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Web-Based Custodial Information Management System

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ABSTRACT

The research implemented an online prison information management system. In this study, it was found that the existing prison system has no centralized reference database for effective administrative functions. The manual jail organization has been tormented by ills of a customary managerial and the board structure. These included human errors in administering records and registration of prison inmates, hurdles in compilation and analysis of data due to lack of data and information integrity. The new system was developed using MySQL, php, HTML 5, and Java script and on top of that non-linear least square regression power model was developed to forecast the trends and frequencies of events in the custodial centres to enhance decision making by relevant authorities. Furthermore, structured query language was used to developed database functions such as creating a dynamic table, backup, and recovery, or even grant or revoke a system and object privilege using the system interfaces. It also designed an in-out register to keep track of all prisoners and others who move in and out for various reasons and include provisions for recording the prisoners sent to courts for hearing. The framework has numerous noteworthy strengths, for example, low-remaining burden, incredible amount of information transmission, high-veracity, and low-costs. At long last, the created model for gauge gave helpful data on the pattern, development and frequencies of wrongdoing dependent on the all-out conceded jail prisoners as extended to an absolute number of 141,128 across the country. This study had provided valuable material and a guide in implementing a custodial information management system in River State. It is a useful prototype for developing other African Countries Custodian system with little modifications.

Keywords-- Database, HTML, inmates, information management, MySQL, prison

INTRODUCTION

Background of the Study

A Custodial, Prison, or restorative office is a spot where people are genuinely limited or interned and normally denied of a scope of individual flexibility. Jails are regular establishments, which structure part of the criminal equity arrangement of a nation, with the end goal that detainment or imprisonment is a lawful punishment that might be forced by the state for the commission of a wrongdoing [1].

In Nigeria, jail is a spot/space used to restrict criminal or individuals indicted or anticipating preliminary. Prisoners bolted inside their dividers are isolated from the rest of the world, held under steady examination and reconnaissance, and compelled to comply with a severe code of authentic principles to abstain from confronting formal assents. Their own belongings are taken from them and they should adjust to institutional dress and individual appearance standards. Numerous human capacities are carefully reduced–hetero movement, kinship, family connections, society, training, and cooperation in bunches become genuinely confined or cut-off [2].

At present, a simple cycle of putting away detainees' information physically and registers is set up, requiring a ton of records saving for the prisoners both in jail offices [3]. These records house a very large number of inmates and their case details, such as: details of where they come from, records about the block and room they are allocated, health records and records of the people who come to visit them. This makes the records environment unkempt with thousands of papers works in form of a manual file system, all of which must be managed. Consequently, when a prisoner's report is needed, it takes longer time to produce to enable management make decisions. Oftentimes reports disappear and tracing becomes a problem since the system is not automated.

This study is focused on the development of a web portal solution to manage the record system of custodial centres in Nigeria. Surprisingly, the record keeping system of this sector in Nigeria has been poorly managed. Hence, the need to develop a computerized record management system. The use of computer is important, and it has helped most people in compiling data which used to be in hard copy. One

of the uses or benefits of computer is that it enables storage and retrieval of information so quickly that it has decreased information and work complexity. The increase in the speed of work has helped us to do many things with fewer resources. In the past lots of manpower was used in keeping the records safe but computer helps us to work with machines which can produce the best quality of products with maximum speed and efficiency.

The Prison Management System seeks to integrate prisoner's data into a single integrated system which will in turn result to all the information being present in a digital format; easy to understand, elegant, consistent, and accessible at real time. It will be implementation with a well-defined interface, data hiding, loose coupling, using passwords and usernames as security measure for data access from the system. Communication would be efficient and effective with the developed system. There would be tracking, and monitoring of the Prisoners' details whenever required from the database. The Data entrant would capture data and be able to store it in the database for future retrieval anytime, anywhere by the Management. Also, the management would be able to control the system using security measures, through the privilege given by the administrator to read, write and edit as at when fit.

Review of Related Work

Prison Management System which he thought about a decent assortment of registers and reports for the viable administration of detainment facilities [4]. His framework was helpful for clients to oversee and store the information of the detainees. With the usage of his undertaking, the Prisons Department, Malaysia had the capacity to change the current framework to this framework so the information base can do works simpler to guarantee the information are totally made sure about and have a reinforcement if there is security assault on the framework or data set. The framework likewise ensured that all the cycles in the modules did the interfaces expected for the trigger module. The interfaces are connections to the Oracle9i Database and the new information that embedded in the interface was put away in the information base.

Likewise, the Management System additionally made a protected path in the matter of dealing with the detainee's data. This is because of the need of username and secret key to utilize the framework. Thus, the System can be gotten to simply by approved clients. Along these lines, the framework is shielded from interruption of unapproved clients. The constraint of this work, nonetheless, is that the usage was done on an information base of records put away locally in the various workstations in the jail. This advancement cannot be gotten to from some other workstation than the penitentiaries where it was executed. This is a significant disadvantage to this forward leap.

Hypothesized that the utilization of web or PC framework could upgrade associations to enhance their correspondence and subsequently viability in administration conveyance [5]. In like manner, Organizations and Institutions today are being constrained by the Internet to move towards teleworking.

In this way, there is requirement for electronic PC framework that could give simple access of data on the web and give openness to data anytime. This requires the executives to get to the information base, which should be possible by enrolling them into the framework and afterward giving the benefit to them once signed in while unapproved clients are denied admittance.

