management Information System", says, the idea of an information system preceded the advent of computers, but computers made the idea feasible. Meanwhile, FRSC have always required system for collecting, processing, storing, retrieving and distributing information systems through database.

The computer has added a new powerful technology to information systems, so that computer-based information system can be radically different from systems using manual or electromechanical processing.

2.19 Computer Application in Road Safety

One can conceptually discuss management information systems without computers, but it is the power of the computer, which makes MIS possible.

The question is not whether a computer shall be used in management information systems, but the extent to which various processes should be computerized. The idea of a computer application information system and decision system does not mean complete computerization. The computer application system concept implies that some tasks are best performed by operators, while others are best done by system.

For many problems, the operator and computer system form a combined system with results being obtained through a set of dialogues and the user.

More early computer processing systems followed the manual processing system approach in which each application is processed in separate file(s). This method has processing and control efficiencies; however, it leads to duplication of file and to separate files, some having the same data fields but with the data frequently not in agreement. Also, in this approach, each application is restricted to the data planned for it.

An analytical application using data from many applications would need to build a new file from parts of separate files.

2.20 Computer application in Data Processing

Osuagwu (2005), Computer were not originally planner for information processing, but this is now the major use to which they are applied. The technical requirements for a computer-based management information system will be surveyed in subsequent chapters.

2.21 Computer Database in FRSC

The development of co-operate databases will be one of the most important data processing activities for many years to come. Data will be regarded as a vital corporate resource, which must be organized so as to maximize their value. In addition, to the databases within the FRSC, a vast new demand is growing for database services, which will collect, organize and store data. The files of which computers can use are growing at a staggering rate.

The growth rate in the size of computer storage is greater than the growth in size or power of any other component in the exploding data processing industry.

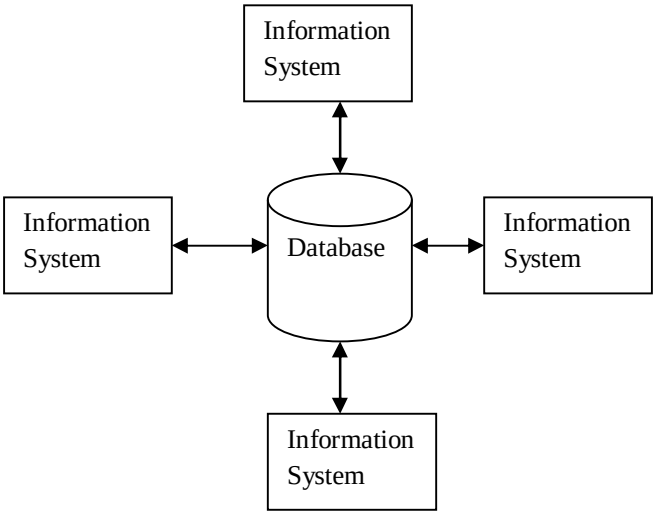


Fig. 2: Database Management

2.22 The immediate & other Disaster challenges that face up FRSC

According to **Ibezim (2011)**, Disaster has been defined as "a serious disruption of the functioning of a society causing or threatening to cause widespread human, material or environmental losses which exceed the ability of affected community to cope with using its own resources". Most Road Traffic Crash sometimes result in fatality/loss of lives.

Disaster management is s continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures aimed at:

- Preventing or reducing the risk of disasters,
- A rapid and effective response to disasters, post disaster recovery and rehabilitation.
- Disasters can have wide ranging effects on a country, its government and its people.

2.23 Approaches to Disaster Management

FRSC as the lead agency in road traffic management manages road traffic crash in a three fold approach namely; Pre-, during and post disaster management.

2.23.1 Pre-Disaster (Road Traffic Crash) Management: This is the preventive and proactive stage where programmes and strategies are put in place to systematically shelve any eventual occurrence of road traffic crash that may probably result in a high magnitude. FRSC considers any RTC that results to fatal and claims a minimum of five lives as disaster and therefore required investigation and reporting to prevent reoccurrence. The strategies include but not limited to:

(i) Enforcement of traffic regulation

- Special Patrol/Mobile Court

(ii) Public Enlightenment/Education

- Mass Media
- Driver training
- Motor park public enlightenment
- Offenders mandatory education
- Production and circulation of Nigeria Highway Code
- Festivity Public enlightenment Programmes – Ember month campaign

(iii) Information and Communication

- Establishing of emergency call centre and closer user group (CUG) service numbers:
  0700-CALL FRSC – 0700 2255 3772 (RSHQ Abuja)
  08077690268 (Imo Rescue). And some other unit call centres.

(iv) RTSSS Programme

- Inspection and certification of fleet operators
- Passengers manifest

During RTC stage (Rescue & Recovery Management): strategies and measures have been put in place to ensure prompt and unhindered rescue operation during road traffic crash, especially fatal cases:

- Communication/Information to ascertain magnitude of crash (use of call centres, CUG, radio stations etc.)
- Use of mobile clinics/Help Areas
- Use of ambulance for treatment and evacuation of accident victims
- Use of patrol vehicles to condone off accident scene
- Standby Rescue Team – presently, response period runs between 5mins to 30mins based on distance/proximity.
- Inter Agency Collaboration – (Imo experience – Police, NSCDC, FRSC, Red Cross Society, Fire Service).

2.23.2 Post (RTC) Management

This involves systematic approach as a follow up to the outcome of a road traffic. The objective is to:

(a) Rehabilitate, and possibly reinstate the RTC victims.

(b) Provide measures to avoid repeat occurrence – e.g. prosecution of offender

The measures at this stage include:

- Treatment of RTC victims, ensuring the victims are taken to certified medical hospitals/clinics.
- Investigating and reporting of the accident, availing the victims and the general public with details of the cause of crash, Press releases etc.
- Clearing of obstructions.
- Settlement of dispute between the accident victims especially in the area of compensation by applying alternative dispute resolution e.g. repairs of reinstatement of vehicles.
- Prosecution of offending driver and vehicle owners.

- Advise to relevant agencies (federal/state ministry of works, FERMA) to rehabilitate/repair/fix road furniture in the black spots whether remotely or proximately attributed to the mishap.

2.24 Constraints in managing Road Traffic Crash

There are serious challenges being face by the Corps (Imo State Command) in the course of managing road traffic crashes. They include the following:

- Poor government investment in Road Safety activity programmes.
  - Poor budgetary provision
  - Lack of working materials – patrol vehicles, ambulances, tow-truck/recovery vehicles, automated enforcement system etc.
  - Low enforcement/compliance resulting in inability to cover wilder area.
  - Inadequate personnel.
  - Poor road infrastructure
- Violation of traffic regulation with impunity and lack of exercise of political will by those in authority.
  - Abuse of siren and convoy.
- Ineptitude by relevant regulatory bodies in addressing squarely road safety related matters.
  - Insurance
- Low private public partnership

2.25 Manual Filling of documents in the FRSC

According to **Onibonje's (2004),** he define filling as the orderly collection, management, and safe-keeping of information and prompt retrieval of such information as and when required for any decision fits both manual and electronic filling.

However, the author says that a good filing system must have the following:

(a) Orderly collection of the papers and documents used in the FRSC.
(b) Preservation of the materials thus collected.
(c) Swift retrieval of relevant information without any delay irrespective of who may wish to retrieve such materials that is either an old or a new.
(d) Simplicity both to understand and to operate.
(e) Optimum cot, because of the inability of the mobility of most filling system to meet these attributing the call for an electronic filing of office documents have become rigorous in many government and private parastatals.

These have been a general argument in business and commercial quarters that a large part of the efficiency of an office depends not only on the existence of a reliable filing system.

2.26 Electronic Filling System in the FRSC

According to **Osuagwu (2005),** Filling system can be manually or electronically designed, I seek to examine the application of the document. This implies that some electronic devices are involved. An in-depth knowledge of these as it applies to the user is very necessary.

For instance, the computer is an electronic device that manipulates data which can control other devices as a result of its manipulation and storage of data, and which can communicate with other computers with other types of devices, and with human beings.

The **Pengium English Dictionary** defines the computer as a “machine which memorizes, sifts, analysis and co-relates data and procedures selective”.

On the other hand, a dictionary of computers compiled by **A. Chandor,** defines a computer as an machine which can accept data in a prescribed form, process the information or data and supply the results of the processing in a specified format as information or as signals to control automatically some further machine or process.

More definitions are available, although, the few reviewed here varied in their emphasis, they convey of a general ideal, is that computer stores, control and handle data, even also communicate to other devices, and that filing of office document can be computerized.

It has shown that the need for computer is to enhance work speed, its accuracy, reliability, versatility and automatic. This is the main reason for the introduction of electronics filing for office documents in modern FRSC. Then, computer was faster than the fastest human being solving the same problem.

Thus, the use of computer enhances easy extension of tasks in a better and faster way. The computer is always accurate. It could give the same result to a problem at any point in time provided it is given the same program, computer can store large amount of data on an external storage devices such as a piece of information stored in a computer is always there unless some certain physical conditions makes it otherwise.

Electronic system have giving better response, time, office space, labour and cost keeping idle filing cabinates has increased dramatically. The information is now being generated in digital form; and that, the number of office automation system, including personal computers has increased. Electronic mails and other digital communication had increased the need for electronic filing. Information has not only increased in volume, but it has also becomes more valuable.

Besides being expensive, paper based system encourage duplication and can hinder in expensive distribution. The increased number of screens is now installed, makes it more feasible to distribute information in an electronic form.

Osuagwu (2002) says a manual process of information system utilizes electrically powered machines to produce a variety of financial records and reports, paper based filing can be computerized. This is by the use of electronic data processing system (EDP), which makes use of computers and related machines called peripheral equipment. The EDP system makes possible a high degree of accuracy but controls that errors are still possible through the programmer or operators omissions. The input data may be in error or the computer program may contain logical or syntax errors.

The use of electronic filing in any FRSC will clear up confusions and reduce the potential for MIS communication envisaged in manual filing. It can free management to spend its time in more productive. Computerized filing will equip the management than with the information and support needed to other works. As well, careful records keeping generally promotes responsible proactive management.

Indeed, careful planned electronic filing system will be a valuable management feel that would benefit any FRSC regardless of the size.

CHAPTER THREE
METHODOLOGY AND ANALYSIS OF THE PRESENT SYSTEM

A system is defined as any set of objects and ideas, and the interrelationships, which are ordered to a common goal or purpose. The system investigation is concerned with the study and understanding of underlying principles of the existing system and noting the basic information requirement of the present system.

Thus, involves analysis of all steps in the operation in other to decide how or find out how the system works.

To be able to make a good design, the present system must be evaluated, to find out what weaknesses are to be amended, to produce a reliable new system. To discover all the weakness, one can ask the following questions:

- Are there any bottlenecks that could be removed, which could be improved upon?
- How does the data flow look like?
- Are the report detailed enough and promptly produced?
- Does information reach the required discipline on time and if not, what can be done.
- Is the organization or FRSC database effective with what redundancy?

3.0 Research Methodology

The Research Methodology adopt is the internationally recognized systems project methodology called Structured Systems Analysis and Design Methodology (SSADM). It involves the following phases:

(i) **Preliminary Investigation:** involves problem identification and feasibility study. The aims to find out the problems or difficulties associated with the present method of record keeping and treating offenders as well as how the contemplated new system will ameliorate them.

(ii) **System Analysis:** This entails detailed study of the present system so as to gain deep insight into the structure and method of operation of the existing system including the available or lacking facilities for efficient and effective management of FRSC.

(iii) **Systems Design:** This aims to model or fashion out a new system of handling data and pass information that win eliminate the identified problems of the existing system and meet the requirements of the objective of the project within cost effective limits.

(iv) **System Development:** This involves scheduling, programming, testing and documentation of the newly designed system to ensure its workability and satisfactory result.

(v) **Implementation and Maintenance:** This means producing a prototype FRSC distributed database management system and providing for its regular update relevance.

The above SSADM approach will be supplemented by the principles of Artificial Intelligence Programming which involves selecting a database network.

3.1 Analysis of the Present System

The main purpose of this stage in project is to analyze facts in respect to the existing operation, procedures and system in order to obtain a full picture of the situation prevailing, so that an efficient computer assisted management system may be designed and implemented.

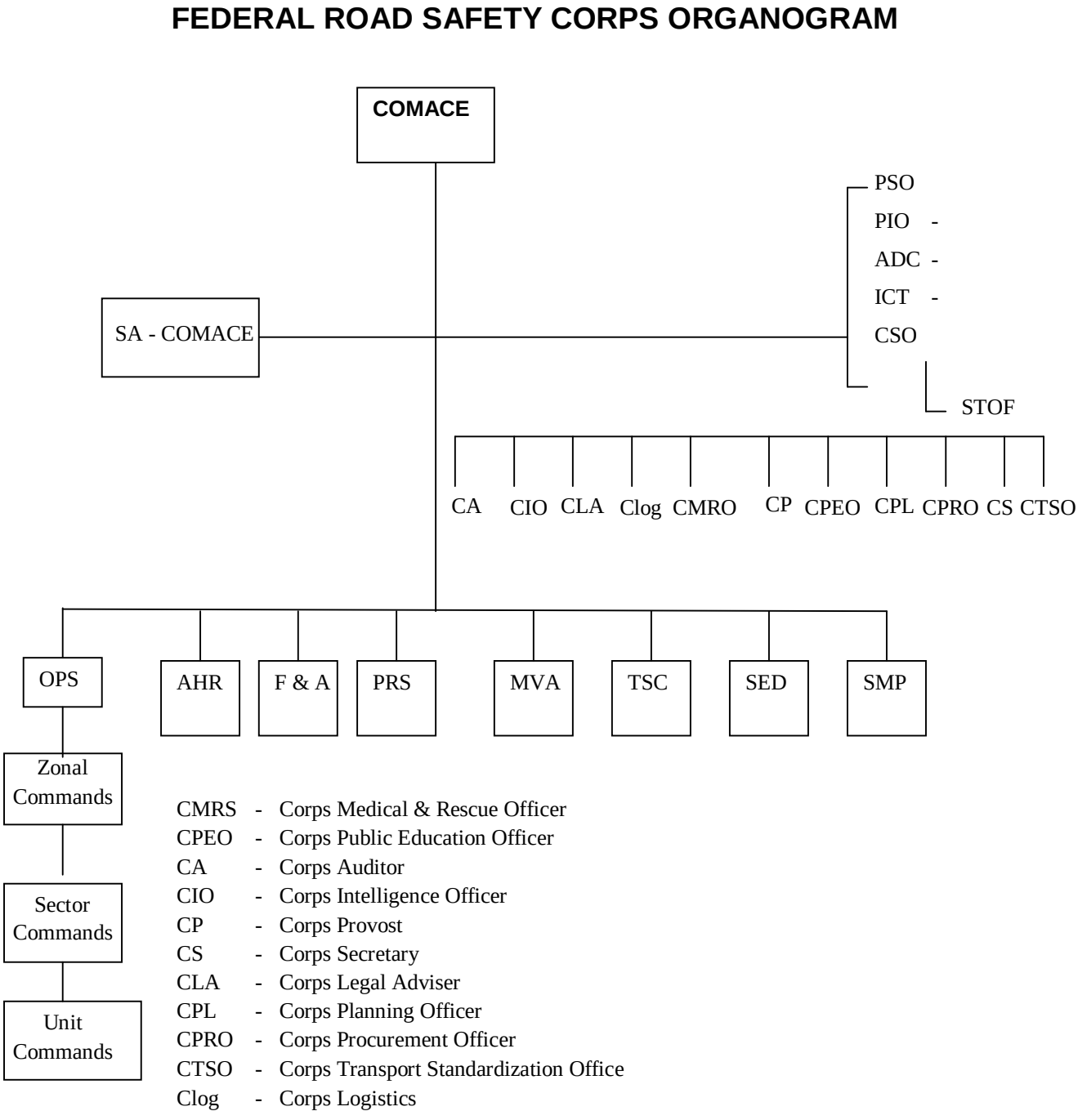


Figure 3.1: Federal Road Safety Corps Organogram

Table 3.1 Road Traffic Accident situation before the creation of Federal Road Safety Commission in 1988

Year	Estimate of Vehicle in use	Number of Accidents	Number of Deaths	Death per Fatal Accident	Accident per 1,000 Vehicles	Accidents fatality index	Death per 1,000	Injured People per 1,000 Accident (injury index)
1971	166	17,969	2,189	1.13	108	157	17	720
1972	195	21,537	3,654	1.32	110	170	19	689
1973	238	24,274	4,272	1.27	102	176	18	721
1974	292	27,412	4,635	1.21	94	169	16	697
1975	320	32,657	5,552	1.34	102	170	17	622
1976	345	40,881	7,761	1.26	118	190	22	660
1977	394	35,841	8,060	1.17	91	226	20	888
1978	464	36,111	9,252	1.27	78	256	20	799
1979	540	29,271	8,022	1.26	54	274	15	859
1980	650	32,138	8,737	1.21	49	272	14	793
1981	748	33,827	10,202	1.26	45	302	14	779
1982	860	37,099	11,382	1.29	43	320	13	749
1983	774	31,844	10,367	1.29	41	326	13	838
1984	696	28,892	8,830	1.26	42	306	15	826
1985	627	28,976	9,222	1.31	46	318	14	814
1986	564	25,188	8,154	1.33	45	324	14	880
1987	508	26,215	7,912	Na	52	302	16	Na

- *Sources: Fed. Ministry of Works & Housing; and Nigerian Police Force Headquarters, Lagos.*
- *Extract from a paper: The Road Traffic Accident problem in Nigeria and National Awareness by Dr. Femi Sumaila, Dept of Geo & Planning UniJos, 1992. Presented at the National Workshop on Road Safety in Nigeria.*

The table above summarizes the Road Traffic accident situation before the creation of FRSC from 1971 – 1987.

Table 3.2 Federal Road Safety Commission Establishment ACT (2007) section 10(4), 28(2) and National ROAD Traffic Regulations (NRTR) 2010 section 142

Offences and Penalties

S/N	OFFENCE	CODE	POINT	FINES
1.	Assaulting Marshal on Duty	AMD	10	10,000
2.	Attempting to corrupt Marshal on Duty	ATCM	10	10,000
3.	Construction Area speed limit violation	CASV	3	3,000
4.	Dangerous driving	DGD	10	50,000
5.	Do not move violation	DNM	2	2,000
6.	Driver's Licence Violation	DLV	10	10,000
7.	Driving under Alcohol/Drug influence	DAD	5	5,000
8.	Driving with worn-out/without spare tyre	TYV	3	3,000
9.	Road Traffic Violation	RDV	3	3,000
10.	Excessive Smoke Emission	ESE	5	5,000
11.	Failure to cover unstable materials	FCM	5	5,000
12.	Failure to fix red flag on projected load	RFV	3	3,000
13.	Failure to move over	FMO	3	3,000
14.	Failure to Report Accident	FRA	10	20,000
15.	Fire Extinguisher Violation	FEV	3	3,000
16.	Hospital rejection of Accident Victim	HRAV	-	50,000
17.	Inadequate construction warning sign	ICW	-	50,000
18.	Light/Caution sign violation	LCV	2	2,000
19.	Mechanically deficient vehicle	MDV	5	5,000
20	Obstructing Marshal on duty	OMD	2	2,000
21.	Operating a vehicle with forged documents	OVFD	10	20,000
22.	Overloading violation	OLV	`10	10,000
23.	Passenger manifest violation	PMV	10	10,000

24.	Riding Motorcycle without safety helmet	RMH	2	2,000
25.	Road obstruction violation	ROV	3	3,000
26.	Road Marking violation	RMV	5	5,000
27.	Route violation	RTV	5	5,000
28.	Seat Belt violation	SBV	2	2,000
29.	Speed limit violation	SLV	3	3,000
30.	Unauthorized removal/tampering with road sign	RTRS	5	5,000
31.	Under aged driving/riding violation	UDRV	2	2,000
32.	Use of phone while driving	UPWD	4	4,000
33.	Vehicle Licence violation	VLV	3	3,000
34.	Vehicle number plate violation	NPV	3	3,000
35.	Windscreen violation	WSV	2	2,000
36.	Wrongful overtaking	WOV	3	3,000
37.	Other violation offences	OVO	3	3,000

NOTE: Custody fee on impounded vehicles is ₦200.00 per day payable after 24 hours of grace.

3.1.1 Interpretation of Notice of Offences and Penalties in the Table above:

1. **Assaulting Marshal on Duty (AMD)** – manhandling a Road Marshal in the course of his duties and causing him bodily harm.
2. **Attempting to Corrupt Marshal (ATCM)** – offering bribes to Road Marshals by traffic offenders in order to prevent the course of justice.
3. **Construction Area Speed Limit Violation (CASV)** – failure to adhere to speed limits posted at construction sites.
4. **Dangerous Driving (DGD)** – Driving in a manner that is reckless and poses threat to the lives of oneself and other road users.

