User Studies: Building the Custodial Centre Information System for Nigerian Correctional Service

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Abstract

In recent times, the trend in organizational administration and management is to automate routine processes by employing an information systems (IS). This comes with a lot of benefits which include easy retrieval/update, efficiency and effectiveness in managing daily duties/responsibilities. However, the IS technology is yet to fully find its way into the Custodial Centers (CC) of the Nigerian Correctional Service (NCoS). Using the interview method (questionnaires), we elicited challenges that plague the current approach of offender management at the study area (Awka Custodial Centre, Anambra State, Nigeria). Our methodology herein is quite unique because it integrates human computer interaction (HCI) methods with the stages of prominent IS development methodologies. Specifically we employed the rapid application development (RAD) methodology but with some tweaks. The survey (questionnaires), alongside the design and usage of a low fidelity prototyping approach was employed, and this was aimed at understanding user (staff) needs. The iterative joint application development (JAD)-based user (prototype) design stage led to an interactive construction of the Custodial Centre Information System (CCIS) - an effective tool for offender/CC management and administration. Unified Modeling Language (UML) and Data Flow Diagrams (DFD) were employed during analyses and the results were presented. Indeed, CCIS does not only incorporate the appropriate CC/NCoS nomenclature, it would also increase efficiency and enhance work processes in the service.

Keywords: *Nigerian Correctional Service, Information Systems, Human Computer Interaction, User Studies, Prototypes*

1. Introduction

Prison is a place, especially a building or buildings bounded by high barriers where criminals or civil offenders/convicts are legally held in captivity, or strictly confined, either in jail or awaiting trial or being detained to allow for sufficient and effective investigation before the commencement of trial [1]. In modern times, it serves as a reformative and correctional institution for offenders and has come to assume integral part of the society. It tries as much as possible to bring offenders in conformity with societal trends via the use of vocational training, moral guidance, counseling and other reformative measures. Correctional institutions are renowned for its responsibility of accepting, housing and reforming offenders, thus encouraging conformity in the contemporary society. Also it is a known fact that little work has been done by researchers as regards Information Technology in order to computerize/automate this area as far as Nigeria is concerned, probably due to type of individuals (offenders) found within. The aims of Nigeria Prisons Service (NPS) include correction and reformation, rehabilitation, re-integration (3Rs). The NPS alongside the Nigerian Police Force (NPF) and the Judiciary (the Courts) constitute the Criminal Justice System (CJS) [2]. NPS over time have pursued the custodial theory of imprisonment, thereby,

paying lip service to the reformation and rehabilitation perspective. In the light of this amongst other challenges they face, the National Assembly of the Federal Republic of Nigeria enacted the Nigerian Correctional Service Act [3] in 2019 so as to make provisions for prison administration and non-custodial measures in the country. The Act repeals the previously enacted Prison Act Cap. P29 Laws of the Federation of Nigeria, 2004 [4]. This initiative intrinsically changed the name from NPS to Nigerian Correctional Service (NCoS) and stated that prison stations should be regarded as Custodial Centers (CC) instead.

Amongst the objectives of the NCoS Act is; "ensuring compliance with international human rights standards and good correctional practices". In line with international best (correctional) practices, there is need to include the vast computing power of information and communication technology (ICT) in the management of offenders. Specifically, if correctional institutions around the country will perform their duties effectively, efficiently and judiciously, then it is necessary that the state-of-the-art ICT measures are adopted, thereby, automating the old way of handling data and information and providing timely, accurate and relevant data to correctional managers. This hypothesis has been pursued by correctional institutions in recent times. Aside, the few instances of ICT application such as the prisoner sentence computation software [5] recently proposed for the correctional management, NCoS is yet to fully appreciate ICT in the overall and holistic management of both staff/offenders in CCs scattered all over the nation. In Nigeria, activities in a CC include documenting of officers and new inmate(s), checking, maintaining and documenting the conduct in the prison yard, deployment of disciplinary actions, documentation of visitors and visits (done at the gate lodge), analysis of staff strength and the capacity of prison, preparing the roster for daily activities, searching cells for unwanted materials, arranging court attendances and drug administration (at the clinic) etc.; and all these duties are performed in line with the Standing Order (SO) [6] as well as the new NCoS Act [3]. From observation, these activities are usually done by filling registers (notebooks), forms and storing in file/folders. These files/folders are further placed in file cabinets.