Actualized a Prison Management System at Arthur Road Prison and at different Prisons of Maharashtra for the Prison Department [6]. The Prison Department, Government of Maharashtra has executed Prison Management System (PMS) at Mumbai Central Prison and Mumbai District Prison, in the year 2010 on pilot premise, with a dream to scale up PMS to all penitentiaries across Maharashtra. Nonetheless, because of specific difficulties, the office is presently assessment of various alternatives/arrangements accessible to automate various jails across Maharashtra. For this undertaking, admittance to the web was an issue because of security reasons. Another issue was that at the lapse of their agreement, terms were not reestablished, thus, the framework separated. Computerization of existing cycle was managed without considering measure reengineering before robotization of the cycle/sub-measure. At first, it was visualized that in the event that the PMS is fruitful, at that point it would be scaled up and might be actualized at different jails across Maharashtra. In any case, because of different reasons the execution at Mumbai Central Prison is not viewed as a completely fruitful framework. The administration was not strong.

Wrongdoing examination framework for the Nigeria Police Force utilizing a biometrics approach [7]. Solid criminal speculates' acknowledgment is a significant issue in wrongdoing examination measure. The undertaking was actualized utilizing Visual Basic programming language. This task carried biometrics into the universe of wrongdoing examinations the board framework yet in addition has a significant disadvantage, overall openness. On the off chance that on account of a fire episode or harm to the framework on which the product conveying the data set was introduced, there would be lost data simply like when everything is done physically. The field of designing looks for answer for each issue

experienced as well as for dependable answer for each experienced issue.

Planned an online jail the board framework for the Nigeria Prisons Service Enugu as a contextual investigation [8]. This undertaking was finished utilizing essential html for noticeable web substance, PHP for worker scripting and MySQL information base was utilized to store and deal with the detainee's records. An instrument used to accomplish this venture incorporates Dreamweaver CS5 html editorial manager, CSS3 for styling, JavaScript, PHP wamp5 worker and MySQL. The task was executed effectively, and the outcome got gives a solitary administration framework which incorporates all the data about a detainee in a solitary profile and can without much of a stretch be gotten to which improved the general proficiency of jail the board. This task acquainted Prisons Management System with the Online Community where the Prison's site fills two needs of being an entrance for guests to come and discover the current happenings in the jails and furthermore an entry for the overseers of the jail to deal with the jail. In any case, the disadvantage was that the instruments utilized for the improvement of this undertaking are not a cross-stage apparatus. PHP is a worker side scripting language yet does not empower detachment of worries for the plans of action of the web application. Dreamweaver CS5 is another apparatus which filled in as an IDE for planning the web application. This expanded the quantity of devices utilized and accordingly, expanded expense and efficiency time. On account of adjusting the framework once actualized, the main individual that would do that would be the designer of the undertaking since it is not cross-plat shaped and simple to control.

Planned a Prison Management System for Nigerian Prisons Service [9]. This work was to fill in as a model for the innovative progression and show of the different utilization of ICT assets in the Police and Prisons Service. He actualized it with ASP.Net MVC 2 of every 2001 as it was the most widely recognized MVC innovation around then. Nonetheless, it was not embraced around then on the grounds that the serious utilization of online frameworks was not seen as the following huge thing in the computerization of cycles in the law offices.

Explored on the utilization of time arrangement and endurance examination to figure future qualities from past qualities to help government or association, prepare with exact information utilizing the Kaplan Meier endurance technique for various grouping of time arrangement information to acquire the ideal goals [10]. Introduced a biometric web based democratic framework that can upgrade the constituent cycles and, in this manner, give quick, exact, and made sure about political decision results [11]. The consequence of this exploration work is a framework that will fill in as a brought together worker to different hubs and will be sent on the World Wide Web (WWW) to make the web casting a ballot conceivable. Zeroed in on giving a tweaked e-learning framework that offer a powerful learning experience for understudies in the Niger Delta Universities utilizing Structural System Analysis and Design Methodology (SSADM) and MySQL information base administration framework [12].

Built up an intuitive virtual homeroom for Electrical Engineering qualification course utilizing PC programming dialects and web advancements, for example, PHP, MySQL, and so forth [13]. The understudies' reaction to the work demonstrated that over half concurred that the program was anything but difficult to utilize and effective.

MATERIALS AND METHOD

The materials used for this work are MySQL Server, PHP Program, HTML 5 Script, Wamp Server, Web Browser, Notepad, Image Editor, Adobe CS6 Master Collection, Microsoft Word, Excel, Laptop and Server systems.

The method used for the design of the Custodian Web-Based Information System is the Object-Oriented Analysis and Design Methodology (OOA/D). The OOA/D methodology is a generic term for the process of analyzing a problem and developing an Object-Oriented approach to solving it. The aim is to decompose the whole problem into a set of reusable classes and their interactions/interrelationships. Whereas Non-Linear Least Square Regression Power model was used for forecasting the system by generating statistical information that will aid the custodian management agencies to plan.

This study proposes an improved web-based custodian management system for prison facilities in Nigeria. This study includes different modules which represent sections of the prisons and the records that these respective sections are exposed to.

The Object-Oriented Analysis and Design (OOAD) philosophy and documentation images of the Unified Modeling Language (UML) will be utilized in the examination of the framework. The Object-Oriented Analysis and Design (OOAD) strategy utilizes charts to archive an article-based decay of frameworks and to show the association between these items and the elements of these articles. The UML outlines utilized in this work include: the utilization case chart and the class graph (Fig. 1).