5. **Do Not Move Violation (DNM)** – Moving a vehicle bearing the "DO NOT MOVE sticker" or a vehicle whose movement has been restricted.
6. **Driver's Licence Violation (DLV)** - Driving without being in possession of a valid driver's licence for the category of vehicle being driven.

Classes of Driver's Licence:

Class A - Motorcycle

Class B - Motor vehicle of less than 3 tones gross weight other than motorcycle, taxi, stage carriage or omnibus.

Class C - Motor vehicle of less than 3 tones gross weight, other than motorcycle.

Class D - Motor vehicle other than motorcycle, taxi, stage carriage or omnibus but excluding an articulated vehicle drawing a trailer, agricultural machines and tractors and earth moving vehicles.

Class E - Motor vehicle other than a motorcycle, articulated vehicle, agricultural machines, tractors, and earth moving vehicles.

Class F - Agricultural machines and tractors.

Class G - Articulated vehicles.

Class H - Earth moving vehicles

Class J - Special, for physically handicapped persons.

7. **Driving under Alcohol Influence (DAD)** – Driving under the influence of alcohol or drugs.
8. **Driving without Spare Tyre (STV)** - driving a vehicle without a spare tyre.
9. **Driving with Worn out Tyre (WTV)** – with budges or generally unsafe tyres.
10. **Excessive Smoke Emission (EME)** – driving with excessive smoke polluting the environment and detracting easy passage of other road users.

11. **Failure to Cover Unstable Materials (FCM)** – Failure to cover securely, unstable materials such as gravel, sand, refuse and thereby capable of causing spillage on the highway.
12. **Failure to fix Red Flag on Projected Load (RFV)** – driving a vehicle with a projected load in excess of 2,8m without adequate warning, i.e. red flag at the end of the projection in daytime and a red warning light at the end of the projection at night.
13. **Failure to Move over (FMO)** – In the case of slow moving vehicles on a single carriageway, failure to move out of the road when four or more vehicles have queued behind.
14. **Fire Extinguisher Violation (FEV)** – driving a vehicle without appropriate Fire Extinguisher or with expired fire extinguisher.
15. **Hospital Rejection of Crash Victim (HRCV)** – hospital's refusal to accept and administer treatment on Road Traffic Crash victims.
16. **Inadequate Construction Warning sign (ICW)** – Failure of a road construction company to provide adequate warning and directional/diversion signs at road repairs or road construction sites.
17. **Lights/Caution signs Violation (LCV)** - Failure to use headlights, rear lights between 1900hrs and 0630 hrs or when it is dark while on the highway or failure to use directional signal indicators when required to do so.
18. **Mechanically Deficient Vehicle (MDV)** – being on the highway with a mechanically deficient vehicle such as emitting dark exhaust fumes that impair vision, driving a vehicle with bent chassis, driving a damaged vehicle, etc.
19. **Obstructing Marshal Duties (OMD)** – Unnecessary interference and willful disruption/obstruction of Road Marshal in carrying out his/her duties.

20. **Operating a Vehicle with Forged Documents (OVFD)** – Driving while being in the possession of forged or fake driver's licence or vehicle documents.
21. **Overloading Violation (OLV)** – Being on the highway with a Motor vehicle loaded with passengers or goods over and beyond the prescribed number or weight respectively.
22. **Passenger ManifesT Violation (PMV)** – being on the highway without a detailed copy of the passenger manifest, by passenger carrying commercial vehicles on interstate journeys.
23. **Road Obstruction Violation (ROV)** - Obstructing the highway by indiscriminate parking, repairs of broken down vehicles on the road or obstructing the highway with any other object, or stopping on the road in a manner that inhibit free traffic flow at any point in time or endangers oneself of other road users.
24. **Road Markings Violation (RMV)** - Failure to observe road markings, regulatory, prohibitory or mandatory road traffic signs.
25. **Route Violation (RTV)** - Contravention of the provisions of any traffic regulations and routes to be followed by vehicles to which the vehicle belongs or the appropriate roads to be used for traffic by such vehicles.
26. **Seat Belt Violation (SBV)** – driving a vehicle without using the Seat Belt and/or ensuring that other passengers use the belts, where applicable.
27. **Speed Limit Violation (SLV)** - Driving or riding on the highway in excess of the prescribed speed limits for a category of vehicle or road. Maximum speed limits for different categories of Motor vehicles are as follows: -

    Cars: 100km/hr

    Taxi and Buses: 90km/hr

    Tankers and Trailers: 60km/hr

    Towing vehicles: 70km/hr and 45km/hr when engaged.

28. **Underage Driving/Riding Violation (UDRV)** – driving a motor vehicle and riding a motorcycle before attaining the age of 18 years.
29. **Use of Phone While Driving (UPWD**) – driving a vehicle and at the same time receiving and/or making telephone calls. This is also applicable even at hold-ups as long as the vehicle is in traffic.
30. **Vehicle Licence Violation (VLV)** - Being on the road with expired vehicle licence or not being in possession of one.
31. **Vehicle Number Plate Violation (NPV)** – Obstructing the view, mutilating of or failure to display appropriate Number Plate on Motor vehicle.
32. **Windscreen Violation (WSV)** – operating a motor vehicle on the road without a windscreen or a severely damaged windscreen that impairs vision for driving.
33. **Wrongful Overtaking (WOV)** - Overtaking a vehicle when it is unsafe to do so.

Table 3.3 Road Traffic Crashes Data and Summary of Reported Road Traffic Crashes Trends in Nigeria (2001-2010)

YEAR	FATAL	SERIOUS	MINOR	TOTAL CASES	NO. KILLED	NO. INJURED	TOTAL CASUALTY
2001	4800	7701	4987	17488	6500	10786	17286
2002	4757	7081	4300	16138	6538	17341	23879
2003	4621	6888	4356	15865	6795	17728	24523
2004	5287	6820	4499	16606	8473	20677	29150
2005	6966	8185	5379	20530	9946	23249	33195
2006	4029	7190	3325	14544	7407	22112	29519
2007	3910	7882	2572	14364	6452	18116	24568
2008	3275	6948	4051	14274	5351	16897	22248
2009	2299	4143	2620	9062	4519	15779	20298
2010	2600	5550	964	9114	4944	17390	22334
TOTAL	**42544**	**68388**	**37053**	**147985**	**66925**	**180075**	**247000**

Table 3.3 above shows the total road crashes annually. It also shows total cases, number killed, number injured and total causality from 2001 to 2010.

3.2 Method of Data Collection

In this section, the following method of information gathering tool utilized by the researcher will be discussed:

(a) Interview: the interview method involves the researcher coming into direct contact with respondent from whom information is obtained on first hand information basis.

(b) Observation method: this research was caused my visitation to different places especially government establishments and private sectors where computers are used. This enabled my interaction with the user of some of the packages and things were observed practically, as to ascertain the prospects benefits and weakness of the software in use.

(c) Examination of text books and other materials: vast majorities of information which have facilitated this work were obtained from various database textbooks, and internet search, and some literature review from scholars.

3.2.1 Overview of the Existing Manual System

Before going into investigating the new system, the old system also needs to be analysed. This will be based on the input, output, procedures, objectives and constraints of the existing manual system, so as to state the need for designing a new system.

3.2.2 Feasibility Study

Feasibility means that a project is possible, practical and realistic. Factors to be considered in evaluating feasibility are financial, operational, technical, scheduling and human.

Completion of a feasibility study means that the original problem or need has been understood, alternative solution has been considered, and the best one has been recommended for evaluation.

A feasibility study should conclude with a clear cut recommendation as to whether the new system should be developed, along with a projected budget for the system development project.

3.3 The Organization and its Environment

Prior to the establishment of Federal Road Safety Commission in 1988, there was no concrete and sustained policy action to address the carnage on Nigerian roads.

Earlier attempts in this direction were limited to discrete and isolated attempts by some states of the federation and individuals.

Notably among the efforts to institute a formidable road safety program, was the effort of Shell Petroleum Development Company of Nigeria (SPDC) between 1960 – 1965. The effort of the Nigerian Army in the training of its officers and men on road safety in the early 70's also contributed to road safety idea and consciousness in Nigeria. The Nigerian Army started the first public Road Safety Campaign in 1972 when it initiated on annual Road Safety week.

The first deliberate policy on road safety was the creation in 1974 of the National Road Safety Commission (NRSC) by the then Military Government. The impact of the Commission was however, not sustained.

In 1977, the Military Administration in Oyo State, Nigeria established the Oyo State Road Safety Corps which made some local significant (second to Ethiopia), the Nigerian Government saw the state. This lasted till 1983 when it was disbanded by the Federal Government. With the continued dangerous trend of road traffic accidents in Nigeria then, which placed it as one of the most road traffic accident (RTA) proned countries worldwide (second to Ethiopia), the Nigeria Government saw the need to establish the present Federal Road Safety Corps in 1988 to address the Road Safety carnage on the highways.

3.4 Demographic Variable

The unpleasant trend in the nation's road system which resulted in upsurge in road traffic accidents made the federal Government initiate a search for a credible and effective response to the challenge.

In February 1988, the Federal Government established the Federal Road Safety Commission through Decree No. 45 of the 1988 as amended by Decree 35 of 1992 referred to in the statute books as the FRSC Act Cap. 141 Laws of the Federation of Nigeria (LFN) passed by the National Assembly as Federal Road Safety Commission (establishment) Act 2007.

3.5 Present Procedure

The functions of the commission generally relates to:

(a) Making the highway safe for motorists and other road users.

(b) Recommending works and devices designed to eliminate or minimize accidents on the highways and advising the Federal and State Governments including the Federal Capital Territory Administration and relevant governmental agencies on the localities where such works and devices are required, and

(c) Educating motorists and members of the public on the importance of discipline on the highway.

In particular, the commission is charged with responsibilities as follows:

- Preventing or minimizing accidents on the highway
- Clearing obstructions on any part of the highways
- Educating driver, motorists and other members of the public generally on the proper use of the highways.

- Designing and producing the drivers license to be used by various categories of vehicle operators.
- Determine from time to time the requirements to be satisfied by an applicant for a driver's license.
- Design and producing vehicle number plates.
- The standardization of highway traffic codes.
- Preventing or minimizing accidents on the highways.
- Clearing obstructions on any part of the highways.
- Giving prompt attention and care to victims of accidents.
- Conducting researches into causes of motor accidents and methods of preventing them and putting into use of the results of such researches.
- Determining and enforcing speed limits for all categories of roads and vehicles and controlling the use of speed limiting devices.
- Cooperating with bodies or agencies or groups in road safety activities or in prevention of accidents on the highways.
- Making regulations in pursuance of any of the functions assigned to the Corps by or under this Act.
- Regulating the use of sirens, flashers and beacon lights on vehicles other than ambulances and vehicles belonging to the Armed Forces, Nigeria Police, Fire Service and other Para-Military agencies.
- Providing roadside and mobile clinics for the treatment of accidents victims free of charge.
- Regulating the use of mobile phones by motorists.
- Regulating the use of seat belts and other safety devices.
- Regulating the use of motorcycles on the highways
- Maintaining the validity period for drivers' license which shall be three years subject to renewal at the expiration of the validity period.

In exercising these functions, members of the Commission shall have power to arrest and prosecute persons reasonably suspected to having committed any traffic offence.

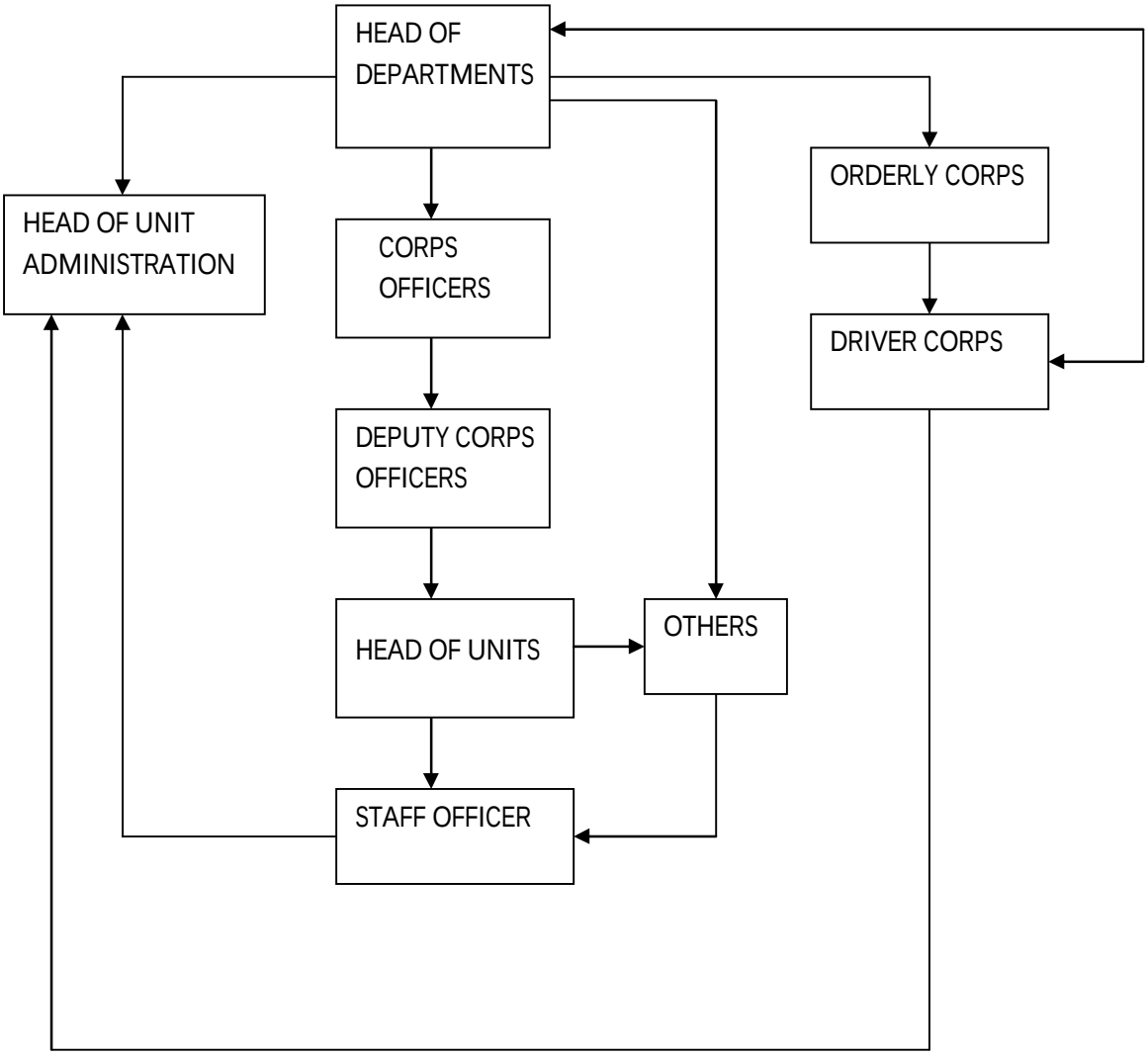


Fig. 3.2 Data Flow Diagram (DFD) of the Present System

The data flow diagram above shows the FRSC operation. It shows movement of operation in the commission.

3.6 PRODUCT FLOW

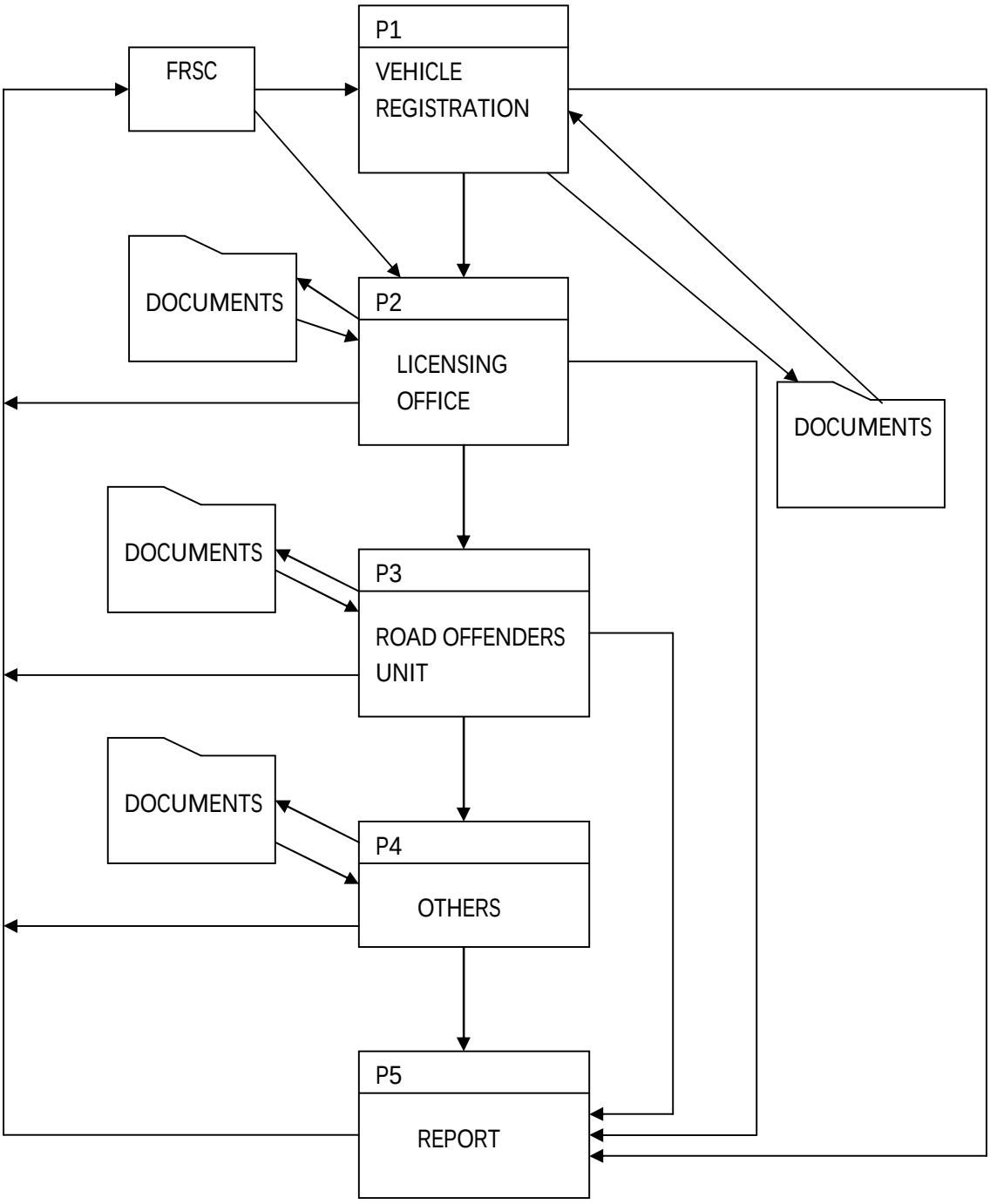


Fig. 3.3 Product Flow

The figure above shows the product flow of operation in FRSC. It displays workflow movement in the organization.

3.7 INFORMATION FLOW

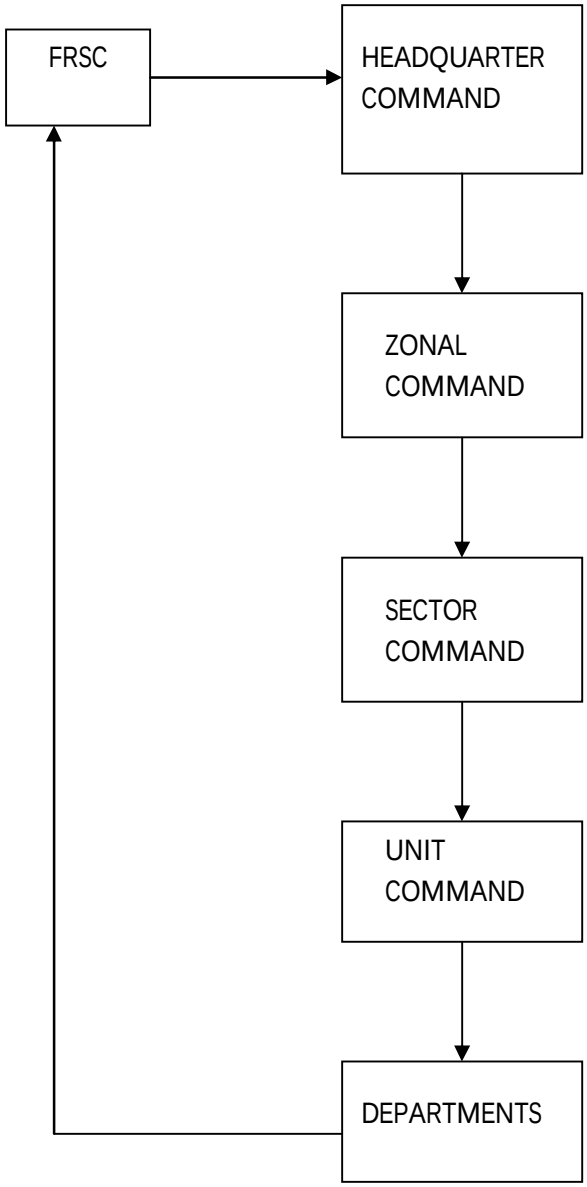


Fig. 3.4 Information Flow

The figure above shows the Information flow in the FRSC operation, it illustrates how information goes in the commission.