Consequently, in this study we aim to perform user studies using interviews and prototypes so as to understand the correctional environment. The interview (using questionnaires) would be used to elicit challenges of the environment while the prototypes will be used to ensure the inclusion of user requirements for the daily duties in the CC. From the latter we hope to generate other issues attendant to introducing new technology in a correctional environment. The user studies are necessary if we are to eliminate some undesirable risks attendant to deploying new technology in a community. Finally, we would develop an IS that encompasses the functional units of a CC and accommodate all other issues highlighted from the user studies.

2. Related Works

At this point, we reviewed some Information Systems (IS) gleaned from literature. This is to make evident some renowned functionalities of a properly designed and developed system for offender/staff management and administration. The merits attendant to IS deployment was highlighted in a survey[7] done by the National Institute of Corrections, Prisons Division and Information Center, US, to establish a baseline for describing the status of offender Management Information Systems (MIS) in Departments of Corrections in 50 states, with emphasis on their use in inmate classification. The essentiality of the survey is captured in the fact that, "the use of automated computer systems to manage data and the need

for better efficiency and more accurate and timely data, management information systems have become a necessary component of prison management".

Saylor [8] focused on the design, development and maintenance of a Strategic Support Systems (SSS) which he labeled an Executive Information System. The system dwelt on the population growth and explosion of inmates in Prisons and makes it imperative that the Bureau of Prisons managers monitor every facet of the system's operations to facilitate strategic planning, minimize the problems associated with inmate population growth, and make the best resource allocations possible. The intent of the developed IS is to provide contemporaneous characteristics (views or descriptions) about the units for administrative purposes (e.g., the facility where an individual is located, or their status with respect to some characteristic).

On the MIS used by the Mississippi Department of Corrections, McAfee [9] posited that it supports the implementation of comprehensive offender management system. The system consists of an integrated database with two front-end applications: Offendertrak, used primarily for inmate management, and Caseload Explorer, used primarily for community supervision management. The system allows onetime capture and repeated usage at logical transaction points, obtaining of numerous offences with its details, chronological entries (personal/financial), automated notations and documentation throughout the inmate cycle in Prison. The National Offender Management Information System (NOMIS) [10] is another system designed to depict in tremendous terms the magnificent abilities of an Information System. It was designed to a large extent to improve on the shortcomings of the earlier designed National offender Management Systems (NOMS). The two systems nevertheless provided a better managerial approach for prisons and corrections in London and the United Kingdom.

In Punjab, India, the Prison authorities developed a Prison Management Information System (PMIS) [11] in order to end the recording of prison data on registers and to reduce the cumbersomeness of retrieving records. This IS features include a database of both inmates and staff, legal histories of inmates, daily management, automated stock/inventory management with an inbuilt budgeting system. The Singapore Prisons Service provides marvelous functionalities with their Prison Management System (PMS) [12], which has contributed to the overall productivity of their correctional facility. The PMS has several functionalities which include inmate tracking using fingerprint and digital imaging technology, access to accurate and efficient statistical data. The system possesses several benefits like standardization across institutions, easy submission and retrieval of information, real-time tracking of inmates, and reduction of paperwork. In Sirilanka, the government developed a Prison Information Management System (PIMS) [13] for the Department of Prison to electronically ensure safe custody, provisions of care and correction of inmates. PIMS has four functional module namely; registration management, transaction management, support functions and system maintenance and they encompass all the activities of a modern prison.

Summarily, these immense merits and advantages in the above accounts of an IS points to the fact that automation of prison procedures would go a long way in aiding planning, management, analysis and the usage of the computing technology to correctional decision making. However, if these efforts (IT wise) has been utilized to enhance productivity in the western world, then it is time to introduce IS into the management and administration of correctional facilities in the country.