Design of the Proposed System

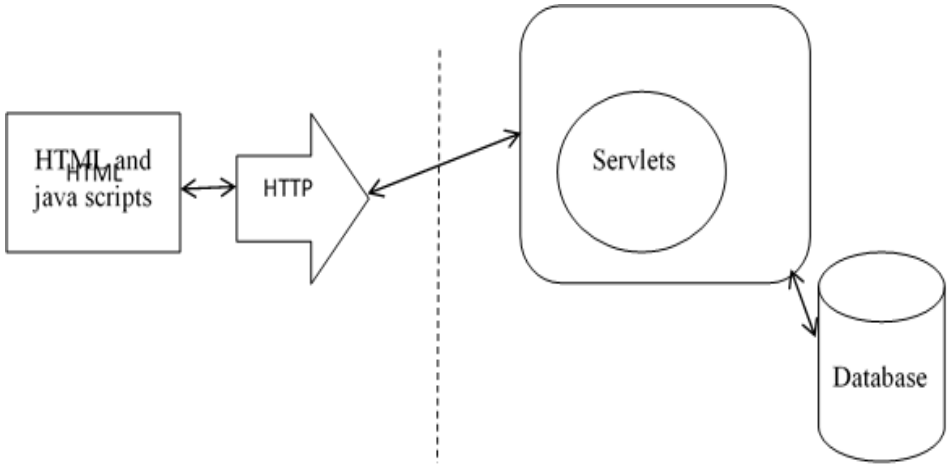

Figure 1: *Block diagram of the proposed system.*

On the Client side, HTML and java scripts were used to provide the user interface. XML is for security purpose. On the server side, Servlets are used to provide intermediate functions between Client side and Database.

Use Case Diagram of the Proposed System

The use case diagram of the proposed system shows all the actors that must play their respective roles (designated as use cases) for the proposed system to function according to its standard design specifications. A utilization case is an action, activity, or capacity which an entertainer of the proposed natural information securing framework should perform inside its assigned class or sub-framework. The Fig. 2 presents a utilization case chart of the proposed framework.

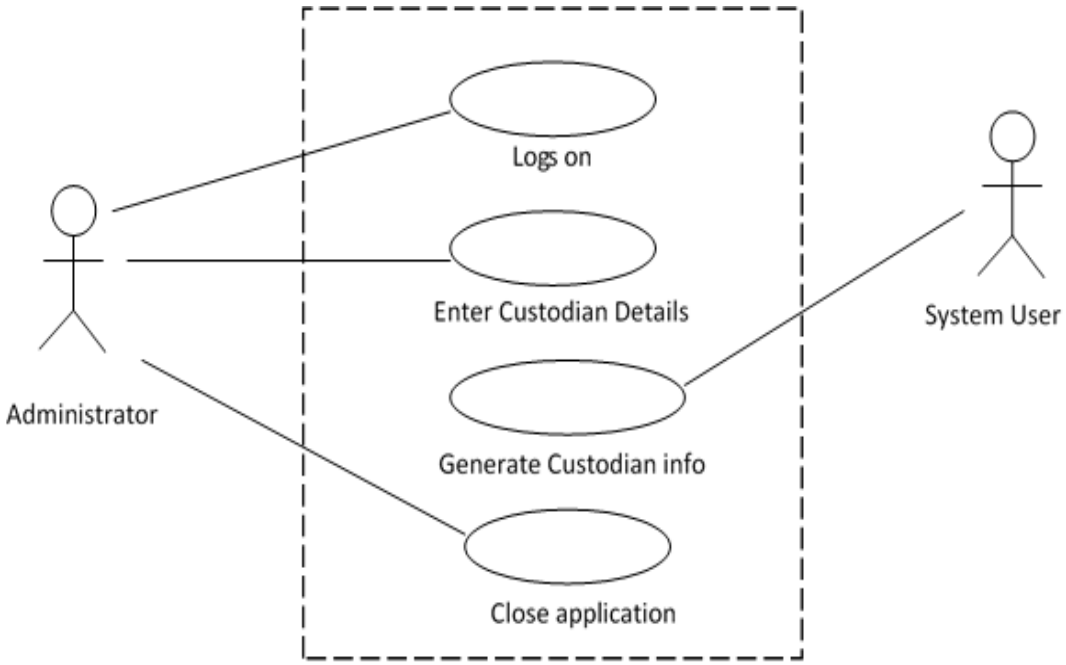

Figure 2: *Use case diagram of the proposed system.*

With the system flow chart (Fig. 3) logical operational units of the physical system can be seen clearer and mapped unto the software domain with fewer hassles. Thus, the need for an accurate system flowchart is paramount in the design of any software system as it serves as the bridge between the physical representation of the system and its software translation. The system flowchart is divided into various columns representing a major sector of the entire system, symbols representing various activities can then be placed in appropriate columns and arrows used to coordinate the flow of activities in the system.