3.8 Weakness and Problems Identified from the Present System

After the investigation and analysis of the present system, there are so many problems identified, there are: -

(i) Inadequate manual record-keeping

(ii) Lack of proper offenders rate record

(iii) No comprehensive record for the casualties/vehicle crashed in accidents.

(iv) No measure to know the ration of accident in monthly or annually.

(v) So many paper works everywhere.

(vi) Bringing a file out is a very big problem because of how it was clustered and shattered.

(vii) Lack of proper file arrangement

(viii) Time consuming in the manual processing is a big task

(ix) The present is not flexible etc.

3.9 Expectation from the New System

The following are some of the expectations from the new system: -

(a) To have proper record keeping via database

(b) Capable of generate comprehensive report i.e. monthly or annually.

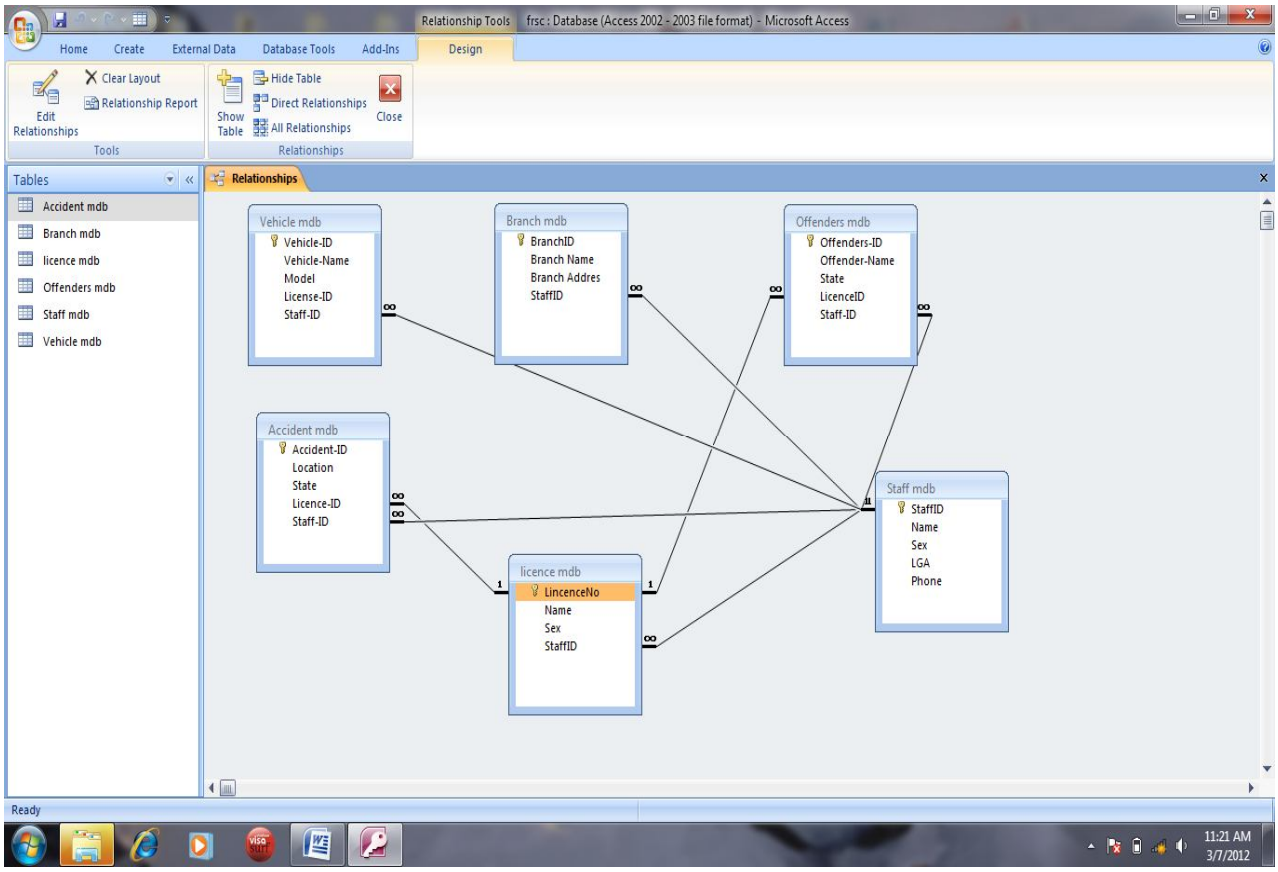
(c) Too much paper works or accessories will be reduced in various offices.

(d) There will be a limited time in searching information.

(e) The system will be flexible and user friendly

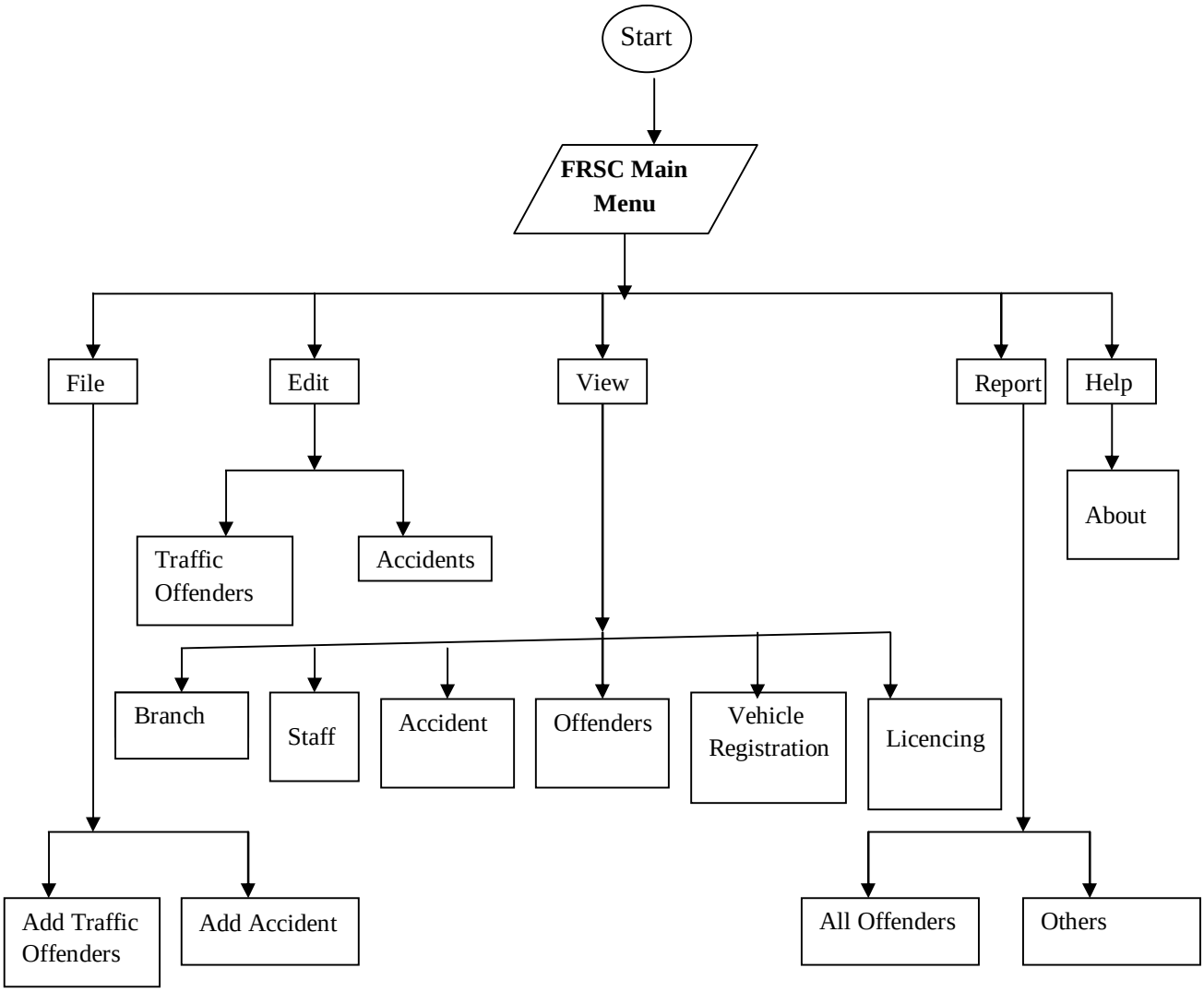
(f) Insertion of accident and traffic offender information in the database will be so easy and will reduce error occurrences etc.

3.10 Entity-Relationship Diagram



The diagram above shows the entity table that links all database structures together as it forms relationship.

3.11 High Level Model of the New Proposed System



The above diagram is the High Level model solution for the proposed system or control centre for the new system.

CHAPTER FOUR

SYSTEM DESIGN

System design entails using the analysis to produce a well designed system, which will satisfy the aims of the FRSC. At the same time, it makes most economical use of the business resources.

System analysis is the study of procedures for collecting, organizing, transmitting, and evaluating information with the aid of determining precisely what must be accomplished, what is obtainable for purpose, and finally formulating a system which meets the organizational objectives.

4.1 Specifications for the New System

The newly proposed system is expected to provide a computerized process for the preparation of FRSC information system in Nigeria by:

(a) Effectively and adequately organizing the FRSC database, the new system is expected to provide an effective database that would be adequately organized the accidents and road offenders information.

(b) To provide information for the preparation of licensing. Information needed for licensing must be handy and always easy for retrieval when needed.

(c) To ensure data security and integrity by ensuring protection against misplaced, lost of records and provides access only to authorized users.

(d) Help to eliminate error in data due to manual processing. Wrong information leads to wrong vehicle registration. To avoid this, data should be free from errors.

4.2 System Design

Having derived the requirements for the new system through the detailed analysis of the old system, the next step is the construction of the detailed designed plan.

The aim of this is to effectively divide the overall problem into small, and more manageable problems that can be easily handled by separate program modules. The separate program modules will later be integrated forming the entire system.

This designed methodology is called “Top-Down Design”. The program modules that control the main logic of the system must rely subordinate tasks reliably.

4.3 Program Design

The program design does the work of identification of all modules of the software and the relationship that exists between them and also the solution statement and coding. The Top-Down design method of modular programming would be adopted. The top-down design therefore; is a design process were by a software designer begins, from a top most module to break the entire system into sub-systems, each module has a task to perform and later integrated.

The major idea in top-down design is that the design must progress from the general purpose, each program module being progressively designed. Normally the main program links the other which sub-program or known as sub-routine.

Each sub-program performs its logical task. Modular programming is simply the art of writing programs in independent modules; the central idea in modular

programming is to sub-divide the system into smaller units that are independently testable and which can be integrated to accomplished the overall program objectives. Program flowcharts are essentially logic diagram used by programmers to graphically depicts a sequential of operations and decisions.
The logic of program in this project are as shown in figure 4.3.1 below

System Start-up Procedure

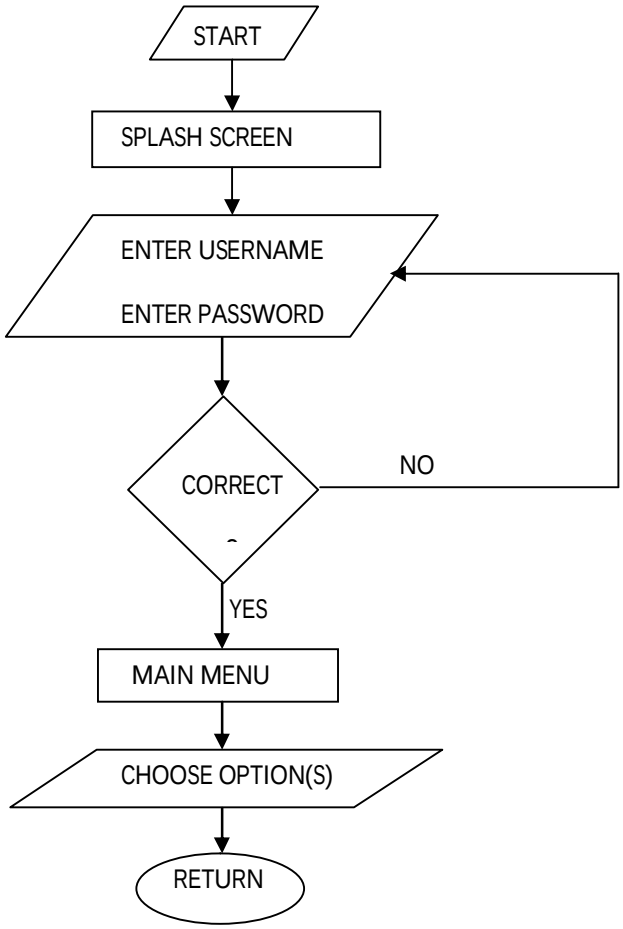


Figure 4.3.1 System start-up procedure

The figure above is the procedure or steps follow to enter into the New System.

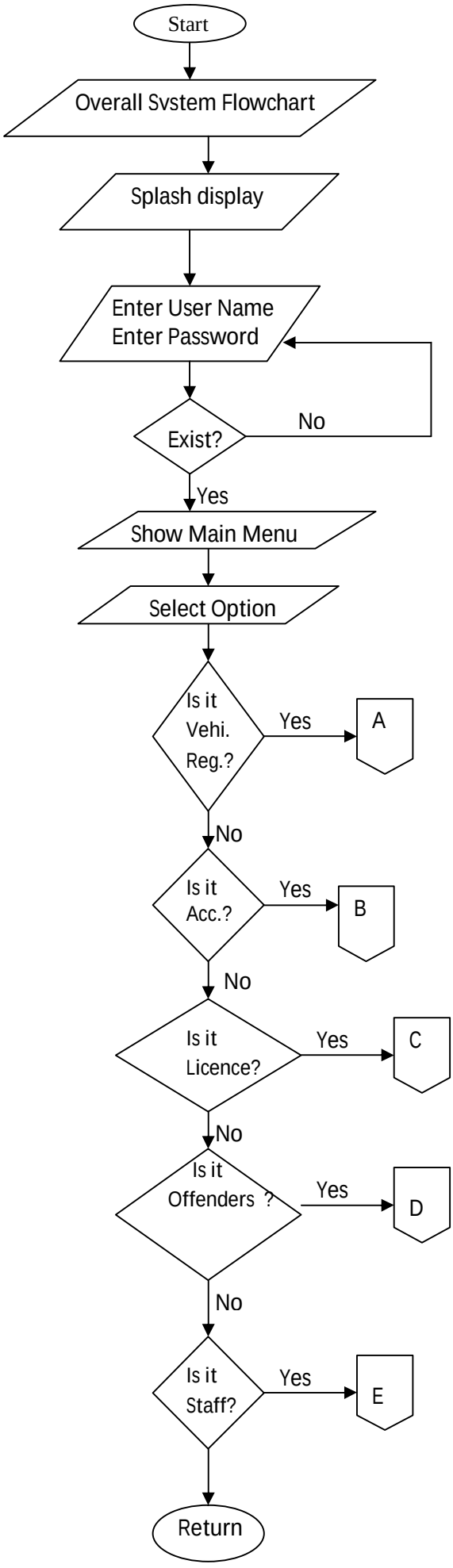


Fig. 4.3.1.1 Main Routine Flowchart

The figure above is the overall / integrated flowchart. That is the main menu flowchart with its sub-modules link.

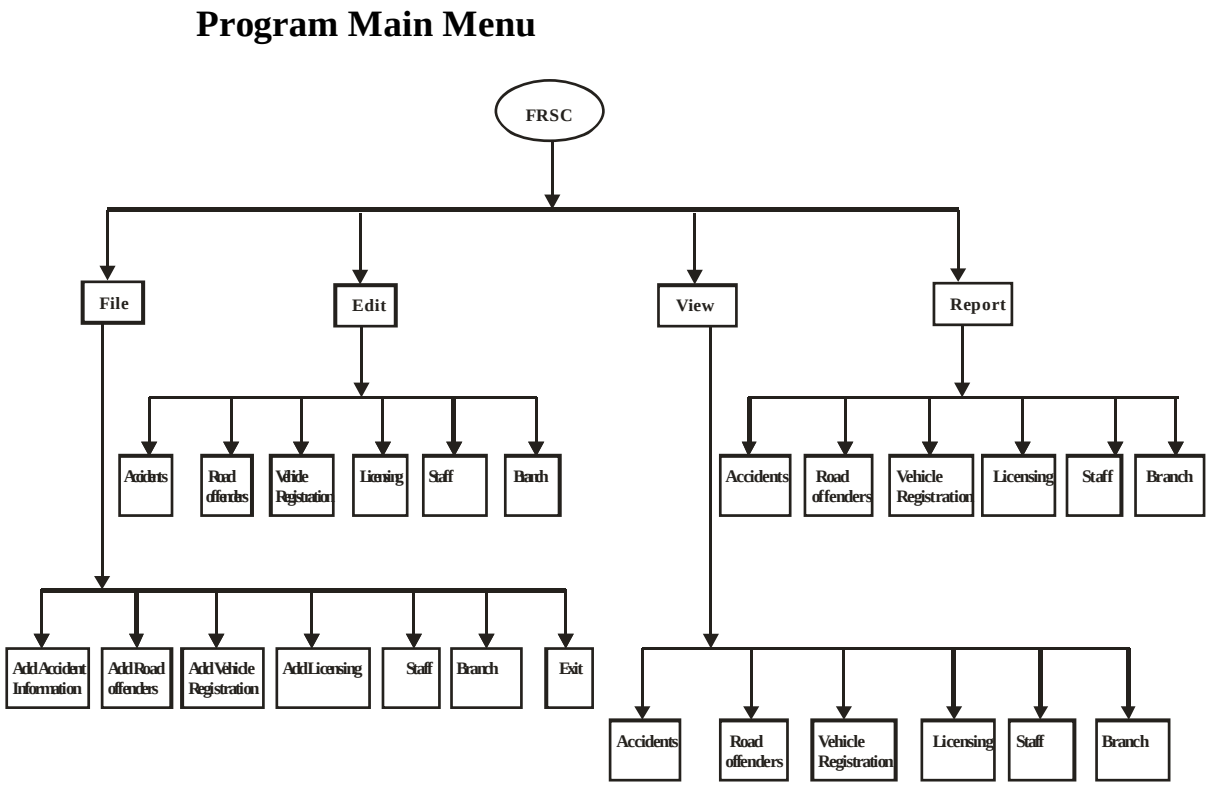


Figure 4.3.2 Program main menu

4.4 Database Specification

The first step in developing the new system is to develop the computer-based system distributed database that will be used in developing the new system (Software) for the FRSC.

The database was designed in Microsoft Access by using real data provided by FRSC. The database contains the required information about new licensing, accidents, road offenders, and vehicle registration.

It organizes and manages the information to obtain the accidents and road offenders reports required, to support the FRSC information processing. The database was designed to be a relational database where a common field relates

different tables of data to each other. The structure of each table is shown below:

Table 4.4.1 Password.mdb

S/N	FIELD NAME	TYPE	SIZE
1	Username	Text	25
2	Password	Text	10

The table above is meant for the system security.

Table 4.4.2 Staff Bio Data Table

S/No.	NAME	TYPE	SIZE
1	Staff ID	Number	10
2	FName	Text	20
3	LName	Text	30
4	Sex	Text	7
5	Age	Number	3
6	Address	Text	50
7	State	Text	30
8	L.G.A.	Text	35
9	Date of Employment	Date	8
10	Rank	Text	10
11	Qualification	Text	15
12	Grade level	Number	5
13	Operation unit	Text	20
14	Present status	Text	10
15	Phone No.	Number	12
16	E-mail Address	Text	30
17	Passport	Text	250
18	Comment	Text	250

The table above is the database structure for the FRSC staff Bio Data

Table 4.4.3 Accident.mdb

S/N	FIELD NAME	TYPE	SIZE
1	Accident Number	Integer	10
2	Date of Accident	Date	8
3	Type of Vehicle	Text	35
4	Location	Text	50
5	No. of Passengers	Integer	4
6	No. of passengers dead	Integer	4
7	No. of Passengers Injured	Integer	4
8	Cause of Accident	Text	50
9	Comment	Text	150

The table above is the database structure for the Accident.

Table 4.4.4 Road Offenders.mdb

S/N	FIELD NAME	TYPE	SIZE
1	Offenders ID	Integer	4
2	Offenders Name	Text	25
3	Offenders sex	Text	7
4	Type of Offence	Text	30
5	Vehicle Plate No.	Text	10
6	Type of Vehicle	Text	25
7	Amount charge	Currency	8
8	Date of Offence	Date	8
9	Comment	Text	150

The above is the database structure for the Road Offenders.