Some researchers have attempted to build an IS for some prisons in Nigeria but these have been adjudged grossly inadequate to cater for all aspects of CC/offender management. Oye and Ibrahim [14] and Akpojaro and Omogbhemhe [15] developed an IS for Yola Central Prison and Ogba Prison, Edo State, Nigeria, respectively. Oye and Ibrahim [14] created forms for gate and inmate registration/record, sentence competition, cell information, and transfer inmate record. Akpojaro and Omogbhemhe [15] developed forms to collect inmate personal data, as well as information on education and court judgements. From analyzing these systems, it is clear that these studies only automated a small part of the Records unit of a CC. The implication is that other sections such as the Medical (Clinic and Pharmacy), Social Welfare, CC Keeper (CCK), Officer-In charge CC, Kitchen (Ration clerk), School/Library and Vocational (workshop, poultry, garden, laundry) units were not catered for. More so, Nigeria, with its penal laws and its modifications presents a unique and peculiar dimension to offender management compared to other prisons/correctional centers around the globe. On the other hand, choice of terminologies/nomenclature for staff in Nigerian custodial centers differ from what is obtainable in other climes. This study is motivated by the need to infuse an IS that recognizes the nuances of Nigerian laws, terms and environment. Therefore, we developed a Custodial Center Information System (CCIS) for electronic offender management and administration after a through user studies.

3. Research Methodology

Here, the survey and prototyping (HCI approach) was used in place of the requirement gathering/planning phase of most IS development methodologies such as System Development Life Cycle (SDLC), Structured System Analyses and Design Methodology (SSADM) and Rapid Application Development. Subsequently, we performed system analyses (using data flow diagrams (DFD) and Unified Modeling Diagrams (UML)), system design, coding and testing. The findings of both the survey and prototyping hugely impacted the aforementioned stages. However, we basically used the RAD methodology [16], which has stages such as requirement planning, user design, rapid construction and cutover.

Requirement Planning: here we dealt with x-raying the study area with its challenges, determining the project requirements, and obtaining the approval of the management using a survey. The survey was performed by administering questionnaires to the members of staff (and some inmates) that work at strategic points of prison/prisoner management of Awka Custodial Center (ACC), Anambra State Nigeria. The strategic points (units) are depicted as Figure 2, include in-charge station, prison yard (custodial center) keeper, social welfare, records and the medical unit (clinic, pharmacy) etc. Note that these strategic points represent the operational sections of an average Custodial Center (CC). The questionnaire is a mixture of closed and open ended questions that revolve around how data and information are collected/stored, how they are retrieved, how fast necessary information are obtained and used, and how they are sorted/searched. On the demography, we randomly selected 2 persons (1 senior and 1 junior officer) from each operational section, making a total of 29 persons. The senior officer we selected were mostly the person in-charge of a particular unit alongside another officer working in that unit. Note that at the In-charge CC's office, 1 person was interviewed, which is the officer in-charge. At the vocational unit, 2 persons each were interviewed from 6 skill acquisition sections (carpentry, laundry, poultry, garden, show making and tailoring) of ACC, a total of 12 persons. The questionnaires administered to the respondents were collected and analyzed. Note that we chose ACC due to its proximity,

however, NCoS is a regimental paramilitary organization, wherein, work processes are uniform throughout the country as they are all governed by the same laws [3, 6].

The questionnaire approach generated some findings i.e. challenges that hamper effective offender/CC management and administration. Firstly, it was evident that books (80 leaves long notes) were used to maintain records in all the represented operational sections of the CC. Consequently, this manual way of storing data and information has the problem of slower update and retrieval of information. Secondly, tables are drawn (by hand) inside these note books to enable data/information entry and date retrieval involves scanning/browsing the pages. The implication is that precious time is wasted looking for needed data i.e. less effective sorting and searching of information. More so, for routine-like tasks, procedures and operations the respondents attested to the presence of inconsistencies and errors i.e. the note books were littered with cancellations and mutilations. Thirdly, there is the unavailability of information for faster decision making. More so, sharing of information between strategic units of CC management was done in a very poor manner.