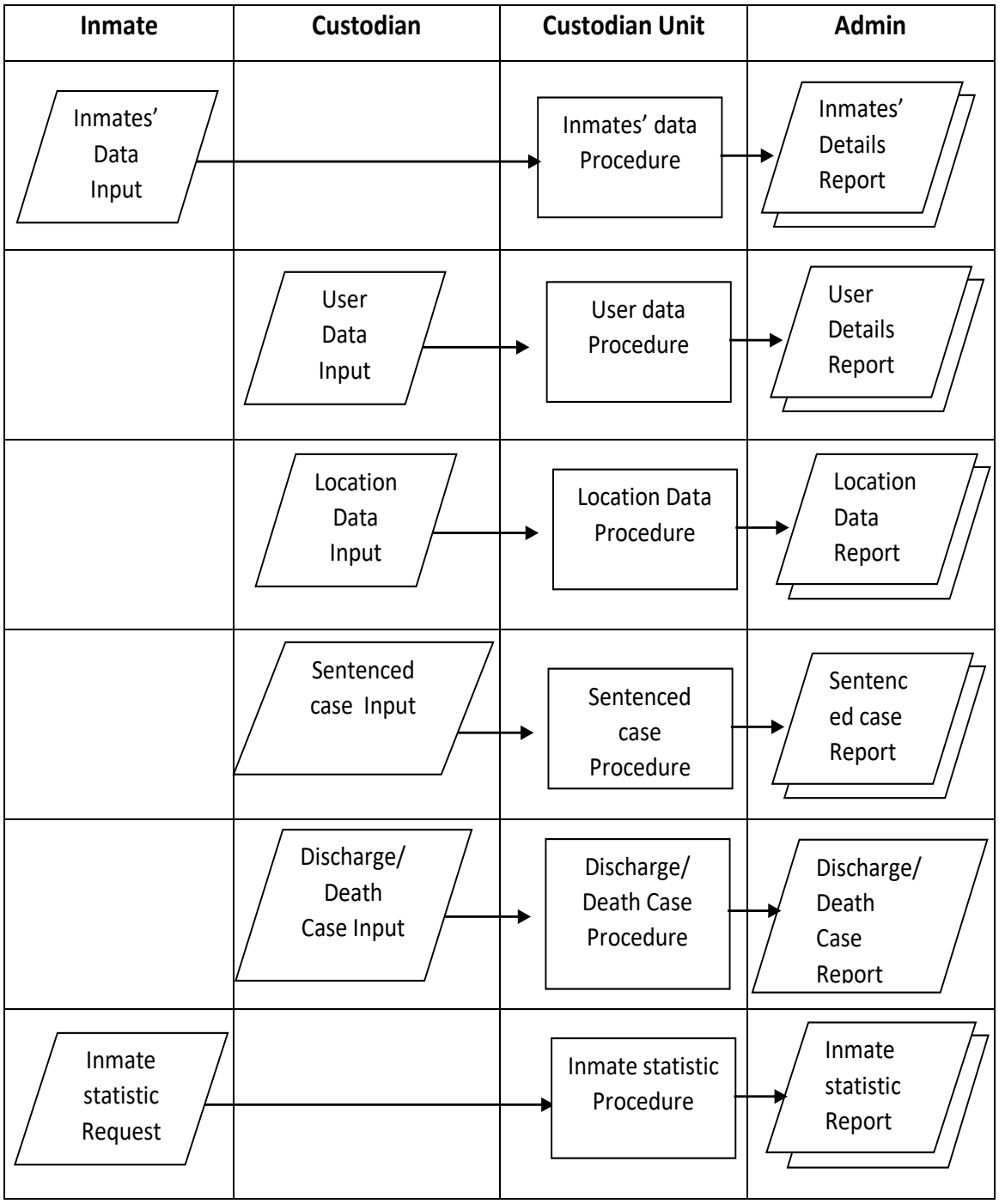

Figure 3: *Custodian system flowchart.*

Computer Run Chart of the Proposed System

Fig. 4 is the chart derived from the system flow chart for explaining and expanding its details and indicating where the computer fits into the system.

Purpose: To depict the logical sequence and where relevant interrelationship of the computer routine is to be performed showing input files and outputs.

This form of sheet is required in the design of a computer system and the operational documentation.

Format: Inputs, Master files, Processes, Transaction files and Outputs appears in the order just described in separate columns from left to right across the sheet.

Database Design of the Proposed System and Method used for Forecasting

The proposed system adopts the relational database model in which data is stored in two dimensional tables.

The proposed Prison Management System database comprised of Six database tables: inmate table, user table, location table, discharge-case table, death-case table, and sentenced-case table. The data were collected from the Nigeria Prison Service, Rivers State Command [14].

Non-Linear Least Square Regression technique was used to obtain the best model for forecasting the custodian or prison population over a period of 11 years between 2020 to 2030, the simple power equation was used to model the system. This nonlinear model has wide applicability in all fields of engineering to characterize quantities that increase or decrease at a rate that is directly proportional to their own magnitude (Fig. 5).

$$y_1 = \alpha x_1^{\beta} \qquad (1)$$

where $y_1 = Total\ Number\ of\ Prison\ Inmates$

$x_1 = Year, \alpha\ and\ \beta\ are\ constants$

Equation (1) is linearized by taking its base-10 logarithm to give:

$$\log(y_1) = \log(\alpha) + \beta \log(x_1) \qquad (2)$$

The general form of linear equation is given as:

$$y = a_0 + a_1 x \qquad (3)$$

$y = \log(y_1)$, $a_0 = \log(\alpha)$,

$a_1 = \beta, and\ x = \log(x_1)$

from equation (3), i.e., $y = a_0 + a_1 x$

$$\begin{bmatrix} n & \sum x \\ \sum x & \sum x^2 \end{bmatrix} \begin{Bmatrix} a_0 \\ a_1 \end{Bmatrix} = \begin{Bmatrix} \sum y \\ \sum xy \end{Bmatrix} \qquad (4)$$

$$a_1 = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} \qquad (5)$$

$$a_0 = \bar{y} + a_1 \bar{x} \qquad (6)$$

$$\bar{y} = \frac{\sum y}{n} \qquad (7)$$

$$\bar{x} = \frac{\sum x}{n} \qquad (8)$$

$$S_r = \sum (y - y_m)^2 \qquad (9)$$

$$S_t = \sum (y - \bar{y}_m)^2 \qquad (10)$$

$$r^2 = \frac{S_t - S_r}{S_t} \qquad (11)$$

$$r = \sqrt{\frac{S_t - S_r}{S_t}} \qquad (12)$$

from equation (5):

$$a_1 = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} = \frac{8*33.2746 - 9.2466*28.75286}{8*10.7264 - (9.246578)^2} = 1.061149542$$