Table 4.4.5 Driver Licence.mdb

S/N	FIELD NAME	TYPE	SIZE
1	Issue State	Text	25
2	Issue Date	Date	8
3	Name	Text	25
4	Address	Text	50
5	Sex	Text	7
6	Height	Integer	4
7	Blood group	Text	5
8	Date of birth	Date	8
9	1st issue date	Date	8
10	Expire date	Date	8
11	Passport	Text	150
12	Authorized sign	Text	50
13	Holder's sign	Text	50
14	National ID No	Integer	4

The table above shows the Drivers licence structure database.

Table 4.4.6 Vehicle Registration.mdb

S/N	FIELD NAME	TYPE	SIZE
1	Vehicle ID	Integer	10
2	Vehicle Name	Text	25
3	Type of Vehicle	Text	35
4	Model	Text	35
5	Chasis No.	Text	30
6	Engine No.	Text	30
7	Body Colour	Text	25
8	Year of manufact.	Text	5
9	Owners Name	Text	25
10	Sex	Text	7
11	Address	Text	25
12	Date of purchase	Date	8
13	Plate No.	Text	10
14	Comment	Text	150

The table above shows the Vehicle Registration database structure

Table 4.4.7. Branch.mdb

S/N	FIELD NAME	FIELD TYPE	SIZE
1	Branch ID	Number	10
2	Branch Name	Text	35
3	Address	Text	35

The table above is for relationship and branch structure for the New System.

4.5 Program Modules Specification

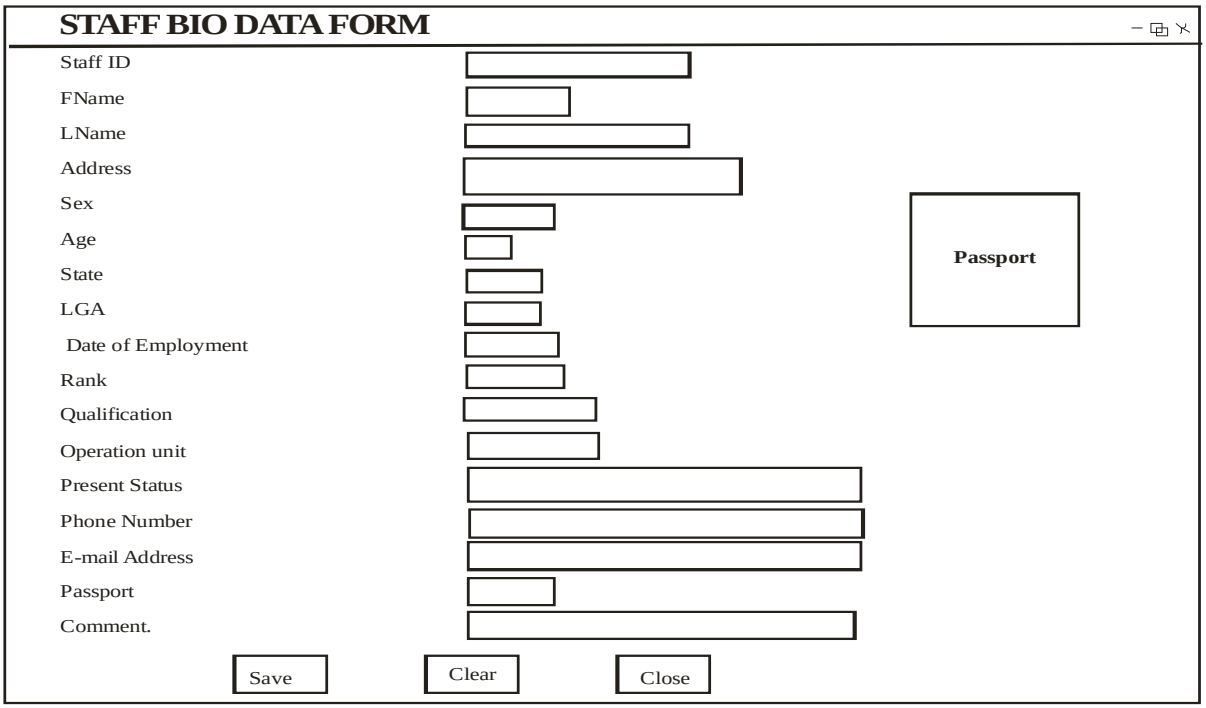
Table 4.5.1 Program Specification

S/N	NAME	DESCRIPTION
1	Frmsplash	Program welcome screen
2	Frmlogin	System security login
3	Frmmenu	The control center of the software
4	FrmAdd-Accident	Module for recording of accident victims
5	FrmAdd-Offenders	Road offenders input module
6	FrmAdd-Registration	Vehicle registration input module
7	FrmAdd-License	This is the licensing capturing module
8	FrmEdit-Accident	Module for accident data update
9	FrmEdit-Offence	Road offenders modification module
10	FrmEdit-Registration	This module is for vehicle registration update
11	FrmEdit-License	Licensing modification module
12	RptAccident	All accidents summary report
13	RptOffence	Road offenders report
14	RptLicense	Licensing module report
15	RptRegistration	Vehicle registration summary report
16	FrmAdd-Staff	Module for Staff Bio data
17	FrmEdit-Staff	Module for Staff data update
18	Rptstaff	All Staff summary report

The table above describes all the modules/sub-modules used in the new system.

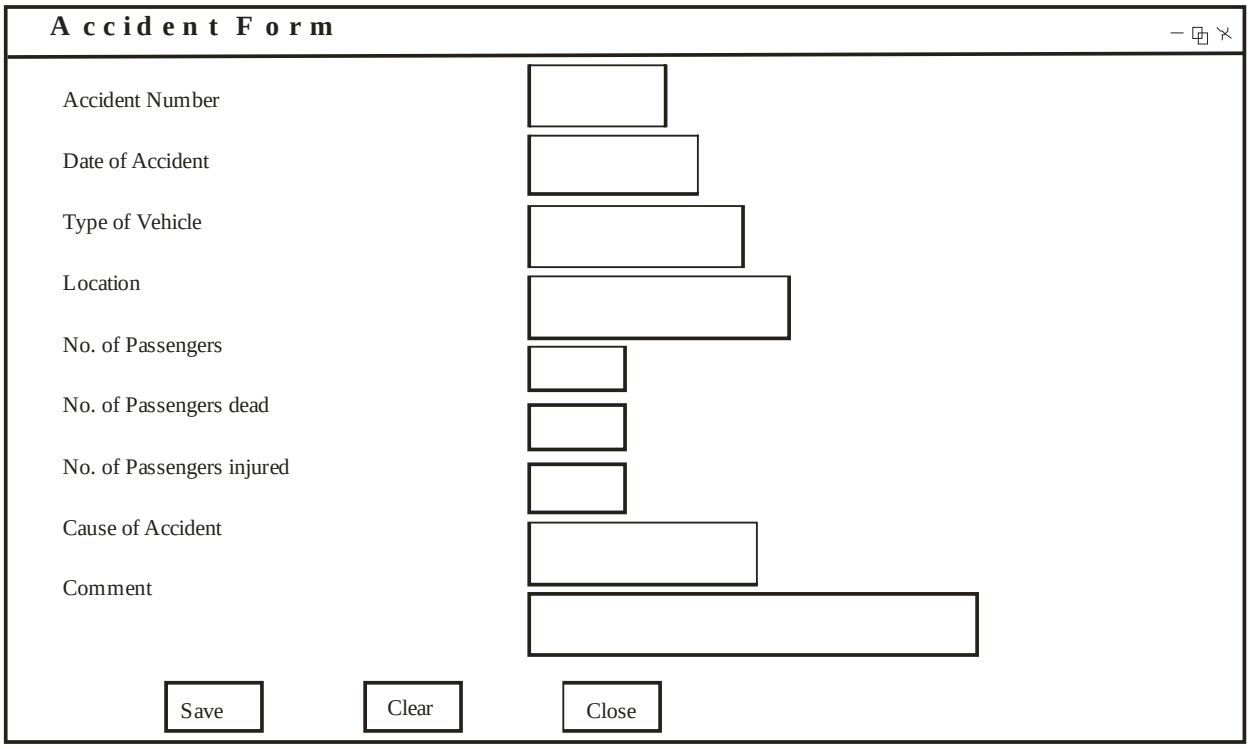
4.6 Input/Output Format

Table 4.6.1 Staff bio data Input Form



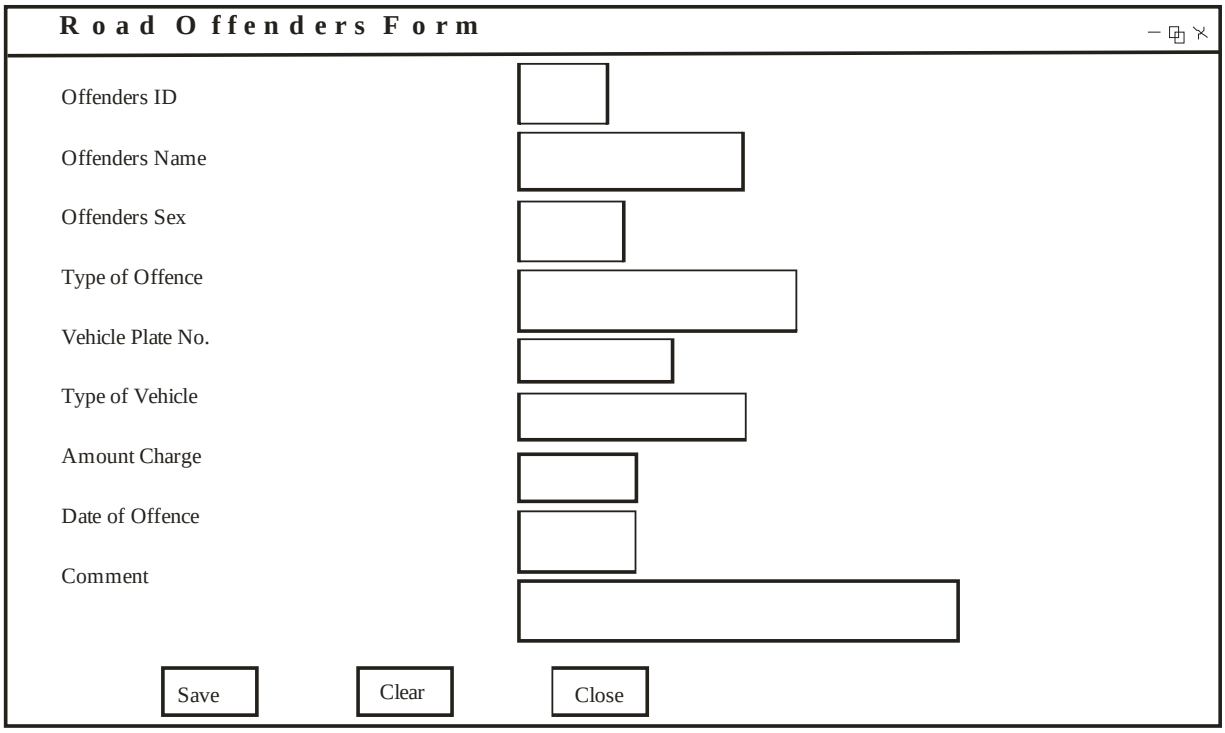
The table above is the Staff Bio data entry screen.

Table 4.6.2 Accident Input Form



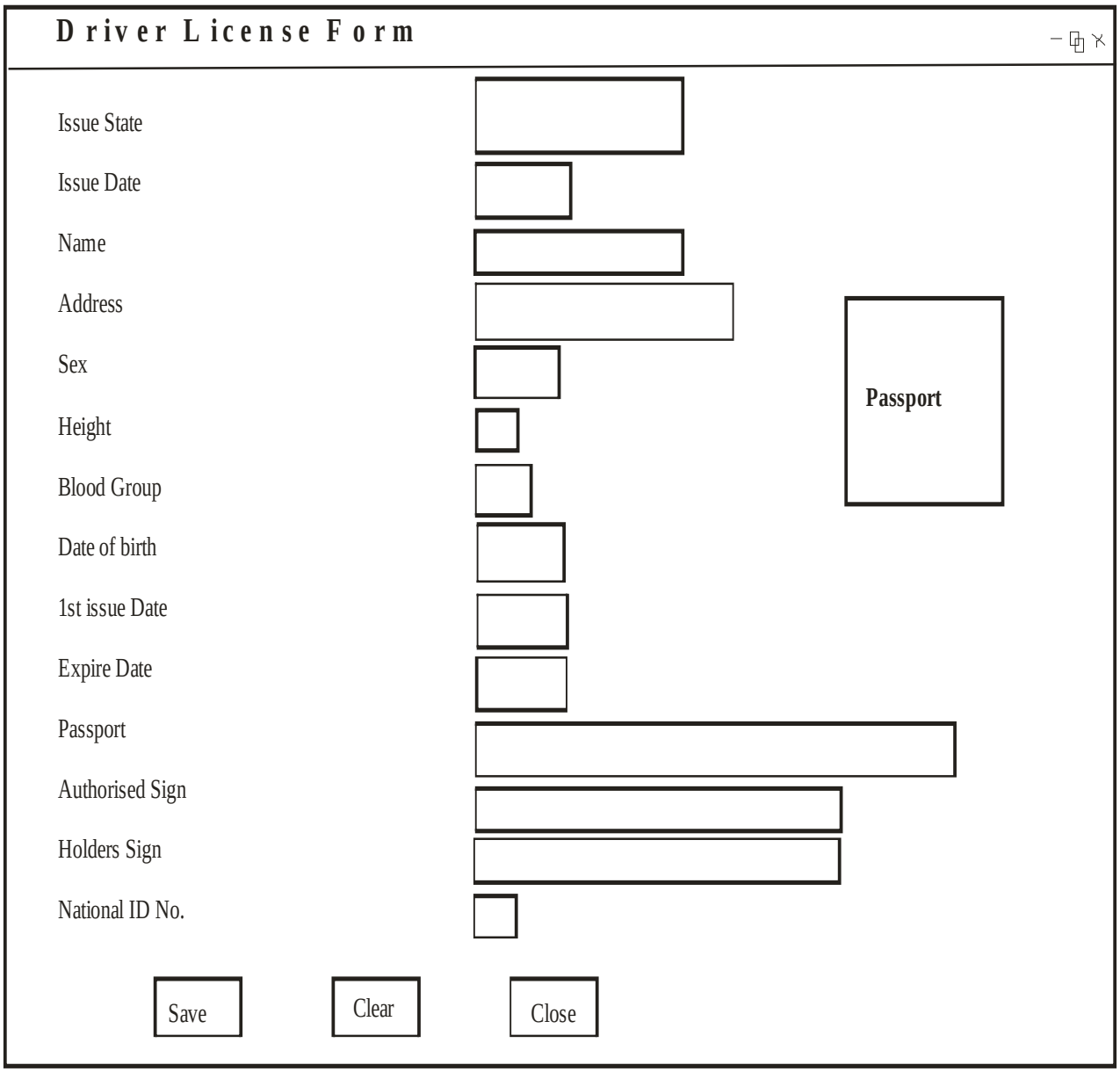
The table above is for accident entry screen.

Table 4.6.3 Road Offenders Input Form



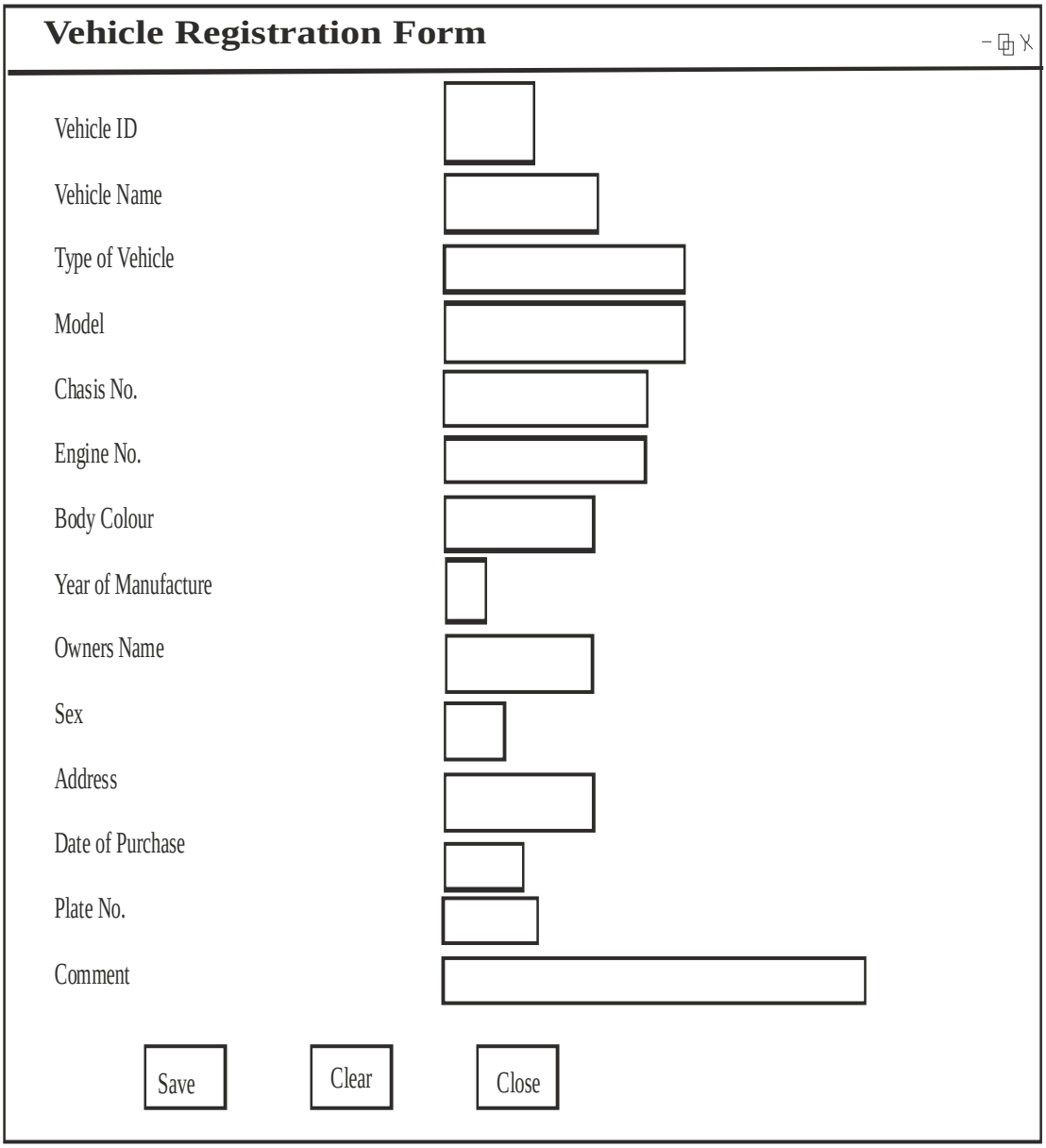
The table above is the road offenders entry screen.

Table 4.6.4 Driver Licence Input Form



The table above is the Drivers Licence entry screen.

Table 4.6.5 Vehicle Registration Input Form



The table above is the Vehicle Registration Screen design.

