

USING DATABASE MANAGEMENT SYSTEM TO DEVELOP AND IMPLEMENT AN AUTOMATED MOTOR VEHICLE MANAGEMENT SYSTEM

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Abstract

The automated motor vehicle management system is a system developed for managing the movement of vehicles in and out of an organization. Presently, movements of vehicles in most organisations are handled manually by the security officials that are stationed at the gates. This system is associated with mismanaged data, inaccurate data or no data at all in some instances. Consequently, it is imperative to develop a computerized system to manage data taken from the large number of vehicles that move in and out of organisations in order to deal with cases of theft, proper monitoring of people and vehicles and to provide reliable information for decision making.

The proposed system is a window based desktop application designed with Microsoft Access as the database management system under a visual studio environment, Microsoft Visual Basic 6.0. It was tested with data collected over a period of two months and it was able to *improve the efficiency, security and professional look of the organization.*

Keywords: System, Organisation, Security, Monitoring, Manual and Automation

1. Introduction

In the past, movements of vehicles in most organisations have been left to the security officials that are stationed at the gates to handle. This system being strictly manual is associated with mismanaged data, inaccurate data or no data at all in some instances. Therefore, it is necessary to develop

a computerized system to manage data taken from the large number of vehicles that move in and out of organisations in order to deal with cases of theft, for inventory control, proper monitoring of people and vehicles and to provide reliable information for decision making.

The proposed system is a window based desktop application designed with Microsoft Access as the database management system under a visual studio environment and Microsoft Visual Basic 6.0 was used to design the front end

Any organization that needs to track their visitors that come with their vehicles can improve the professional look and feel of their organization with an Automated Motor Vehicle Management System. With a vehicle Check In system, the organization can accurately document times and reasons for visit of their visitors while providing privacy for both the organization and the visitor. Printing vehicle passes by the system becomes automatic. The Automated Motor Vehicle Management System will improve the efficiency, security and professional look of the organization.

The present mode of paper sign in sheets is unprofessional because it lacks privacy and the visitor must be attended to by a staff, leading to avoidable labour and material costs. Also, the information from a paper sign in sheet is often discarded or filed in such away that the information cannot be easily recalled.

1.1 Shortcomings of Manual System

There are numerous inadequacies associated with the existing system used by most organisations. A critical analysis of this current system shows that the system is biased to security issues and cannot accommodate the reliable recordkeeping and resilient functions that an organization will want to implement. Other shortcomings of the system are:

- a. Lack of register for vehicles that utilize the entry/exit points; this poses a big security problem as the organization cannot get information about the vehicles brought in by different motorists that comes in and out of the organisation at any given time.
- b. The system does not have any provision for the database of vehicles going in and out of the organisation for strictly record and security purposes.

1.2 Objective of The Proposed System

The main objective of the research is to design a fully functional Automated Vehicle Movement Management System, with primary focus on

- Reducing human error
- Reducing the stress and strain involved in manual labour
- Ensuring high security

- Reducing data redundancy
- Improving data consistency
- Ensuring easy updating of data
- Ensuring and improve easy record keeping
- Ensuring easy generation of Backup data

1.3 Research Methodology

Achieving the objectives of this research required the review of existing literature to get acquainted with the problems associated with the systems in place in some organisations, identify their strengths and weaknesses in order to determine the platform to build the proposed system.

The design phase consisted of the analysis of the architectural design used in implementing the system, hardware and software specification, development of the software using Microsoft Access and Visual Basic 6.0, while the implementation phase was carried out using real data obtained from visitors entry and exiting Joseph Ayo Babalola University, Ikeji Arakeji, Nigeria over a period of three months.

2 Related Work

The focus of this research is to develop a system that would reduce the volume of paperwork involved in the checking-in-out and security of vehicles in an organization by keeping a resilient database, ensuring an easier method of keeping records and ensuring a more effective system of vehicle entry and exit.

2.1 Existing Systems of Vehicle Monitoring

Monitoring generally means to be aware of the state of a system. It is the act of carrying out surveillance on, and/or recording the emissions of one's own or allied forces for the purpose of maintaining and improving procedural standards and security. Monitoring had been accepted as a scientific tool that is widely used to guide likely occurrence and to categorically state the required action to take in case the unexpected happens. Researchers and corporations had developed many systems that are used either on stand-alone or along with other device(s) for the purpose of monitoring. A careful observation of these systems generally showed that the process of monitoring basically involve communication between source and remote locations. Miya, (1975) identified the various procedures involved in the act of communication from source to remote locations and proposed that the effectiveness of any system developed for such purpose depends to a great extent on the communication components.