from equations (7) and (8)

$$\bar{y} = \frac{\sum y}{n} = \frac{28.75286}{8} = 3.594107862$$

$$\bar{x} = \frac{\sum x}{n} = \frac{\sum x}{8} = 1.155822248$$

from equation (6)

$$a_0 = \bar{y} + a_1 \bar{x} = 3.594107862 + 1.061149542 \times 1.155822248 = 2.367607613$$

from equations (9) and (10)

$$S_r = \sum (y - y_m)^2 = 0.007334182$$

$$S_t = \sum (y - \bar{y}_m)^2 = 0.051270831$$

from equations (11) and (12)

$$r^2 = \frac{S_t - S_r}{S_t} = \frac{0.051270831 - 0.007334182}{0.051270831} = 0.856952161$$

$$r = \sqrt{\frac{S_t - S_r}{S_t}} = \sqrt{\frac{0.051270831 - 0.007334182}{0.051270831}} = \sqrt{0.856952161} = 0.925717106$$

Comparing equations (2) and (3)

$$a_0 = \log(\alpha) \text{ and } a_1 = \beta$$

therefore, $\alpha = 10^{a_0} = 10^{2.367607613} = 233.1350722$

$$a_1 = \beta = 1.061149542$$

The Developed model for forecasting the growth rate of the Custodian centres in Rivers State is given as:

$$y_1 = 233.1350722 x_1^{1.061149542}$$

The value of x_1 = The year - 2000 (eg. 2030 - 2000 = 30)