Table 4.6.6 Staff Output Design

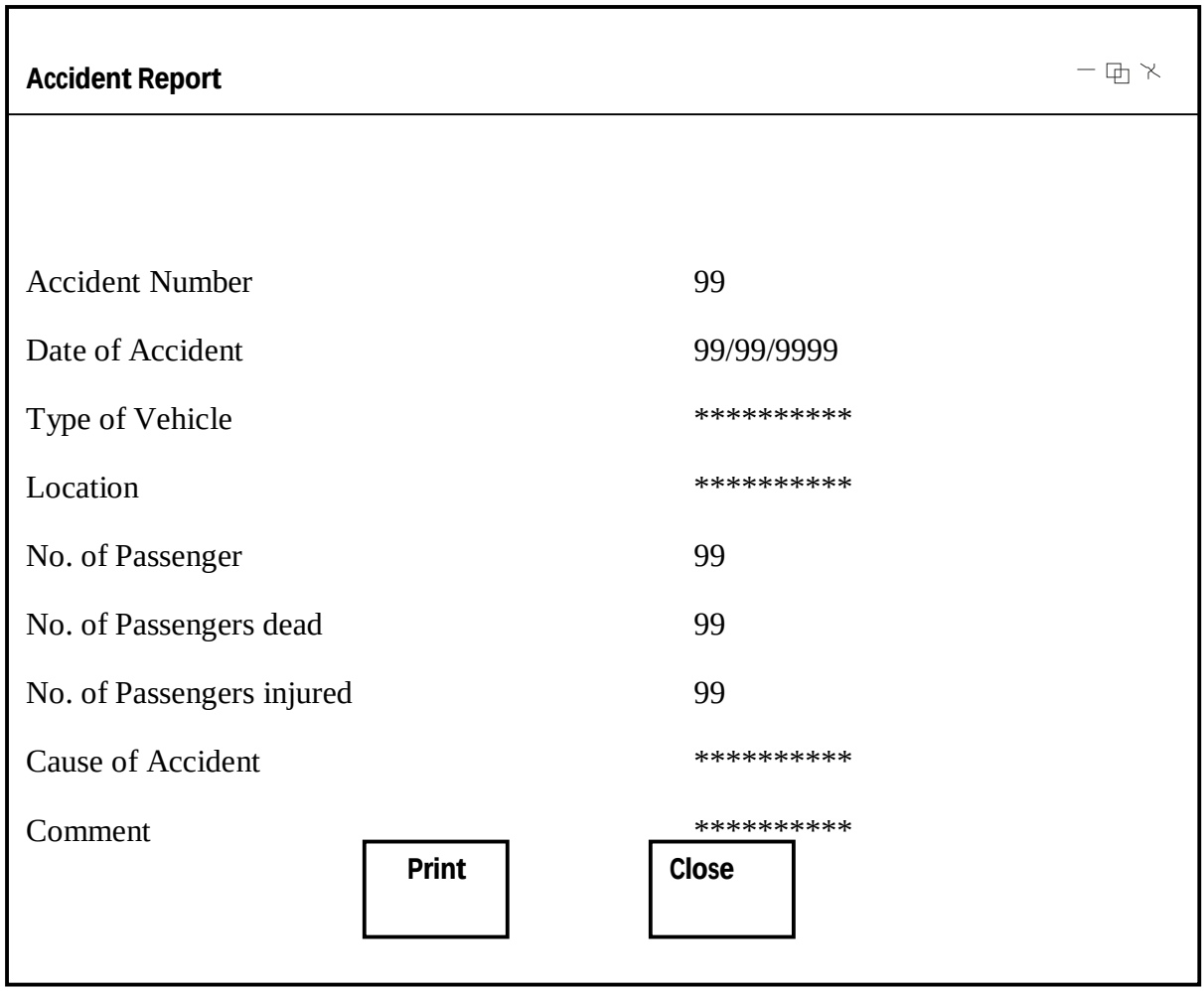
Staff Report

Staff ID	99
FName	99/99/9999
LName	**********
Sex	**********
Age	99
Address	99
State	99
LGA	**********
Date of Employment	**********
Rank	**********
Qualification	**********
Grade Level	**********
Operation unit	**********
Present status	**********
Phone Number	**********
E-mail Address	**********
Passport	**********
Comment	**********

Print **Close**

The above is the Staff summary output design.

Table 4.6.7 Accident Report



The design above the Accident summary Report Design.

Table 4.6.8 Road Offenders Output Design

Driver's Licence Report

Issue State	*********
Issue Date	99/99/9999
Name	**********
Address	**********
Sex	**********
Height	99.99
Blood Group	**********
Date of birth	99/99/9999
1st issue Date	99/99/9999
Expire Date	99/99/9999
Passport	*********
Authorized Sign	*********
Holders Sign	*********
National ID No.	*********

****
****
****
****
****
****

Print **Close**

The design above shows the Road offenders summary report design

Table 4.6.9 Drivers Licence Output Design

Road Offenders Report

Offenders ID	99
Offenders Name	**********
Offenders Sex	**********
Types of Offence	**********
Vehicle Plate No.	**99**
Type of Vehicle	**********
Amount of Charge	9999.99
Date of Offence	99/99/9999
Comment	**********

Print **Close**

The table above shows the Drivers Licence summary report design.

Table 4.6.10 Vehicle Registration Output Design

Vehicle Registration Report

Vehicle ID	9999
Vehicle Name	**********
Type of Vehicle	**********
Model	**********
Chasis No.	***99****
Engine No.	***99****
Body Colour	*********
Year of Manufacture	99/99/9999
Owners Name	**********
Sex	**********
Address	**********
Date of Purchase	99/99/9999
Plate No.	**999**
Comment	*********

Close Print

The table above shows the Vehicle Registration summary report design

Thus, the design is so simple to use for the different users, if any one intended to use the software, the person will simply go to the Chapter 5, session 5.5.2 and follow the steps.

4.7 Overall Data Flow Diagram

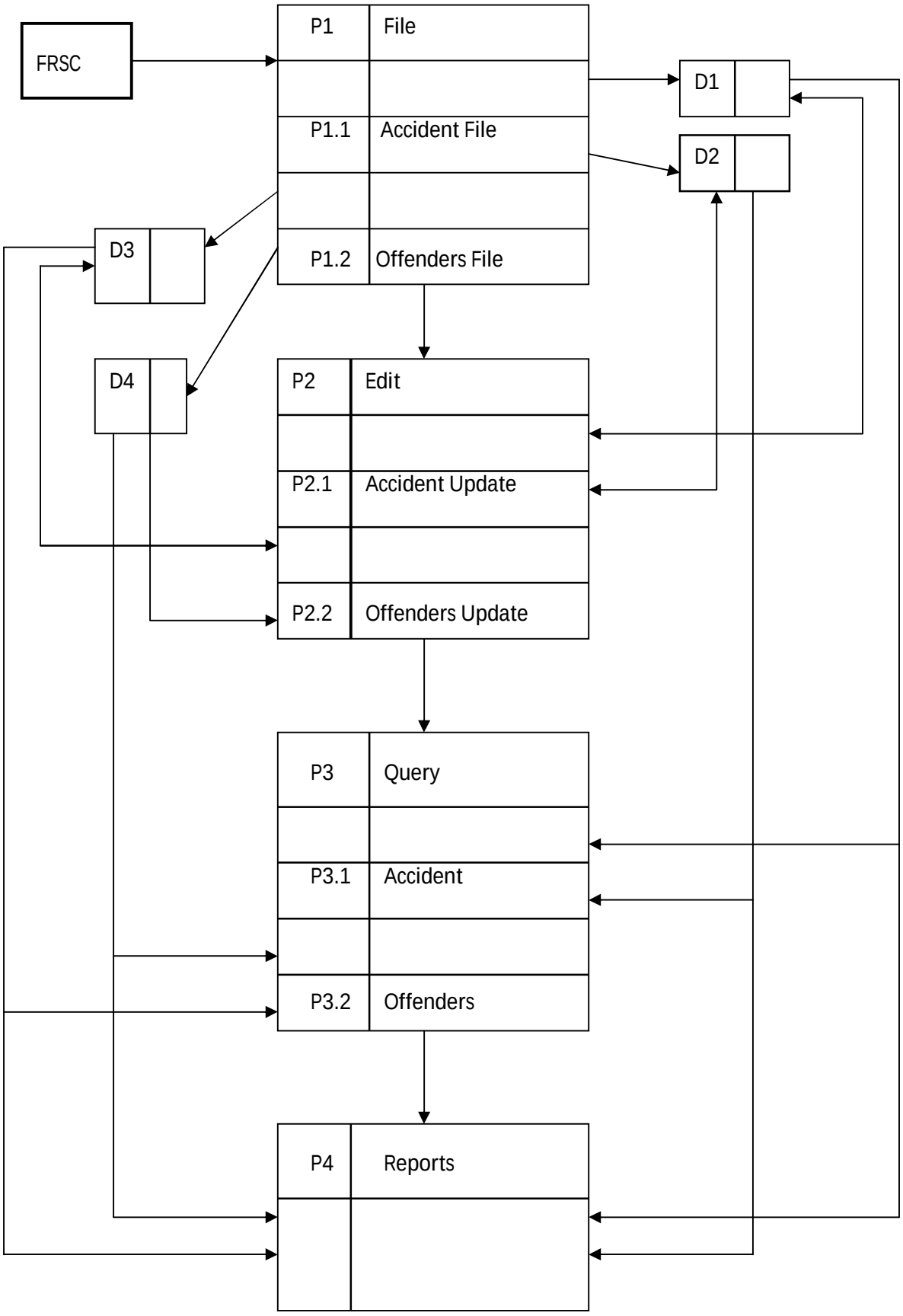


Fig. 4.4 Data flow diagram of the New System

The data flow diagram is designed to show these processes including the overall system. The overall system DFD (Data Flow Diagram) reflects the interplay and exchange of data among the components which forms it.

4.8 Program Module Flowchart

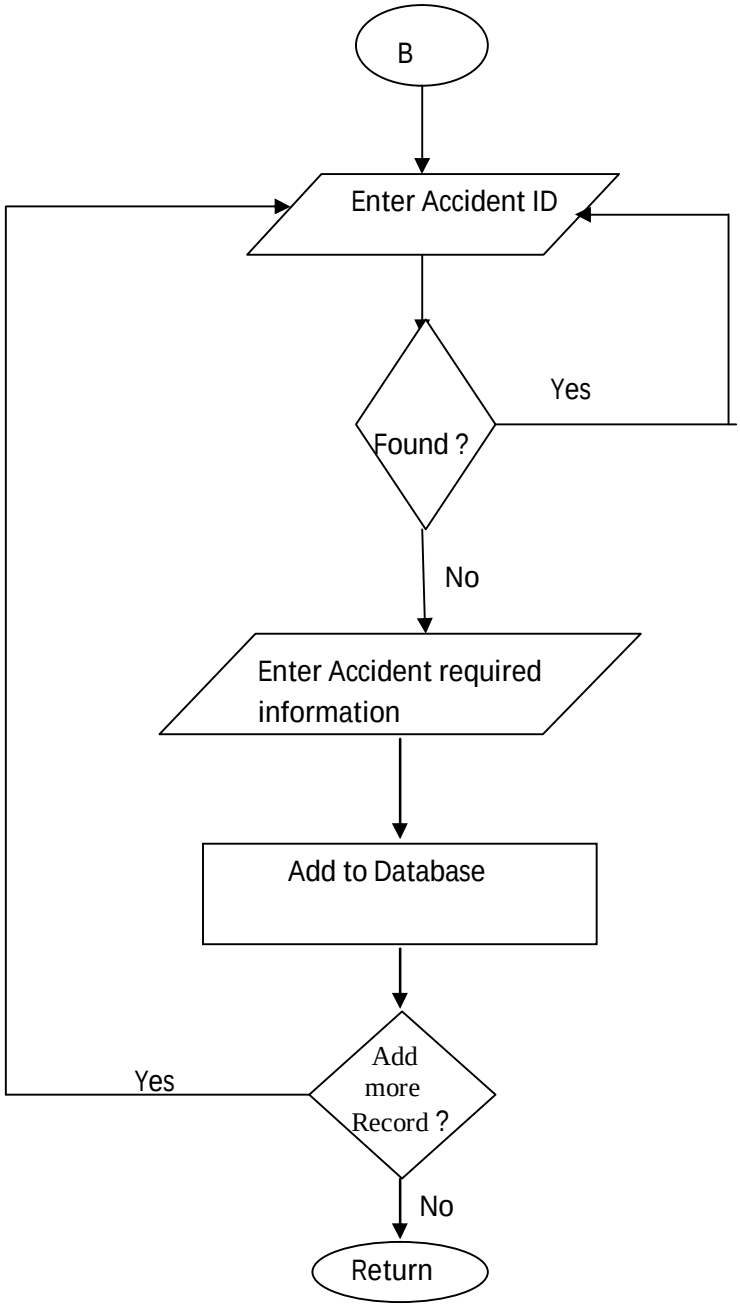


Fig. 4.12.1 Accident Flowchart

This is the Accident information flow through the new system.

Offence flowchart

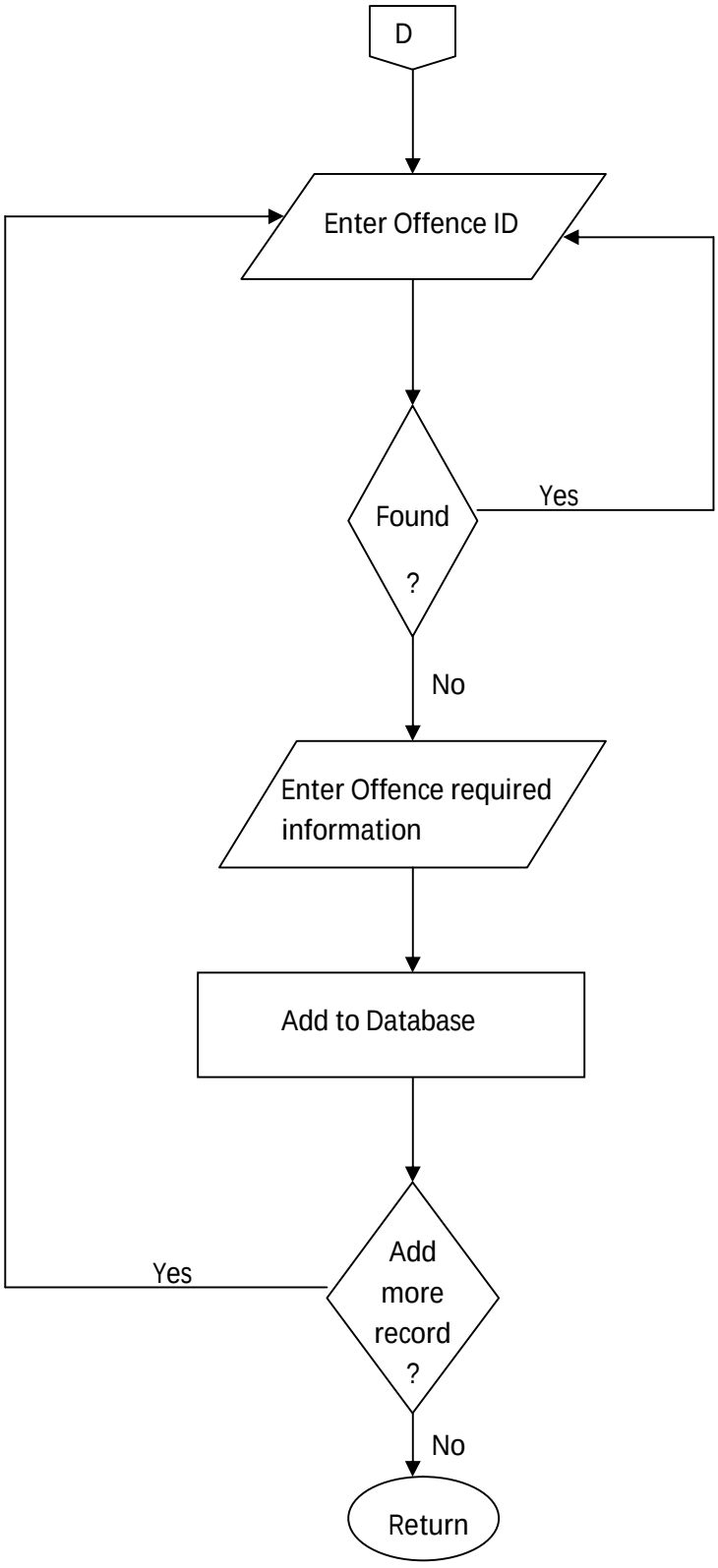


Fig. 4.12.2 Offence Flowchart

The above flowchart is for offence module information flow through the new system.

Licence Flowchart

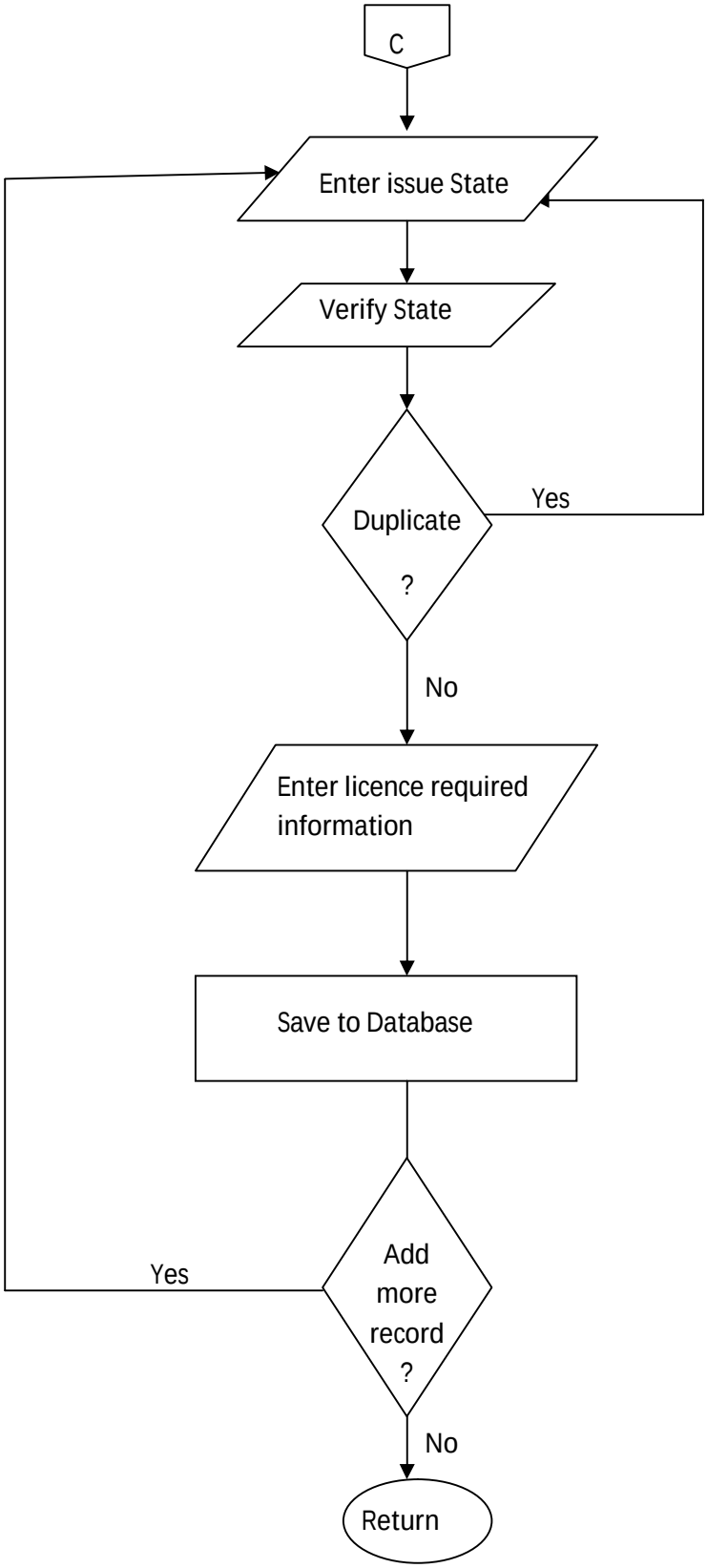


Fig. 4.12.3 Licence Flowchart

This flow chart is for Licence information flow through the new system

Vehicle Registration Flowchart

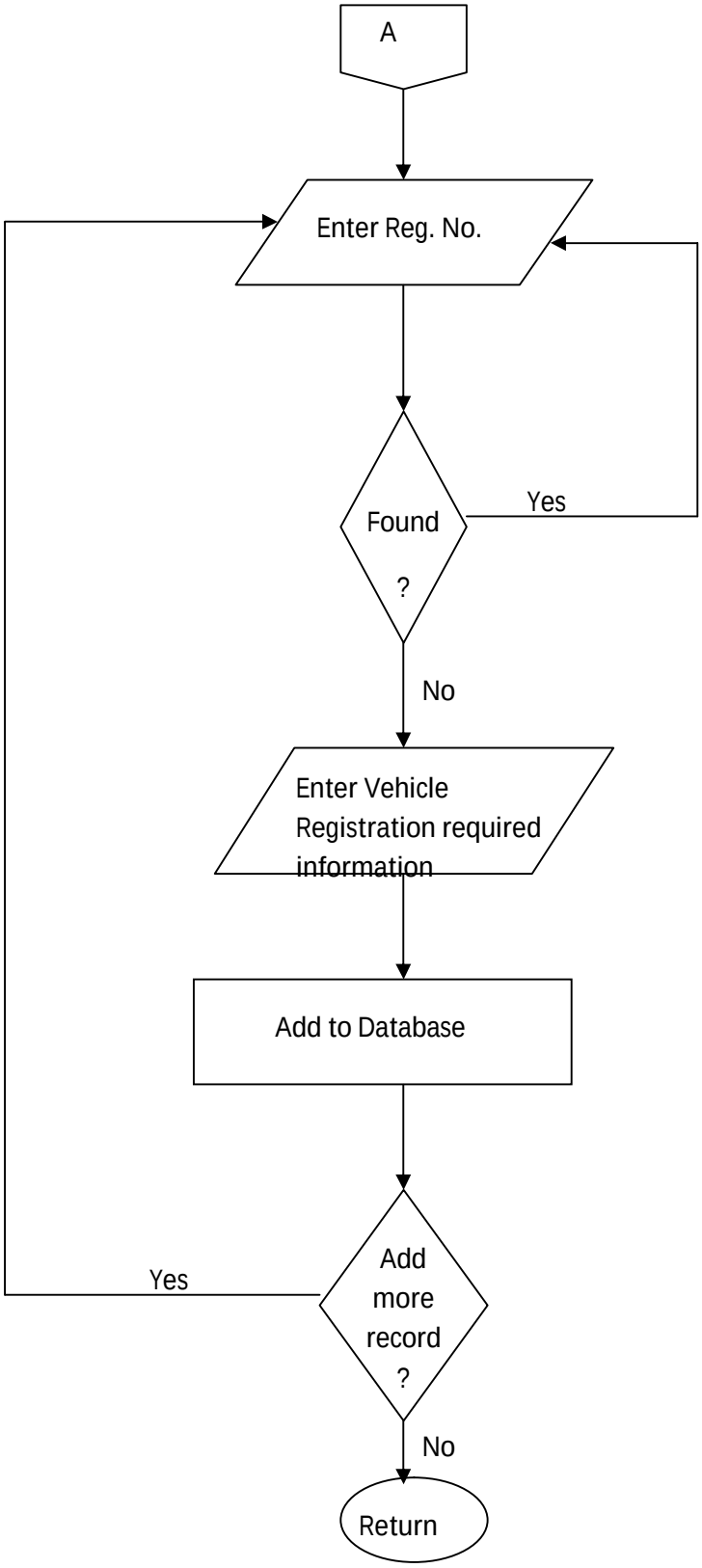


Fig. 4.12.4 Vehicle Registration Flowchart

This chart shows Vehicle Registration information flow through the new system

4.9 Data Dictionary

Table 4.9.1 Data dictionary

S/N	VARIABLE NAME	DESCRIPTION	TYPE	SIZE
1.	Date-Acc	Date of Accident	Date	8
2.	Type-Vehi	Type of Vehicle	Text	35
3.	Passenger-No.	Number of Passengers	Integer	4
4.	Id-Offender	Identification Number	Integer	4
5.	Off-Name	Offenders Name in full	Text	25
6.	Off-sex	Offenders sex	Text	7
7.	Type-off	Type of Offence committed	Text	30
8.	Veh-p-No	Vehicle plate number	Text	10
9.	Cause-acc	Cause of accident	Text	50
10.	Veh-Id	Vehicle identification Number	Integer	10
11.	Model	Vehicle identification No.	Text	35
12.	Engine-No.	Vehicle Engine Number	Text	30
13.	Chasis-No.	Vehicle Chasis Number	Text	30
14.	Address	Owners Address	Text	25
15.	Owner-N	Vehicle Owners Name	Text	25
16.	HT	Height for driving license	Integer	4
17.	Bg	Blood Group	Text	5
18.	Dbt	Date of birth	Date	8
19.	Exp-date	Expire date	Date	8
20.	Iss-date	Issue date	Date	8
21.	Iss-state	Issue state	Text	25
22.	Nat. ID	National ID card No.	Integer	4

The table above is the Data dictionary. It shows the meaning of every variable used in the software.