The numerous existing monitoring devices were designed using different technologies and adopted diverse modes in their implementation.

While some were implemented manually, some were activated electronically, robotically and mechanically. Among the existing devices are Automatic Point Location (APL)/ and Specific Time Alert (STA), (ola, 2007) and Enhancing Road Transportation through Geospatial Technology (Akomolafe, et al.2009).

These and other monitoring devices that were not actually designed for vehicle coming and leaving an organization possess some negative effects which posed challenges for further researches into monitoring devices. Some of these effects were similar to those identified by Miller, Vucetic and Barry(1993) and these facilitated the design of the Hazard Alert Device (HAD) by Bell Inc. The primary objective of HAD was to remove the negative effects of previous devices and provide an effective monitoring device. The shortcomings of the APL and STA are:

- a) Lack of communication between the base station and remote location
- b) Lack of adequate information on vehicles plying the road
- c) Inadequate information on vehicles coming and leaving the organization
- d) Lack of database

2.2 Vehicle Arrival/Departure Using Remote Bar Code Readers

Kano (1998) discusses the development of a remote bar code reader-applied management system for monitoring the arrival and departure of vehicles. The system, designed for use at a substation or similar facility, scans a bar code sticker on the windshield of an approaching vehicle and sends signals to open a motor-driven entrance gate, while at the same time automatically recording the type of vehicle, license plate number, vehicle owner's name, time of arrival/departure and other relevant information. This system is efficient but it is not robust enough to give sufficient and reliable data of the vehicle(s) when such is required.

2.3 Management Information Systems (MIS)

Davis (1974) gave one of the earliest definitions of MIS, in which he described it as an integrated man/machine system for providing information to support the operation, management and decision-making functions in an organization. At the first International Conference on Information System (ICIS), Keen (1980) defined MIS as the effective design, delivery and use of information systems in organizations. In an MIS text by Ahituv and Neumann (1986) they stated that MIS is the systematic study of information systems. An information system is a set of components (people, hardware, software, data, and procedures) that supports the operation and management functions of an organization.

However, Heeks (1998) defined MIS as information systems that provide reports which assist the managerial monitoring and control of organizational functions, resources or other responsibilities. [10] added that the purpose of the computer based information system is to collect, store and disseminate information from an organizations environment and internal operations, for purposes of supporting organizational functions and decision making, communication; co-ordination and control analysis. To this (Laudon and Laudon (2003)opined that an effective information system provides users with accurate and relevant information.By comparison with manual systems, creation of a computerized, rationally-functioning MIS can produce benefits to an organization. Such as; faster decision making and control through provision of timely and credible information. However,it is complex to designand experts are required for its operation.

2.4Integrated Multi-Pass System (Imps) – Vehicle License Plate Recognition System

An IMPS is a system that is designed to give consistent results under all weather conditions both day and night. Using image processing and artificial intelligent techniques such as integrated multiple pass algorithm, neural network recognizers, connected components, fuzzy logic and an arsenal of image processing tools, it automatically locates vehicle license plates and reads numbers accurately each time.This system only processes vehicle number plates without taking into consideration passengers and goods therein.

It is obvious from the analysis above that each of the systems mentioned had one inadequacy or the other. Consequently, it is desirable to develop a system that is capable to handle vehicles leaving and exiting an organisation

3System Analysis and Design

3.1Data Collection Methods

Three methods were adopted for data collection and these are observations, interviews and references. Furthermore, the requirements of the vehicle entry/exit system were derived by analyzing the existing entry/exit system through:

- i. Analysis of the existing documentation such as daily record books; reports and other management documents were studied to understand how the vehicle entry/exit operates.
- ii. Observation as a data collection tool was used to know how the current system was being used right from when a car arrives at the entry point, the various forms filled manually, and the reports made. Observing the time it takes to prepare the reports and the likely

limitations in the manual system of reporting. This helped to gather data and information that would not easily be obtained by other methods,

- iii. The Head and some members of the security unit of Joseph Ayo Babalola University were interviewed. It was discovered that they were facing some challenges such as long period of documentation and safety of records with the manual system.

3.2 Analysis and Design Tools

The main objective of this phase was to analyze system requirements and identify the data requirements of the vehicle entry/exit management system. The data collected was analyzed using tools that include decision tables, structured English, and flow charts, in order to evaluate the current system and come up with the new system specifications.

The tools used in the analysis and design of the proposed system were:

- i. Data Flow Diagram (DFD): This was used for process modeling. It helps to show how data moves and changes through an information system in a graphical top-down fashion. It also gives the graphical representation of a system's components, processes and the interfaces between them.
- ii. Entity Relationship Diagram (ERD): This is an important tool for Data modeling. It helped in the design of the Entity Relational Model to show the relationships between the entities involved in the system together with their attributes.
- iii. Decision Tree: This was used in decision-making on assigning access rights to the user(s) of various levels of the vehicle entry/exit management system.