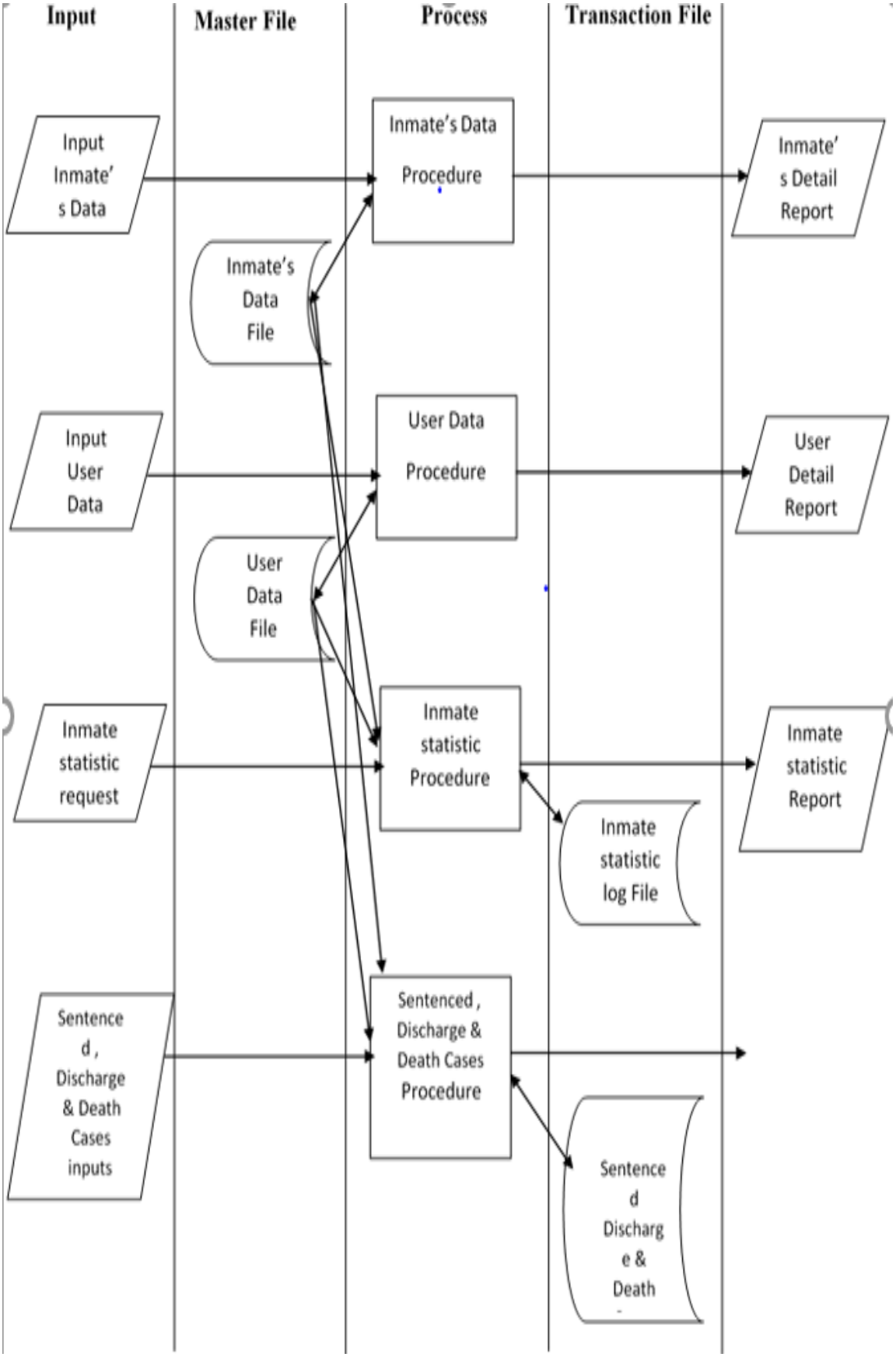

Figure 4: *Computer run chart.*

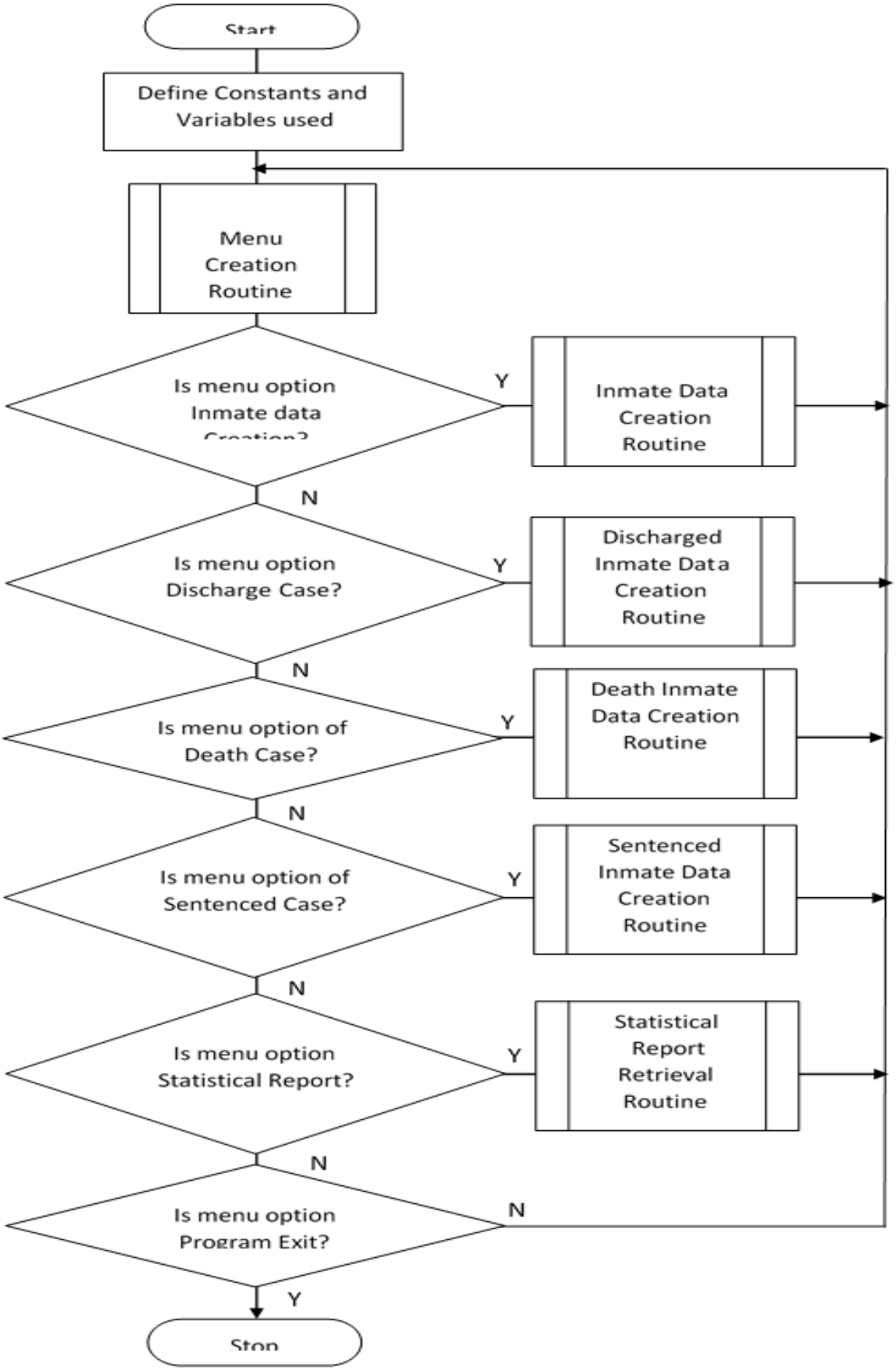

Figure 5: *Program flowchart.*

RESULTS AND DISCUSSION

Custodian Web Portal Testing and Results

In this study, an improved web-based custodian management system for prison facilities in Nigeria was implemented with a focus on Rivers State prison facilities. Fig. 6 and 7 are some of the interfaces of the software as described in the materials and method phase.

Fig. 6 shows the Index page that contains content of information about the Nigeria Prison Service such as who they are, general public information, Rolls of Honour and mission/vision with a screen of the National Headquarters building based on the data gotten from the live web page online. The Fig. 7 shows the login page which gives the user ability to be authenticated before gaining access to the staff administrative area. In this proposed design system, the username is S1 and the password used is S1.

Fig. 8 show the death case database structure. This is an overview of the table structure of the death-case table capturing inmate information including cause of inmate death and date

.