User (Prototype) Design (UPD): From analyzing the collected questionnaires, we were able to design paper prototypes (PP) of the proposed CCIS, which to a large extent met the needs of the officers. We chose this low fidelity approach due to its advantages which include; rapid iteration, cost effectiveness, active user involvement, team building, less learning curve and automatic documentation. More benefits of PP are flexibility, item support, error and ambiguous input handling [17]. Another reason for using PP is that it can be administered without a device (computer) or electricity supply, which is a problem in a developing nation such as Nigeria. The PP also was less intimidating for the not-so-computer literate staff and with plentiful guidance, it aided the elimination of a major disadvantage of this low fidelity method i.e. inaccurate feedbacks. Consequently, the feedbacks was immensely correct and helped us capture requirements of the staff and the service in general. With the prototypes, we understood input and output specifications of the proposed system. While the input include forms for prisoners admitted, awaiting trial court schedules, labor gangs, duty roster for officers, CC keeper (CCK) comments, inmate count update, session in-charge comments etc.; the output specifications include cell and ward state, daily inmate admittance report, daily inmate discharge report, inmates slated for corporal punishment, daily CCK's and in-charge session comments etc. The paper prototypes of individual sections were shown to the officers that man the operational sections and their comments were documented by our team of application developers. More so, the individual PPs for the top modules were also brought together (and depicted as Figure 1) to illustrate how users can navigate the CCIS. Note that clicking of the several radio buttons on the home page takes one to the desired unit. The user studies is basically joint application development (JAD)-based and this is to ensure that the essential needs of the staff were fulfilled.