3.3 Implementation of System Architecture

The design tools were used to understand the structure and functioning of the proposed system. However, the System Architecture provided the high level view of the implemented system which had the two main components: database management system and user interface. System users interact with the system through pages generated by Microsoft Visual Basic 6.0. The database for storing data relevant to the vehicle entry/exit management was created using Microsoft Access 2010 as the database management system. To interface the DBMS and Microsoft Visual Basic 6.0, an ODBC middleware was used that supports object oriented programming languages. Therefore the management information system was developed as a system implemented based on the Microsoft Visual basic 6.0 platforms.

3.4 Validation

The integration of the various components of the management information system for vehicle entry/exit was achieved through data input to the system and obtaining the output information. In case of any errors, correction measures were followed until the expected output was achieved as required in the specification. This involved repeating various stages of the development process. Interfaces to the system were validated to ensure that relevant data to the system is entered.

3.5 System Design

The system designed was required to able to generate reports as regards the different client and administrative needs. The system was also in position to give details of the staff in the motor vehicle movement management system and details of the registered vehicles easily generated by the new system. The system enables users to register new records in it. The users also view, delete and search for the already existing records in the system. The system also ensures that only registered users can access it.

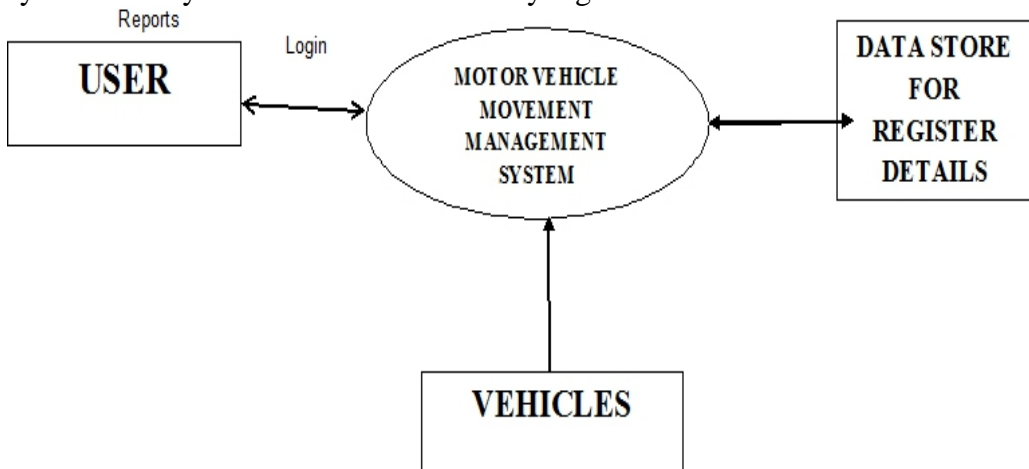


Fig 1: Context Flow Diagram for the new system.

4 System Implementation

This phase involved installing all components of the system that include hardware, software and training users of the system. The conversion plan used in the system was known as Parallel Conversion, given the advantage of low risks and being able to compare performance between the new system and the old one.