Figure 6: *Index page of the new system.*

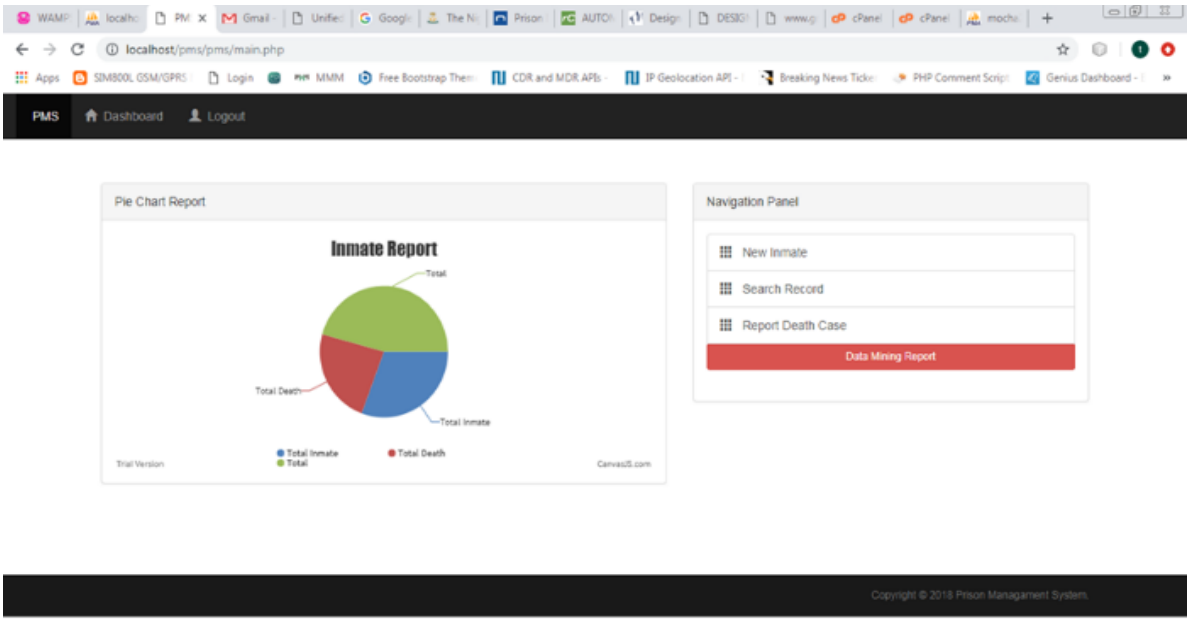

Figure 7: *Administrative dashboard of the new system showing summary reports of inmates at real time.*

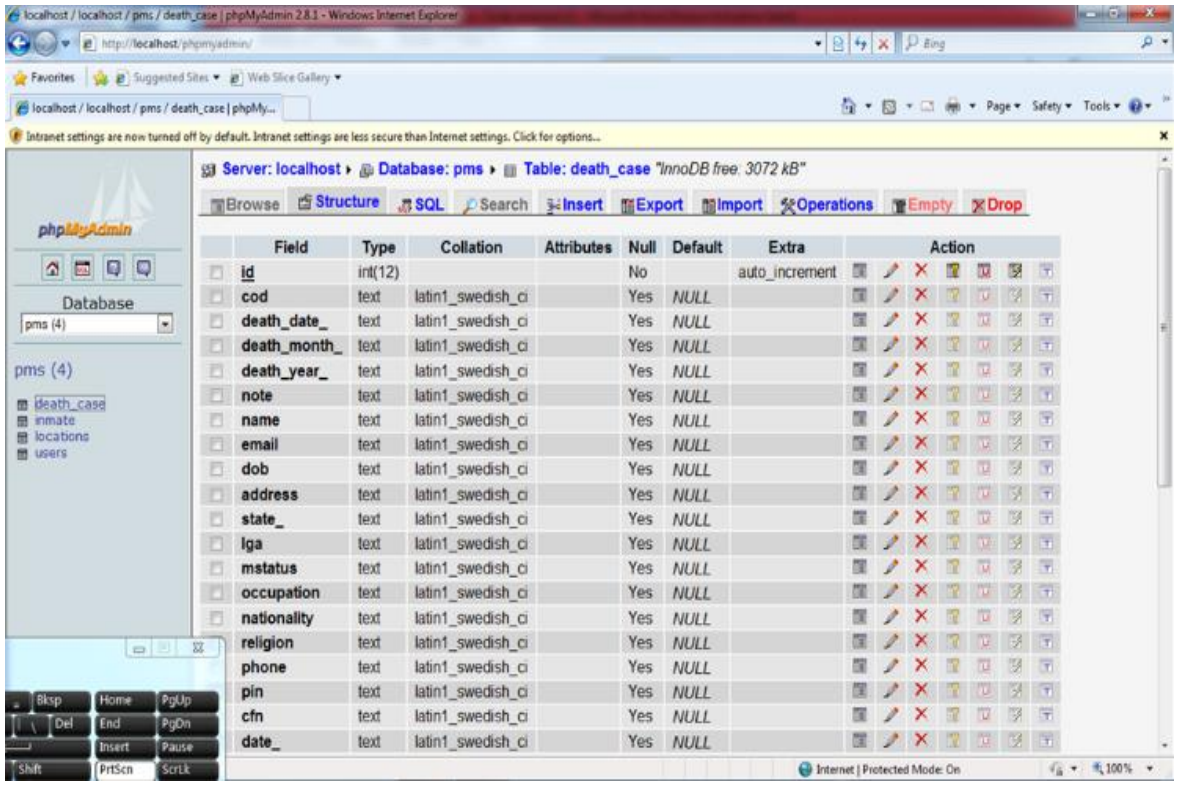

Figure 8: *Structure of 'death_case' table in the new system.*

Results of Forecast from the Developed Models

The developed model was used to obtain the results from the model fittings to forecast the trend and growth of population in the custodian centres in Rivers State between 2017 and 2030. This information will aid government and the custodian agencies to plan for the effective management of the prison ahead of time. Table1 shows that the prisons in Rivers State is already over-crowded and requires urgent attention otherwise the trend will continue and get worst by 2030. The table also shows the trends in the size of the sentenced prisoner and those awaiting trials which formed the total remand populations, the number of offenders' trend was forecast up to 2030.