4.10 Choice of Programming Language

There are thousands of programming language(s) but each of these languages performs some specific task, which depends on the nature of the program, and the task to execute. For this purpose, nature and easily implementation of this project, Visual Basic 6.0 is used.

Visual Basic 6.0 is a database programming language which comes with a set of graphical tools and high-level language constructs that makes it easy and quick to have an ideal to a full-fledged running application. It allows one to quickly and easily create windows application for your pc without being an “Expert” in other programming languages. Visual Basic (VB), provides a graphical environment where you design the forms and controls that your application will use. Also, visual basic supports many useful tools that will help you to be productive in your works and designs to be utilized in the internet. In the same vein, VB is easy and fun to use, that you will found yourself experiencing with your design and come up with a result.

Finally, the full application of Visual Basic is seen in the areas of:

(a) Developing a database software like the FRSC software

(b) Many computer games are written in visual basic etc.

CHAPTER FIVE
SYSTEM DOCUMENTATION AND IMPLEMENTATION

This Chapter is shows the system documentation, test, running, conversion procedure, availability of hardware, software development with installation, systems requirements, training and system maintenance.

5.1 Program Implementation

Program Implementation involves the orderly schedules of activities and list of materials requires for the new system. In program implementation, the following process should be considered:

i. The hardware and software
ii. The methodology for testing provided
iii. Management was provided with comprehensive test plan
iv. The user was provided with the description of the steps required to implement the system.

Finally, the program source code is in Appendix A while the program sample outputs are in Appendix B.

5.2 Hardware Requirement

This new system is designed to be implemented on any IBM compatible micro-computer with the following:

i. Minimum of 1GB RAM
ii. From Pentium iv 2.4 GHz
iii. 14 LCD flat screen colour monitor with Mic and speakers
iv. CD/DVD Rom drive/writer
v. 40 GB Hard disk
vi. 200w stabilizer

vii. Uninterrupted power supply (UPS)

viii. HP Laser or DeskJet printer

ix. Hp DeskJet Scanner etc

5.2.1 Software Requirement

The software needed for smooth running of the new developed system is:

i. Windows XP professional

ii. DBMS: Ms access

iii. Microsoft Office XP 2005

iv. Nero Express

v. Antivirus etc.

5.2.2 Material Requirement

The new system will require the following materials to operate:

i. Computer stationeries like a designed output sheet

ii. Facilities for extensive backup storage e.g. reserved hard disk, diskettes, flash drives, CD plates, magnetic tapes etc.

5.3 System Test-run

This refers to the testing of a new system. The main reason is to ensure compatibility. The system is subjected to trial run with test data, which confirms the axiom that the quality of the test data is more important than the quality of the best data. Data accordingly was simulated, analyzed and fed into the system as an inputted data. The three types of testing carried out are:

(i) Unit Testing: A program module that has been written and successfully compiled; is tested instruction by instruction with a well prepared test data. Each of these modules can be put together as a single program and tested.

(ii) Integrated Testing: Modules or programs are combined into groups and tested. The purpose is to find out how these programs would interact with one another.

(iii) System Testing: The Utilizes special testing data meant for that purpose. The expected result of the system should be predetermined to see if t he system would give us exactly what we desire from it.

5.4 System Maintenance

The new system should be subjected to maintenance from time to time; this will eliminate or reduce the problems of hardware and software breakdown and consequently prevent operational delays in the system. For smooth running of the system, the following maintenance practice should be adhered to strictly.

(i) Proper use of the system: In the case, the system should be started and shut down in the right manner to avoid system hanging or file data corruption.

(ii) Periodic servicing of the computer hardware or peripherals to prevent unforeseen break down.

(iii) Regular backup of the files on the hard disk to external storage device to recover most of the data or all of them in the event or hard disk failure.

5.5 File Conversion

In conversion process, the newly designed system is put into use alongside with the old system. The conversion procedure alludes to the steps and process involved in changing from one system to another. The conversion procedure method recommended is the pilot operation method. This method is chosen because it enables the old and new system to run concurrently during the conversion period so that the strengths and weakness of both systems with respects to each other.

5.5.1 Loading the Software

Create a directory / Folder say “FRSC Software” on the c:\ and copy the executable file from the CD-Rom into the folder.

5.5.2 Running the Software

Once the analyst finished the installation, the user should click on the start button menu position the mouse pointer to programs, then point again to folder of the new system and finally click the executable icon.

5.5.3 Exiting the Software

To exit the software, the user have to pull down the menu save all works then click exit which will bring the user back to desktop window environment.

5.6 Training

General awareness and software specific training will be given during the implementation phase. The essence of this is to train users to know how to use the system with easy. A user manual and a well developed extensive documentation of the system will be given to the user. During this training, a batch of 20 people from the FRSC headquarter will be train first for a period of 60 days.

5.7 System Implementation

When testing, training has been completed and all the necessary requirements has been put in place (Hardware, software and peopleware) Implementation will be immediate. The new system will be running parallel to the existing manual system for four (3) weeks after which the new system will be used fully. After the implementation phase has been completed and a review check will be carried out from time to time for a period of two (2) months. This is to ensure that there is proper;

(i) Data collection

(ii) Data directory creation

(iii) Taking daily backups

(iv) Monitoring of the software implementation

(v) Attending to hardware problems etc.

5.8 Other Requirements

These include the following:

(i) Site preparation

(ii) Furniture and Air conditioning would be provided by the FRSC department.

5.9 Cost Estimation

Ground rules and assumptions for the Road Safety Database System development

This project was preceded by a detailed study of the working of the Road Safety commission information flow.

a. Cost overrun is put into consideration because of changing technology

The work break down structure (WBS) of the road safety application development

1. Programmers
   1.1 Senior programmer
   1.2 Sub programmers
2. Hardware
   2.1 Laptop computers
   2.2 Desktop computers
   2.3 Servers

2.4 Server racks

2.5 Inverter system

2.6 Routers

2.7 Switches

2.8 Cat5 cable

2.9 Cat6 cable

2.10 Wireless access point

3. Training and Support

b. Cost must be estimated by WBS and by month. The project coordinator will report progress on the project using earned value analysis.

c. Cost will be provided in naira. Since the project length is less than one year, inflation will now be included.

d. The project will be managed by a consulting firm that is specialized in software development.

e. A computer model for the estimate is to be developed to make it easy to change several inputs, such as number of labour per hour for various activities or labour rates.

f. The time duration required to setup the database system is 3 months.

Assumptions in estimating the cost for each work break down structure (WBS)

1. Programmers

Budget experts suggested using a labour rate of ₦2000/hr for the senior developer, ₦1500/hr for the sub developers. The project will

be completed in 3 months and will last for 3years before it will need a major upgrade.

1.1 Senior programmer

Total hours for the senior developer is 20 hrs per month for three months $(20 \times 3) = 60 hrs$

1.2 Sub programmers

The three developers will work 20 hrs per month for 3 months $(20 \times 3) \times 3 = 180 hrs$

2. Hardware

2.1 Laptop

One laptop is estimated at ₦200,000 based on recent market prize. 4 laptops are required for the project

2.2 Desktop computers

One desktop computer cost ₦85,000 based on recent market prize. One desktop computer is required for the project.

2.3 Servers

One server is required for the project costing ₦200,000

2.4 Server racks

One server rack is required for the project costing ₦50,000

2.5 Inverter system

An inverter system is required for the design due to power failure peculiar to the Nigeria system. One server system is required for the project costing ₦300,000

2.6 Routers

Four routers will be required for the project each costing ₦100,000.

2.7 Switches

Four switches will be required for the project each costing ₦100,000

2.8 Cat5 cable

Two cartons of cat 5 cable will be required for the project each costing ₦15,000

2.9 Cat6 cable

Two cartons of cat 6 cable will be required for the project each costing ₦30,000

2.10 Wireless access point

5 access points will be required for the project each costing ₦50,000.

3. Training and Support

The training will commence after the development of the system. The training will last for one week and will involve all the staff members of the commission. A total of 20hours will be used for training.

Calculating the net present value, payback period and ROI for the result Management portal project

a. Discount rate = 8%

b. The project will be completed in 3months

c. The project will be used for 3 years before it will need a major upgrade

d. The project cost is in naira

Net Present Value calculation for the project

Table 5.1 Net Present Value calculation for the project

Project year	**0**	**1**	**2**	**3**	**Total**
Cost	2,565,000	200,000	200,000	200,000	
Discount factor	1	0.93	0.86	0.79	
Discount cost	2,565,000	186,000	172,000	158,000	**3,081,000**
Benefit	0	2,000,000	2,000,000	2,000,000	
Discount factor	1	0.93	0.86	0.79	
Discount benefit	0	1,860,000	1,720,000	1,580,000	**5,160,000**
Discount benefit – discount cost	(2,565,000)	1,674,000	1,548,000	1,422,000	2,079,000
Cumulative discount benefit - cost	(2,565,000)	(891,000)	657,000	2,079,000	

A Calculating the Net Present Value (NPV)

$$NPV = \sum_{t=0}^{n} \frac{A_t}{(1+r)^t}$$

NPV = total discounted benefit - total discounted cost

From the table above,

NPV = 5,160,000 – 3,081,000 = ₦2,079,000

Comment:

Since the NPV is positive, the project is worth engaging in.

B Calculating the Return on Investment (ROI)

$$ROI = \frac{total\ discounted\ benefit \quad - \quad total\ discounted\ cost}{total\ discounted\ cost}$$

$$ROI = \frac{5{,}160{,}000 - 3{,}081{,}000}{3{,}081{,}000} \times \frac{100}{1} = 67.48\%$$

Comment:

Since the ROI is positive, and the higher the ROI the better the project, we can say that the project is good.

C. Estimating the Payback Period

This is the amount of time it will take to recoup, in the form of net cash inflows, the total money invested in the project.

The Graph below illustrates Payback Period (PBP) for the TIRMP app development

(The point of intersection is the PBP)

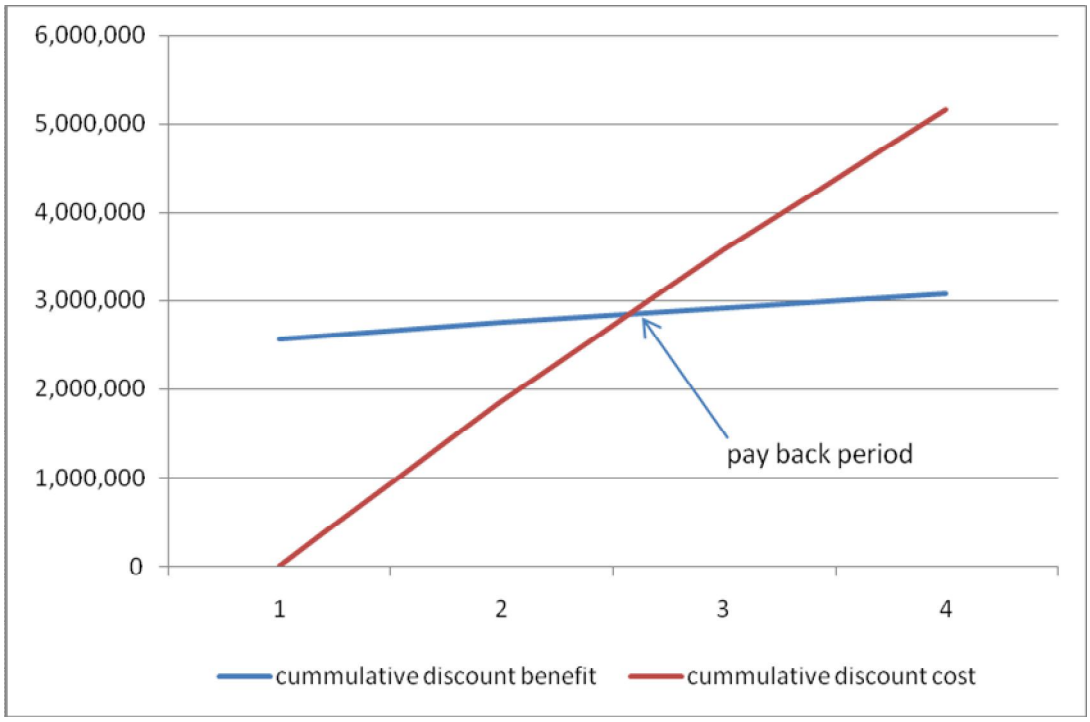


Fig. 5.1 Payback Period (PBP)

Comment:

Since the PBP occurs in the second year, as shown on the diagram at the point of intersection, the project is a good one.

Table showing the cost estimate for the design of the road safety database system

Table 5.2 Cost Estimation for the New System

	Units/hr	Cost/unit/hr	Subtotal	WBS level 1 Total
WBS Items				
1. *Programmers*				₦390,000
1.1 *Senior programmer*	60	₦2000	₦120,000	
1.2 *Sub programmers*	180	₦1500	₦270,000	
2. *Hardware*				₦2,135,000
2.1 *Laptop computers*	4	₦200,000	₦85,000	
2.2 *Desktop computers*		₦85,000	₦85,000	
2.3 *Servers*	1	₦200,000	₦1,000,000	
2.4 *Server racks*	1	₦50,000	₦50,000	
2.5 *Inverter system*	1	₦300,000	₦25,000	
2.6 *Routers*	4	₦100,000	₦400,000	
2.7 *Switches*	4	₦100,000	₦400,000	
2.8 *Cat5 cable*	2	₦15,000	₦30,000	
2.9 *Cat6 cable*	2	₦30,000	₦60,000	
3.1 *Wireless access point*	5	₦50,000	₦50,000	
4. *Training and Support*	20	₦2,000	₦40,000	₦40,000
Total project cost estimate				₦2,565,000

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Summary

The proposed system will be a computer aided and hence an improvement on the existing system. It will redesign the existing forms which include modified or additional data items.

This will enable it perform the specific operation in order to achieve performance requirements of the new system. This system will also give detailed reports and display formats terminals, which will also be designed so that a user can be located at different location of FRSC. This helps the user to collect and view the personal data of offenders, accidents etc, avoid redundant files, facilitate a removal process, and keep an up to date records.

The system stage of this project is aimed towards establishing the specifications, which will enable a complete and accurate implementation of a distributed database system for FRSC with more security features to offer.

6.2 Conclusion

It is note worthy to say that in an environment where corruption and indiscipline are the order of the day, this project can be more reliable than human experts.

This project aims to develop FRSC software that will reduce problems in FRSC service by way of electronic data processing. Some of the gains of this software are:

(i) The chief marshal of FRSC can access his computer and get up to date information on accident, offenders population and their current stations without resource to anyone to supply him the information that may be distorted.

(ii) It reduces paper work burden and improves FRSC record keeping.

(iii) The FRSC software could be modified and put to work in other departments etc.

6.3 Recommendation

I recommend that this project be fully implemented and used in all Nigerian FRSC station so that the problems are of FRSC offenders will be reduced. Also, due to ease, authorized users can access this software with no problem.

However, I recommend that more critical studies and research be carried out on this project so as to enhance its potentials and to overcome any presumed limitations.

Finally, for further research, the researcher recommends the followings:

(a) Networking FRSC Information System

(b) A FRSC web monitoring system

(c) FRSC Inventory management system

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Appendix A

Program Code

```
Private Sub CmdClear_Click()
Text1 = Empty: Text2 = Empty
Text3 = Empty: Text4 = Empty
Text5 = Empty: Text6 = Empty
Text7 = Empty: Text8 = Empty
Text9 = Empty
Text1.SetFocus
End Sub
Private Sub CmdClose_Click()
Unload Me
End Sub
Private Sub CmdSave_Click()
 On Error GoTo errorchecker
   With DatAccident.Recordset
   .AddNew
      ![Accident Number] = Text1.Text
      ![Date of Accident] = Text2.Text
      ![Type of Vehicle] = Text3.Text
      ![Location] = Text4.Text
      ![No of Passengers] = Text5.Text
      ![No of Passengers Died] = Text6.Text
      ![No of Passengers Injured] = Text7.Text
      ![Cause of Accident] = Text8.Text
      ![Comment] = Text9.Text
   .Update
```

```
    End With
    CmdClear_Click
    Exit Sub
errorchecker:
    MsgBox Err.Description, vbInformation, "Storage Error"
    Text1.SetFocus
End Sub
Private Sub Form_Load()
FrmAccident.Move (Screen.Width - FrmAccident.Width) * 0.5, _
(Screen.Height - FrmAccident.Height) * 0.2
DatAccident.Visible = False
DatAccident.DatabaseName = App.Path & "\FRSC.MDB"
DatAccident.RecordSource = "Accident"
End Sub
Private Sub Timer1_Timer()
Image2.Visible = False
Image1.Visible = True
End Sub
Private Sub Timer2_Timer()
Image2.Visible = True
Image1.Visible = False
End Sub
Private Sub CmdAdd_Click()
    On Error GoTo errorchecker
    With Data1.Recordset
    .AddNew
        !Offenders_ID = Text1.Text
        !Offenders_Name = Text2.Text
```

```
        !Address = Text3.Text
        !Offence_Code = Text4.Text
        !Date_Arressted = Text5.Text
        !Vehicle_Number = Text6.Text
        !Amount_Charged = Text7.Text
        !Amount_Paid = Text8.Text
        !Remarks = Text9.Text
    .Update
    End With
    CmdClear_Click
    Exit Sub
errorchecker:
    MsgBox Err.Description, vbInformation, "Storage Error"
    Text1.SetFocus
End Sub
Private Sub CmdClear_Click()
Text1 = Empty: Text2 = Empty
Text3 = Empty: Text4 = Empty
Text5 = Empty: Text6 = Empty
Text7 = Empty: Text8 = Empty
Text9 = Empty
Text1.SetFocus
End Sub
Private Sub CmdClose_Click()
Unload Me
End Sub

Private Sub Form_Load()
```

```
FrmAddoffence.Move (Screen.Width - FrmAddoffence.Width) * 0.5, _
(Screen.Height - FrmAddoffence.Height) * 0.2
Data1.Visible = False
Timer1.Interval = 1000
Timer2.Interval = 1000
Picture1.Visible = False
Data1.DatabaseName = App.Path & "\FRSC.MDB"
Data1.RecordSource = "Offenders"
End Sub
Private Sub Timer1_Timer()
Picture2.Visible = False
Picture1.Visible = True
End Sub
Private Sub Timer2_Timer()
Picture1.Visible = False
Picture2.Visible = True
End Sub
Private Sub CmdClear_Click()
Text1.Text = Empty
Text2.Text = Empty
Text3.Text = Empty
Text4.Text = Empty
Text5.Text = Empty
Text6.Text = Empty
Text7.Text = Empty
Text8.Text = Empty
Text9.Text = Empty
Text10.Text = Empty
```

```
Text11.Text = Empty
Text12.Text = Empty
Text13.Text = Empty
Text14.Text = Empty
Combo1.Text = "  Select"
Combo2.Text = "     Select"
Image1.Picture = Nothing
Text1.SetFocus
End Sub
Private Sub CmdClose_Click()
Unload Me
End Sub
Private Sub CmdPic_Click()
CDgOpen.ShowOpen
Image1.Picture = LoadPicture(CDgOpen.FileName)
Text15.Text = (CDgOpen.FileName)
End Sub
Private Sub CmdSave_Click()
 On Error GoTo errorchecker
   With DatStaff.Recordset
   .AddNew
      ![Staff ID] = Text1.Text
      ![Name] = Text2.Text
      ![Sex] = Combo1.Text
      ![Age] = Text3.Text
      ![Address] = Text4.Text
      ![State] = Text5.Text
      ![LGA] = Text6.Text
```

```
        ![Date of Employment] = Text7.Text
        ![Rank] = Text8.Text
        ![Qualification] = Text9.Text
        ![Grade Level] = Text10.Text
        ![Operation Unit] = Text11.Text
        ![Present Status] = Combo2.Text
        ![Phone Number] = Text12.Text
        ![Email Address] = Text13.Text
        ![Comment] = Text14.Text
        ![Passport] = Text15.Text
    .Update
    End With
    CmdClear_Click
    Exit Sub
errorchecker:
    MsgBox Err.Description, vbInformation, "Storage Error"
    Text1.SetFocus
End Sub
Private Sub Form_Load()
FrmAddStaff.Move (Screen.Width - FrmAddStaff.Width) * 0.5, _
(Screen.Height - FrmAddStaff.Height) * 0.2
DatStaff.Visible = False
DatStaff.DatabaseName = App.Path & "\FRSC.MDB"
DatStaff.RecordSource = "Staff_Bio"
Text15.Visible = False
End Sub
Private Sub CmdAuthorised_Click()
CDgOpen.ShowOpen
```

```
Image2.Picture = LoadPicture(CDgOpen.FileName)
Text12.Text = (CDgOpen.FileName)
End Sub
Private Sub CmdClear_Click()
Text1.Text = Empty
Text2.Text = Empty
Text3.Text = Empty
Text4.Text = Empty
Text5.Text = Empty
Text6.Text = Empty
Text7.Text = Empty
Text8.Text = Empty
Text9.Text = Empty
Text10.Text = Empty
Text11.Text = Empty
Text12.Text = Empty
Text13.Text = Empty
Combo1.Text = "   Select"
Image1.Picture = Nothing
Image2.Picture = Nothing
Image3.Picture = Nothing
Text1.SetFocus
End Sub
Private Sub CmdClose_Click()
Unload Me
End Sub
Private Sub CmdHolder_Click()
CDgOpen.ShowOpen
```

```
Image3.Picture = LoadPicture(CDgOpen.FileName)
Text13.Text = (CDgOpen.FileName)
End Sub
Private Sub CmdPassport_Click()
CDgOpen.ShowOpen
Image1.Picture = LoadPicture(CDgOpen.FileName)
Text11.Text = (CDgOpen.FileName)
End Sub
Private Sub CmdSave_Click()
On Error GoTo errorchecker
   With DatLicense.Recordset
   .AddNew
      ![Issue State] = Text1.Text
      ![Issue Date] = Text2.Text
      ![Name] = Text3.Text
      ![Address] = Text4.Text
      ![Sex] = Combo1.Text
      ![Height] = Text5.Text
      ![Blood Group] = Text6.Text
      ![Date of Birth] = Text7.Text
      ![1st Issue Date] = Text8.Text
      ![Expire Date] = Text9.Text
      ![National Id No] = Text10.Text
      ![Passport] = Text11.Text
      ![Authorised Sign] = Text12.Text
      ![Holders Sign] = Text13.Text
   .Update
   End With
```

```
    CmdClear_Click
    Exit Sub
errorchecker:
    MsgBox Err.Description, vbInformation, "Storage Error"
    Text1.SetFocus
End Sub
Private Sub Form_Load()
FrmLicense.Move (Screen.Width - FrmLicense.Width) * 0.5, _
(Screen.Height - FrmLicense.Height) * 0.2
DatLicense.Visible = False
Text11.Visible = False
Text12.Visible = False
Text13.Visible = False
DatLicense.Visible = False
DatLicense.DatabaseName = App.Path & "\FRSC.MDB"
DatLicense.RecordSource = "License"
End Sub
Private Sub CmdClear_Click()
Text1.Text = Empty
Text2.Text = Empty
Text3.Text = Empty
Text4.Text = Empty
Text5.Text = Empty
Text6.Text = Empty
Text7.Text = Empty
Text8.Text = Empty
Text9.Text = Empty
Text10.Text = Empty
```

```
Text11.Text = Empty
Text12.Text = Empty
Text13.Text = Empty
Combo1.Text = "   Select"
Text1.SetFocus
End Sub
Private Sub CmdClose_Click()
Unload Me
End Sub
Private Sub CmdSave_Click()
On Error GoTo errorchecker
   With DatVehicle.Recordset
   .AddNew
      ![Vehicle ID] = Text1.Text
      ![Vehicle Name] = Text2.Text
      ![Type of Vehicle] = Text3.Text
      ![Vehicle Model] = Text4.Text
      ![Chasis No] = Text5.Text
      ![Engine No] = Text6.Text
      ![Body Colour] = Text7.Text
      ![Year of Manufacture] = Text8.Text
      ![Owners Name] = Text9.Text
      ![Sex] = Combo1.Text
      ![Address] = Text10.Text
      ![Date of Purchase] = Text11.Text
      ![Plate No] = Text12.Text
      ![Comment] = Text13.Text
   .Update
```

```
    End With
    CmdClear_Click
    Exit Sub
errorchecker:
    MsgBox Err.Description, vbInformation, "Storage Error"
    Text1.SetFocus
End Sub
Private Sub Form_Load()
FrmVehicle.Move (Screen.Width - FrmVehicle.Width) * 0.5, _
(Screen.Height - FrmVehicle.Height) * 0.2
DatVehicle.Visible = False
DatVehicle.DatabaseName = App.Path & "\FRSC.MDB"
DatVehicle.RecordSource = "VehicleReg"
End Sub
Dim SqlStr As String
Private Sub CmdClear_Click()
Text1 = Empty: Text2 = Empty
Text3 = Empty: Text4 = Empty
Text5 = Empty: Text6 = Empty
Text7 = Empty: Text8 = Empty
Text9 = Empty
Text1.SetFocus
End Sub
Private Sub CmdClose_Click()
Unload Me
End Sub
Private Sub CmdFind_Click()
On Error GoTo ErrorHandler
```

```
Dim n As Long
   n = InputBox("Enter Accident Number:")
   SqlStr = "Select * from Accident where [Accident Number]=" & Val(n)
   DatAccident.RecordSource = SqlStr
   DatAccident.Refresh
   rBind
   Exit Sub
ErrorHandler:
   MsgBox Err.Description, vbCritical
End Sub
Private Sub CmdSave_Click()
 On Error GoTo errorchecker
   With DatAccident.Recordset
   .Edit
      ![Accident Number] = Text1.Text
      ![Date of Accident] = Text2.Text
      ![Type of Vehicle] = Text3.Text
      ![Location] = Text4.Text
      ![No of Passengers] = Text5.Text
      ![No of Passengers Died] = Text6.Text
      ![No of Passengers Injured] = Text7.Text
      ![Cause of Accident] = Text8.Text
      ![Comment] = Text9.Text
   .Update
   End With
   CmdClear_Click
   Exit Sub
errorchecker:
```

```
    MsgBox Err.Description, vbInformation, "Storage Error"
    Text1.SetFocus
End Sub
Private Sub rBind()
On Error GoTo errorchecker
    With DatAccident.Recordset
        Text1.Text = ![Accident Number]
        Text2.Text = ![Date of Accident]
        Text3.Text = ![Type of Vehicle]
        Text4.Text = ![Location]
        Text5.Text = ![No of Passengers]
        Text6.Text = ![No of Passengers Died]
        Text7.Text = ![No of Passengers Injured]
        Text8.Text = ![Cause of Accident]
        Text9.Text = ![Comment]
     End With
    Text1.SetFocus
    Exit Sub
errorchecker:
    MsgBox Err.Description, vbInformation, "Storage Error"
End Sub
Private Sub Form_Load()
FrmEdAccident.Move (Screen.Width - FrmEdAccident.Width) * 0.5, _
(Screen.Height - FrmEdAccident.Height) * 0.2
DatAccident.Visible = False
DatAccident.DatabaseName = App.Path & "\FRSC.MDB"
DatAccident.RecordSource = "Accident"
End Sub
```

```
Private Sub Timer1_Timer()
Image2.Visible = False
Image1.Visible = True
End Sub
Private Sub Timer2_Timer()
Image2.Visible = True
Image1.Visible = False
End Sub
Dim SqlStr As String
Private Sub CmdAuthorised_Click()
CDgOpen.ShowOpen
Image2.Picture = LoadPicture(CDgOpen.FileName)
Text12.Text = (CDgOpen.FileName)
End Sub

Private Sub CmdClear_Click()
Text1.Text = Empty
Text2.Text = Empty
Text3.Text = Empty
Text4.Text = Empty
Text5.Text = Empty
Text6.Text = Empty
Text7.Text = Empty
Text8.Text = Empty
Text9.Text = Empty
Text10.Text = Empty
Text11.Text = Empty
Text12.Text = Empty
```

```
Text13.Text = Empty
Combo1.Text = "   Select"
Image1.Picture = Nothing
Image2.Picture = Nothing
Image3.Picture = Nothing
Text1.SetFocus
End Sub
Private Sub CmdClose_Click()
Unload Me
End Sub
Private Sub CmdFind_Click()
On Error GoTo ErrorHandler
Dim n As String
   n = InputBox("Enter National ID Card Number:")
   SqlStr = "Select * from License where [National Id No]='" & n & "'"
   DatLicense.RecordSource = SqlStr
   DatLicense.Refresh
   rBind
   Exit Sub
ErrorHandler:
   MsgBox Err.Description, vbCritical
End Sub
Private Sub CmdHolder_Click()
CDgOpen.ShowOpen
Image3.Picture = LoadPicture(CDgOpen.FileName)
Text13.Text = (CDgOpen.FileName)
End Sub
Private Sub CmdPassport_Click()
```

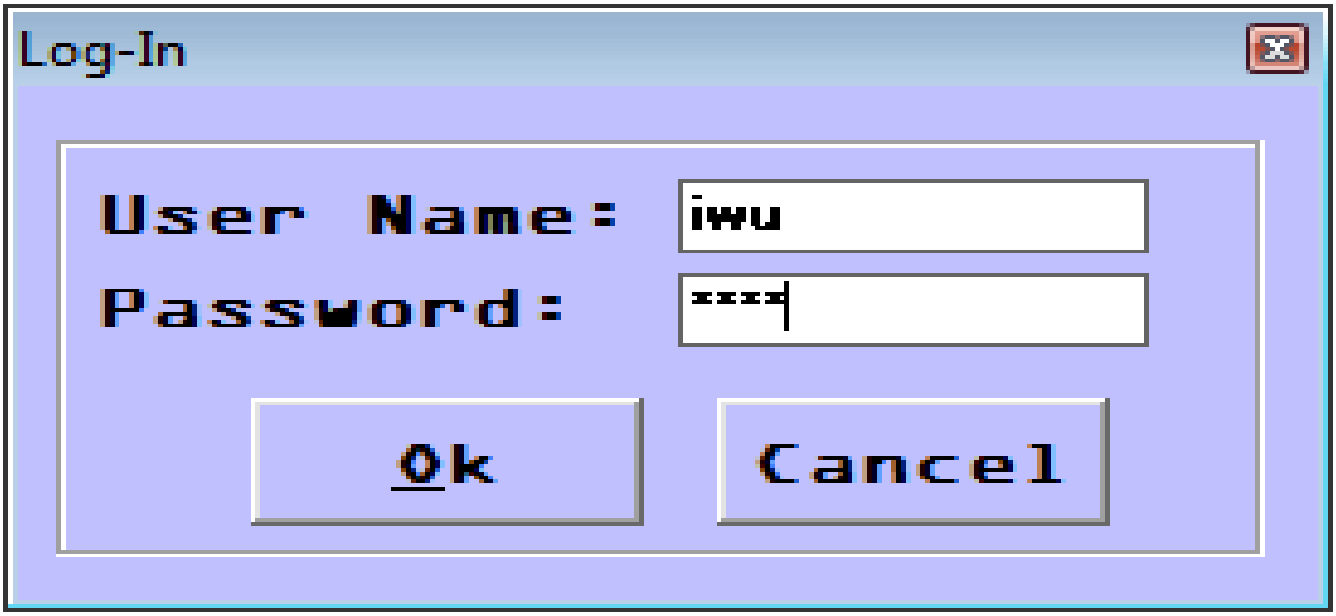
```
CDgOpen.ShowOpen
Image1.Picture = LoadPicture(CDgOpen.FileName)
Text11.Text = (CDgOpen.FileName)
End Sub
Private Sub CmdSave_Click()
On Error GoTo errorchecker
   With DatLicense.Recordset
   .Edit
      ![Issue State] = Text1.Text
      ![Issue Date] = Text2.Text
      ![Name] = Text3.Text
      ![Address] = Text4.Text
      ![Sex] = Combo1.Text
      ![Height] = Text5.Text
      ![Blood Group] = Text6.Text
      ![Date of Birth] = Text7.Text
      ![1st Issue Date] = Text8.Text
      ![Expire Date] = Text9.Text
      ![National Id No] = Text10.Text
      ![Passport] = Text11.Text
      ![Authorised Sign] = Text12.Text
      ![Holders Sign] = Text13.Text
   .Update
   End With
   CmdClear_Click
   Exit Sub
errorchecker:
   MsgBox Err.Description, vbInformation, "Storage Error"
```

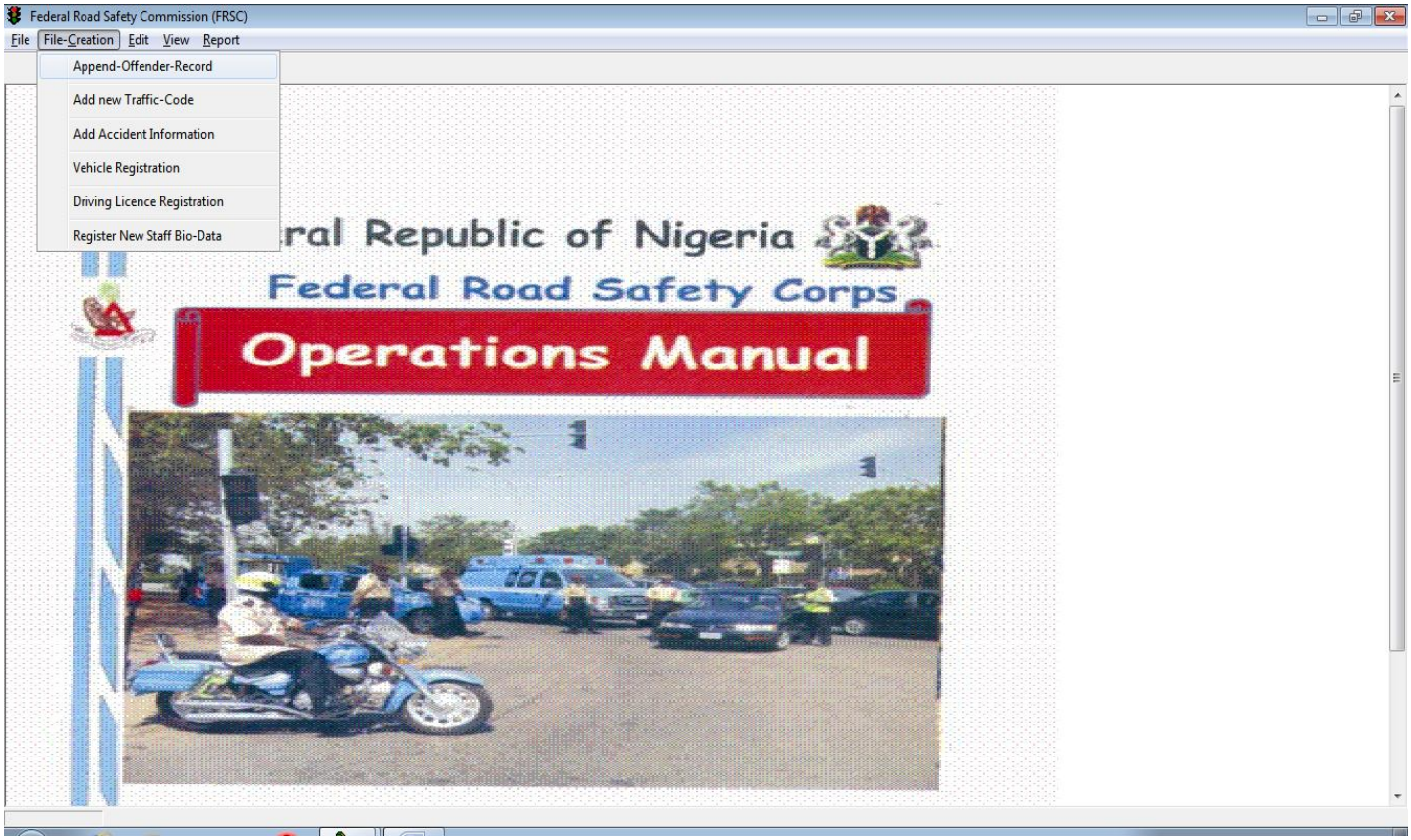
```
    Text1.SetFocus
End Sub
Private Sub rBind()
On Error GoTo errorchecker
    With DatLicense.Recordset
        Text1.Text = ![Issue State]
        Text2.Text = ![Issue Date]
        Text3.Text = ![Name]
        Text4.Text = ![Address]
        Combo1.Text = ![Sex]
        Text5.Text = ![Height]
        Text6.Text = ![Blood Group]
        Text7.Text = ![Date of Birth]
        Text8.Text = ![1st Issue Date]
        Text9.Text = ![Expire Date]
        Text10.Text = ![National Id No]
        Text11.Text = ![Passport]
        Text12.Text = ![Authorised Sign]
        Text13.Text = ![Holders Sign]
    End With
    Image1.Picture = LoadPicture(Text11.Text)
    Image2.Picture = LoadPicture(Text12.Text)
    Image3.Picture = LoadPicture(Text13.Text)
    Text1.SetFocus
    Exit Sub
errorchecker:
    MsgBox Err.Description, vbInformation, "Storage Error"
  End Sub
```