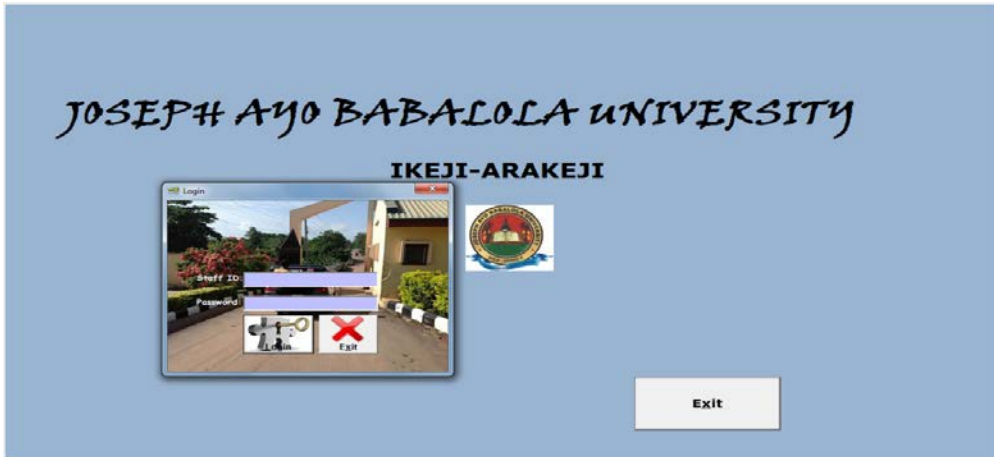


Fig 2: The Login page



Fig 3 User Menu



Fig 4 Vehicle Check In page

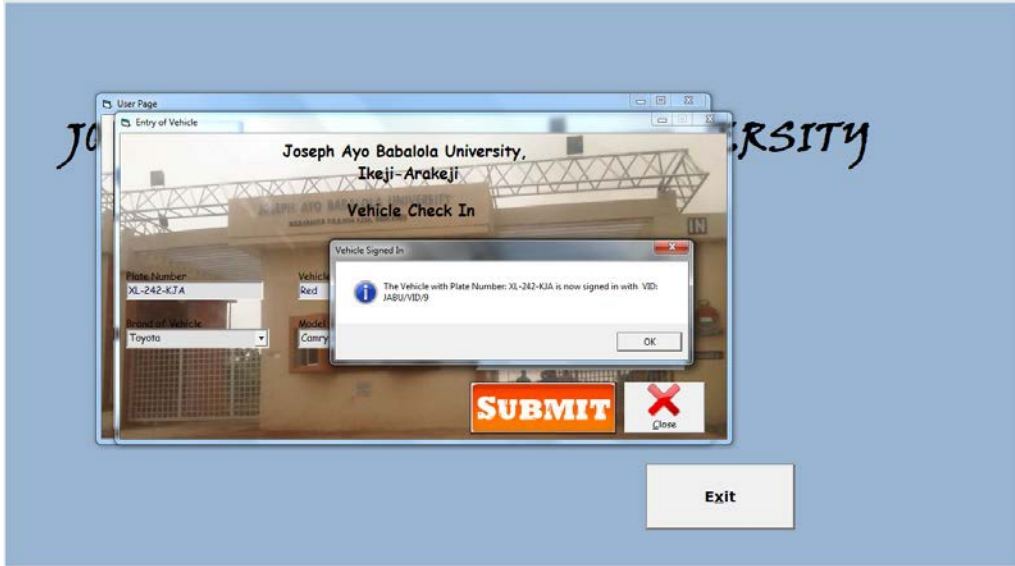


Fig 3.6.4: Vehicle Check In Affirmation

VID	PNumber	VBrand	VModel	Vcolour	Datein
JABU/VD5	1	1	1	1	07-Jun-13
JABU/VD6	2	2	2	2	07-Jun-13
JABU/VD7	u4fu	Nissan	Almera	wine	12-Jun-13
JABU/VD8	xox	Nissan	Atlas	xkcxk	12-Jun-13
JABU/VD9	xkcxkcxk	Nissan	Pathfinder	cxkcx	12-Jun-13
JABU/VD10	xox	Nissan	xox	xkcxkcx	12-Jun-13
JABU/VD11	sd4sd4	Nissan	ada	sd4d	12-Jun-13
JABU/VD12	2322	Nissan	Armada	23	12-Jun-13
JABU/VD13	sd4sd4sd4	Nissan	Cabstar	sd4d	12-Jun-13
JABU/VD14	yufuyy	Nissan	Almera	uy	12-Jun-13
JABU/VD15	hknkjk	Nissan	X-Trail	hjk	12-Jun-13
JABU/VD16	SD239 AM	Nissan	Leopard	REO	12-Jun-13

Fig 5 Vehicle Reports

5 Conclusion

Since motor vehicles in urban areas have become increasingly part and parcel of successful businesses, it is imperative to note that more and more vehicle users get attracted to organized vehicle movement management systems where ample, secure and effectively managed vehicle entry/exit is provided. There is need for people, especially business organization owners and executives to effectively pay attention to the design and deployment of a well organized motor vehicle movement management systems for visitors and their vehicles.

In the space and time available, this study has attempted to convey a feeling of the process of developing and using Management Information Systems which intend to assist managers arrive at decisions more easily through fast access to relevant information. There is now extensive literature available on the technologies of motor vehicle movement management systems, but the amount of literature reporting experience in building actual systems is much more limited.

This study was aimed at the implementation of a motor vehicle movement management system and was a useful starting point in managing records at the Joseph Ayo Babalola University main gate. Due to time limitations, a comprehensive research and analysis that extend to the methods with which management information system can be used to alleviate vehicle entry/exit problems has not been exhaustively done. However, the results show that to some extent vehicle entry/exit problems could be reduced by the deployment of the motor vehicle movement management system at an organization's main entry/exit points. The program designs and codes were purely academic and not all specifications of the study system were implemented.

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