Table 1: *Result of the forecast from (2020-2030) for rivers state custodian centres.*

YEAR	Sentenced Cases	Awaiting Trial Cases	Prison Inmates	Prison Capacity
2020	1,680	3,920	5,600	1,354
2021	1,769	4,128	5,898	1,354
2022	1,859	4,337	6,196	1,354
2023	1,949	4,547	6,495	1,354
2024	2,039	4,757	6,795	1,354
2025	2,129	4,967	7,096	1,354
2026	2,219	5,178	7,398	1,354
2027	2,310	5,390	7,700	1,354
2028	2,401	5,602	8,003	1,354
2029	2,492	5,815	8,307	1,354
2030	2,583	6,028	8,611	1,354

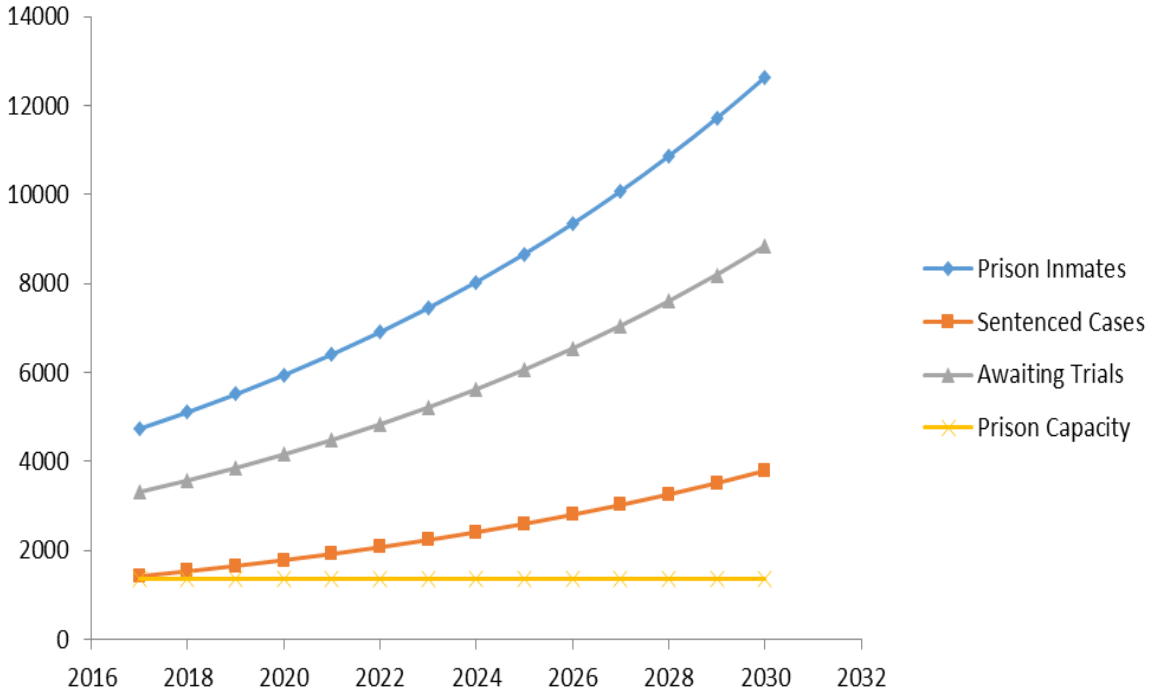

Figure 9: *Forecasted remand and sentenced prison population in rivers state.*

Fig. 9 shows that by the year 2032 the sentenced prisoners will outnumber the capacity of the prison which means that the prison is already over-crowded. When it is combined with the number of those awaiting trial. This information sends a signal that the government need to urgently increase the capacity of the prison to avoid serious crises and high death rate at the prisons if the trend continues.

CONCLUSION

The research implemented an online improved prison management system. In this research, it was found that the existing prison system has no centralized reference database for effective administrative functions. The manual jail organization has been tormented by ills of a conventional regulatory and the board structure. These included human errors in administering records and registration of prison inmates, hurdles in compilation and analysis of data due to lack of data and information integrity. The new framework built up the information base capacities, for example, making a unique table, reinforcement, and recuperation, or even award or deny a framework and article benefit utilizing the framework interfaces. It also designed an in-out register to keep track all prisoners and others who move in and out for various reasons and include provisions for recording the prisoners sent to courts for hearing. The framework has numerous critical strengths, for example, low-remaining task at hand, incredible amount of information transmission, high-veracity, and low-costs.

The new system has been successfully tested, implemented, and meets all the specified requirements. In comparison to the current system (manual system), the system is more secure, flexible, provides more user feedback, reduces the workload, prevent erroneous data entry and provides more functionality. This framework ought to be actualized not exclusively to facilitate the remaining task at hand of Prison Inmate Information System, yet to energize coherence and improvement in record keeping.

A successful implementation of the Prison Management System will greatly increase the efficiency of the Nigerian Prison Service and will help to ensure that records are managed properly for effective monitoring of prison inmate in the country. The problem of delay in retrieving criminal suspects records for reference purposes and for appropriate court action or prosecution to be taken can be reduced drastically and the efficiency in the management of criminal records and investigation of criminal case being rendered by the Nigerian Police Force will greatly be improved upon.

The new developed “Prison Management System” included a forecasting module to provide adequate statistical information for future planning and effective management of the custodian centers in Nigeria by the government, law enforcements agents, judiciary, and the custodian management agencies.

RECOMMENDATIONS

As a result of the findings from this study, it is recommended that:

a. The prison be networked so that when a prisoner is registered at the gate his or her record can be accessed at record office and other offices. More so, all operators that may likely use this system must be computer literate who have undergone a short training on how to use the system to avoid errors.
b. This research be used as a valuable material and a guide in implementing a custodian information management system for Nigeria and as a prototype for other African Countries with little modifications.
c. Awareness about the numerous advantages of a Custodian Information Management System should be communicated, highlighting its information features, economic values and importance to law enforcement agencies and the government. Therefore, this awareness would be useful to other African countries.

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