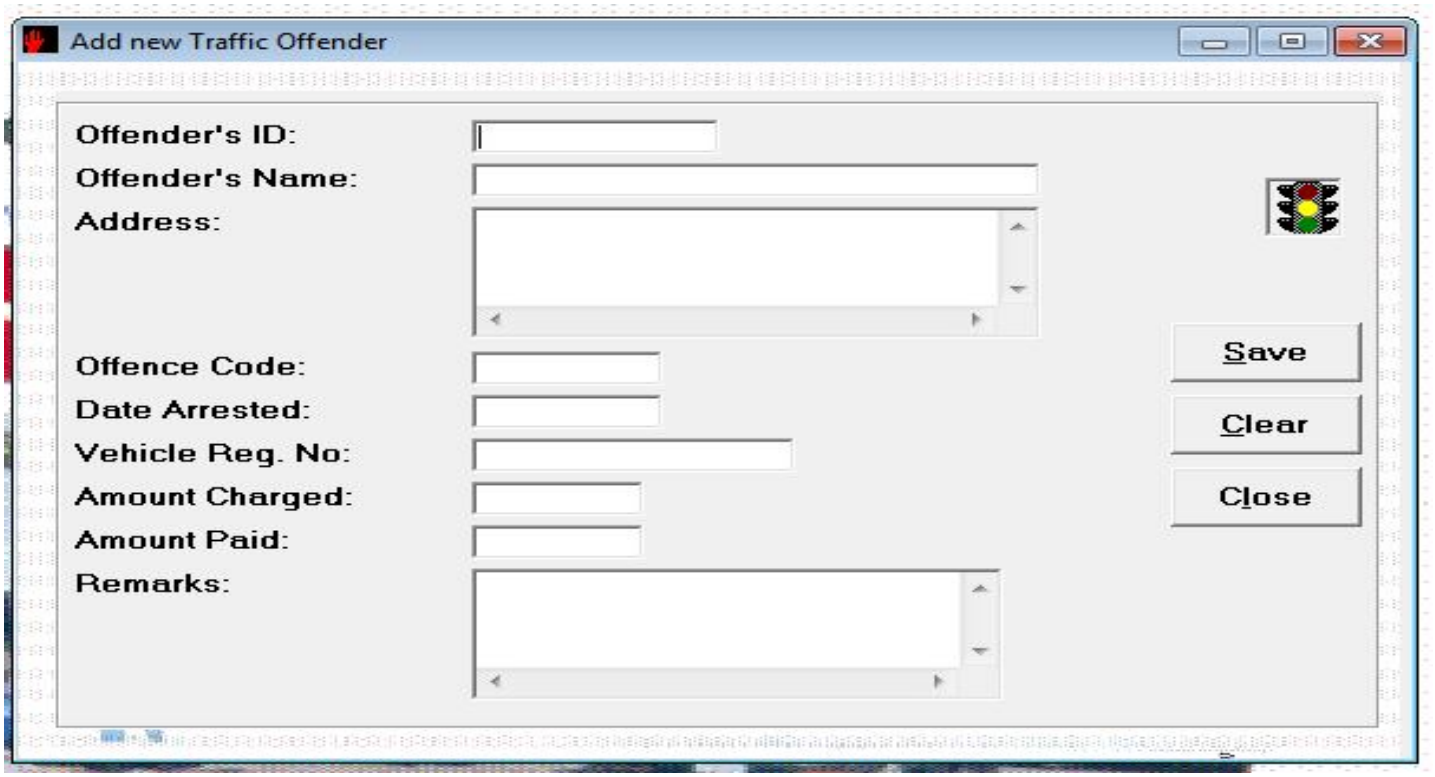
```
Private Sub Form_Load()
FrmEdLicense.Move (Screen.Width - FrmEdLicense.Width) * 0.5, _
(Screen.Height - FrmEdLicense.Height) * 0.2
DatLicense.Visible = False
Text11.Visible = False
Text12.Visible = False
Text13.Visible = False
DatLicense.Visible = False
DatLicense.DatabaseName = App.Path & "\FRSC.MDB"
DatLicense.RecordSource = "License"
End Sub
```

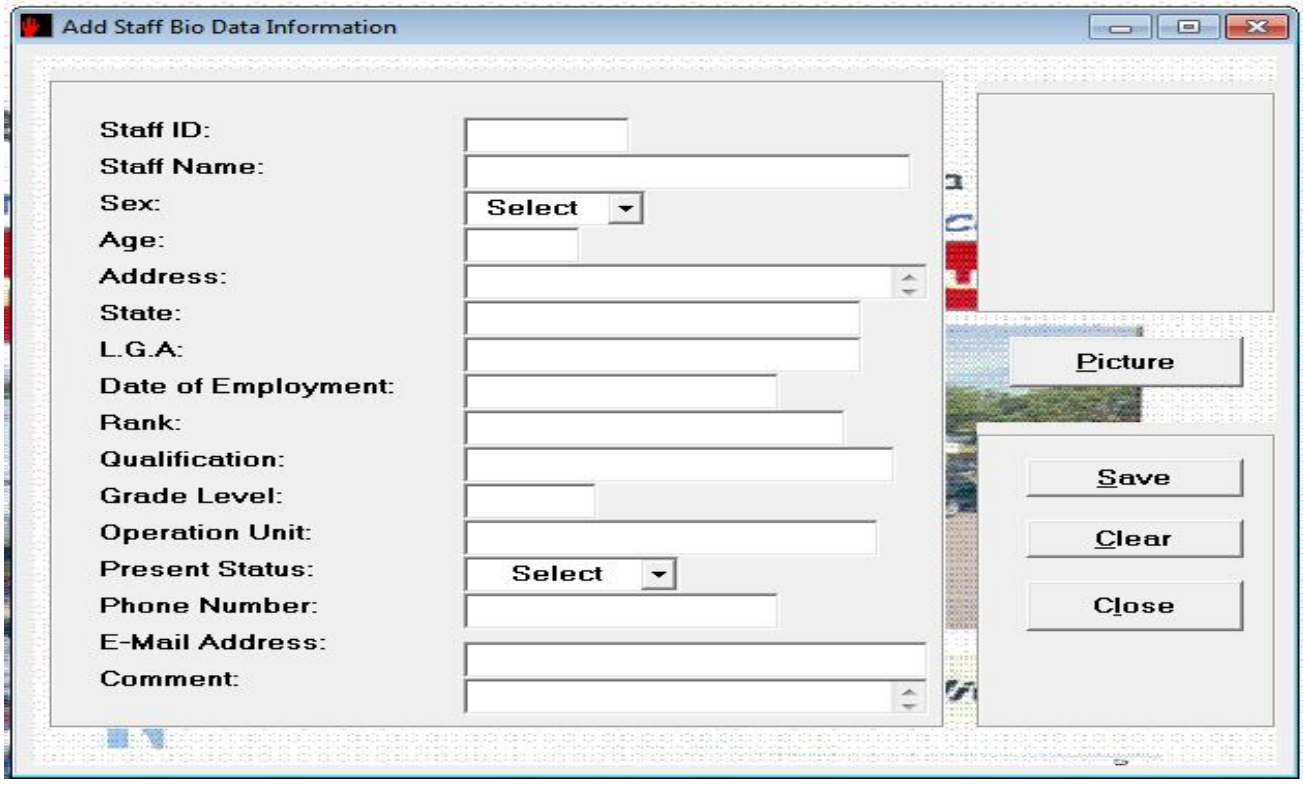
Appendix B

Input/Output

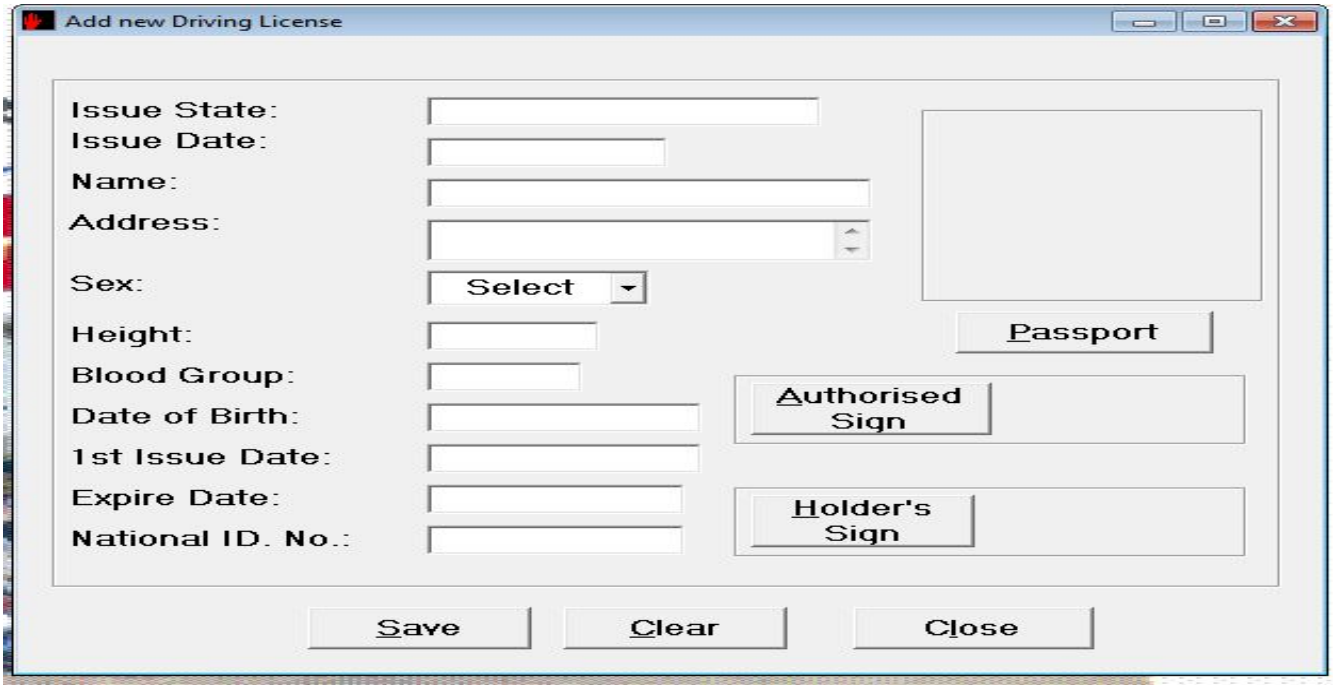


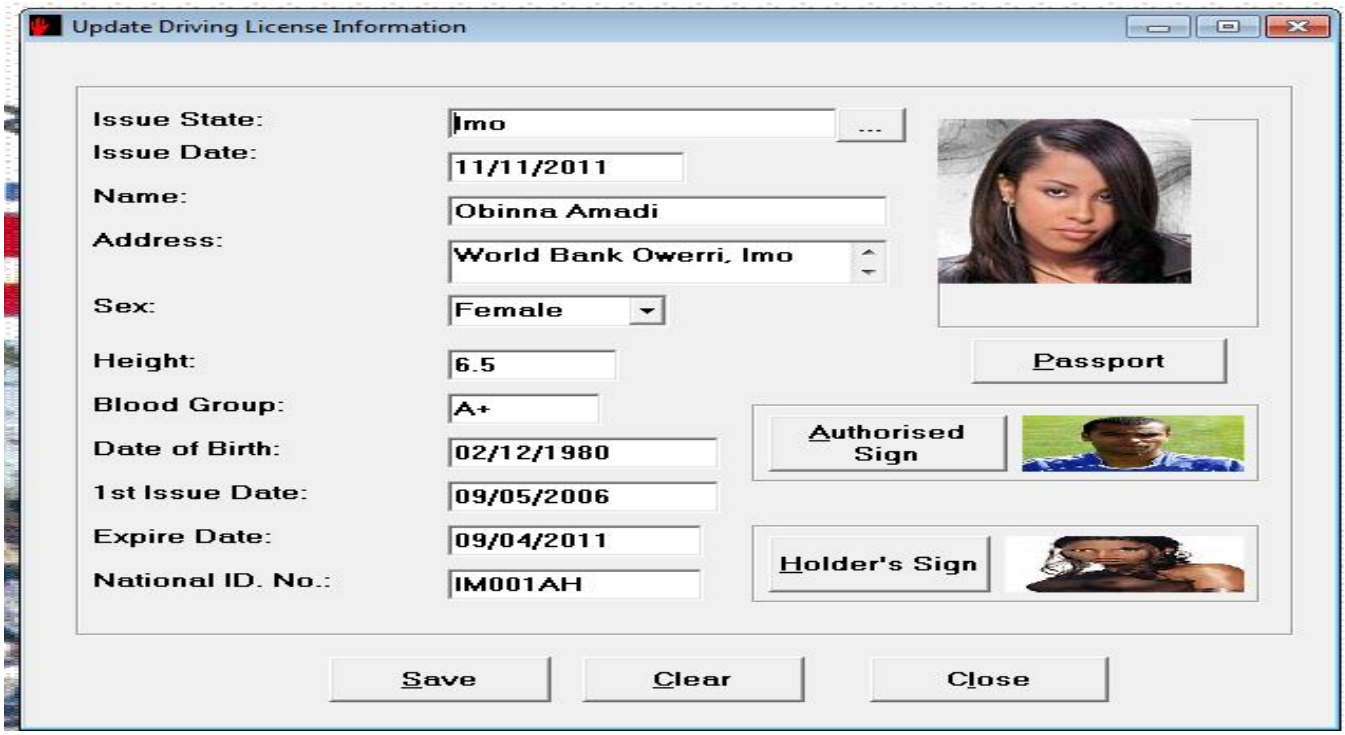

Federal Road Safety Commission (FRSC)
File
File-Creation
Edit
View
Report
Append-Offender-Record
Add new Traffic-Code
Add Accident Information
Vehicle Registration
Driving Licence Registration
Register New Staff Bio-Data
ral Republic of Nigeria
Federal Road Safety Corps
Operations Manual

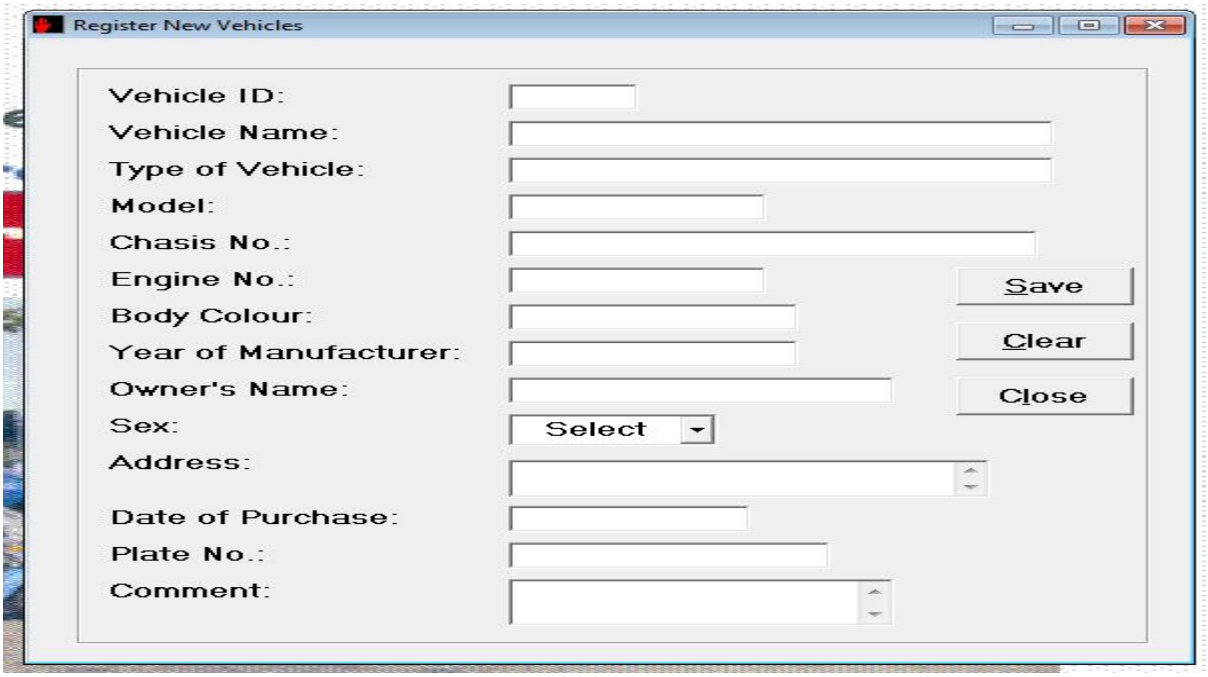

Add new Traffic Offender
Offender's ID:
Offender's Name:
Address:
Offence Code:
Date Arrested:
Vehicle Reg. No:
Amount Charged:
Amount Paid:
Remarks:
Save
Clear
Close

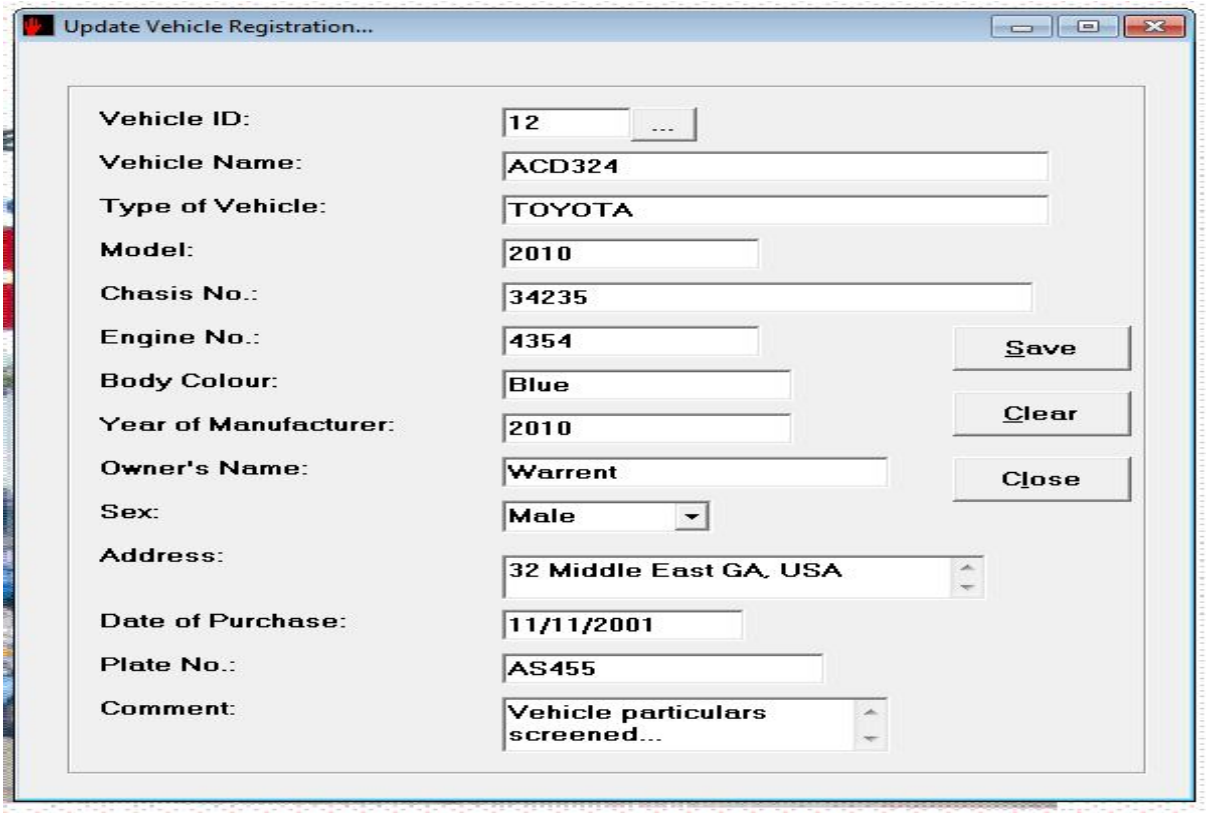

Add Staff Bio Data Information
Staff ID:
Staff Name:
Sex:
Select
Age:
Address:
State:
L.G.A:
Date of Employment:
Rank:
Qualification:
Grade Level:
Operation Unit:
Present Status:
Select
Phone Number:
E-Mail Address:
Comment:
Picture
Save
Clear
Close


Update Staff Bio-Data
Staff ID:
1
.....
Staff Name:
Mr Chidi Echefu
Sex:
Male
Age:
38
Address:
20 Tetelow Road, Ow.
State:
Imo
L.G.A:
Orlu
Date of Employment:
03/04/1996
Rank:
Senior Officer
Qualification:
BSc
Grade Level:
8
Operation Unit:
Finance
Present Status:
Married
Phone Number:
08037465321
E-Mail Address:
chidi2001@yahoo.com
Comment:
Good Performance
Picture
Save
Clear
Close


Add new Driving License
Issue State:
Issue Date:
Name:
Address:
Sex:
Select
Height:
Blood Group:
Date of Birth:
1st Issue Date:
Expire Date:
National ID. No.:
Passport
Authorised Sign
Holder's Sign
Save
Clear
Close


Update Driving License Information
Issue State:
Imo
...
Issue Date:
11/11/2011
Name:
Obinna Amadi
Address:
World Bank Owerri, Imo
Sex:
Female
Height:
6.5
Blood Group:
A+
Date of Birth:
02/12/1980
1st Issue Date:
09/05/2006
Expire Date:
09/04/2011
National ID. No.:
IM001AH
Passport
Authorised Sign
Holder's Sign
Save
Clear
Close


Register New Vehicles
Vehicle ID:
Vehicle Name:
Type of Vehicle:
Model:
Chasis No.:
Engine No.:
Body Colour:
Year of Manufacturer:
Owner's Name:
Sex:
Select
Address:
Date of Purchase:
Plate No.:
Comment:
Save
Clear
Close


Update Vehicle Registration...
Vehicle ID:
12
...
Vehicle Name:
ACD324
Type of Vehicle:
TOYOTA
Model:
2010
Chasis No.:
34235
Engine No.:
4354
Body Colour:
Blue
Year of Manufacturer:
2010
Owner's Name:
Warrent
Sex:
Male
Address:
32 Middle East GA, USA
Date of Purchase:
11/11/2001
Plate No.:
AS455
Comment:
Vehicle particulars screened...
Save
Clear
Close


Federal Road Safety Commission (FRSC) - [DataReport1]
File File-Creation Edit View Report
Zoom 100%
Staff List
Staff Id: 1
Name: Mr Chidi Echefu
Sex: Male
Age: 38
LGA: Orlu
State: Imo
Phone Number: 08037465321
Present Status: Married
Qualification: BSc
Operation Unit: Finance
Rank: Senior Officer
Grade Level: 8
Date of Employment: 03/04/1996
Address: 20 Tetelow Road, Ow.
Pages: 1