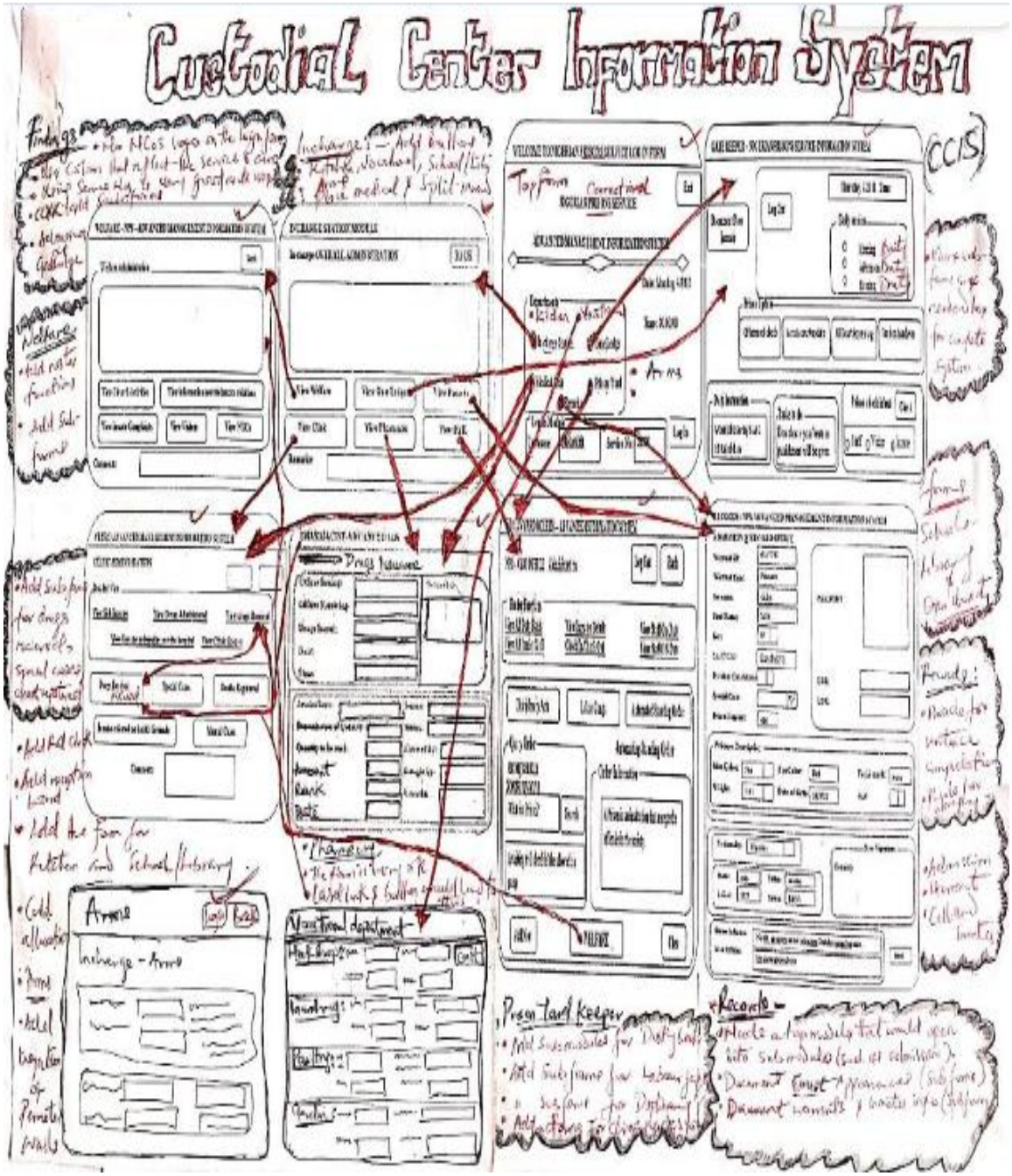

Figure 1. Paper Prototype(s) for CCIS

The prototypes shows the units represented i.e. gate keeper, Custodial Center keeper (CCK)/Chief Disciplinary Officer (CDO), Clinic, Pharmacy, In-charge station, Records, Welfare. From their responses, the In-charge station and the Pharmacist form needs no modification, however, they maintained the latter should be a sub-form in the Medical module. On the log in form, the respondents hinted at the need for the addition of the NCoS logo and her colors in the final version of the application. They confirmed that using the service number as the password is fine since it is unique for every officer. On the Gate Keepers module, the respondents confirmed that the sub-forms for officers profile documentation, duty beat, admission of prisoners, inmate count and visits are missing. While

for the CCK's form, sub-forms for labor gangs and disciplinary acts were missing. Reviewing the Records form, it was evident that we must add sub-forms for admission board, discharge board, admission of prisoners and cell allocation. However, they applauded the fact that the prototypes involved "admission of prisoners" at the gate lodge and at the records. They insisted on the automation of several prison books not entirely captured by Records form. Some of the commonly used books include escapes, prisoners' cash etc. While the Welfare form was absent, sub-forms for inmates' welfare, visits, inmate complaints, case works, calls, discharge and other aftercare activities, the Medical unit lacked sub-forms for special cases and deaths. They reminded us that the special cases form should also involve the hospital to which an inmate was referred to as well as the officer(s) posted alongside. These interactions between the developers and staff aided the development of individual forms of CCIS.

For effective results, we integrated system analyses phase of (SDLC and SSADM) and analyzed the graphics and functionalities of the system. First, we thought of potential images and functions of the CCIS. We identified and acquired NCoS logos and other related pictures on the internet. The chosen colors included green, red, yellow and black, matching the colors of NCoS insignia. Using the popular DFDs and UMLs, we analyzed further an average CC in Nigeria so as to technically understand the existing system. Figure 2 is the context diagram, whichis a level 0 DFD representation of boundary definitions and clarifications of the system. More so, it describes information flows between CCIS and external entities such as the Police, Courts, the NCoS state headquarters, suppliers and visitors. Figure 3 is the first level diagram showing the whole system as a single process, highlighting the major functions. Case UML diagram was used to clarify the needs of a CC in offender management, in terms of entry/exit (Gate Officer), staff (CDO), health (Clinic), need assessment/care (Social Welfare), riot handling/perimeter wall security (Armed Squad), custody/court attendance (Records), correction, reformation and rehabilitation through religion, formal education (School/Library) and skill acquisition (Vocational). Using case diagrams, both images ofFigure 4 illustrates the roles and responsibilities of the individuals that constitute the correctional community alongside the system administrator, who is an IT personnel. Figure 5 is the flowchart of the CCIS;

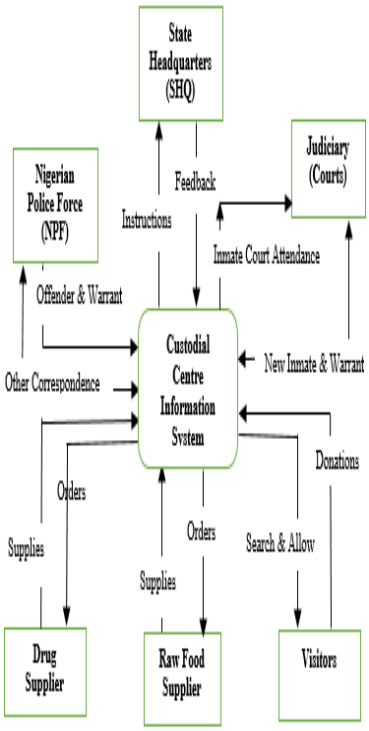

Figure 2.Context Diagram of CCIS

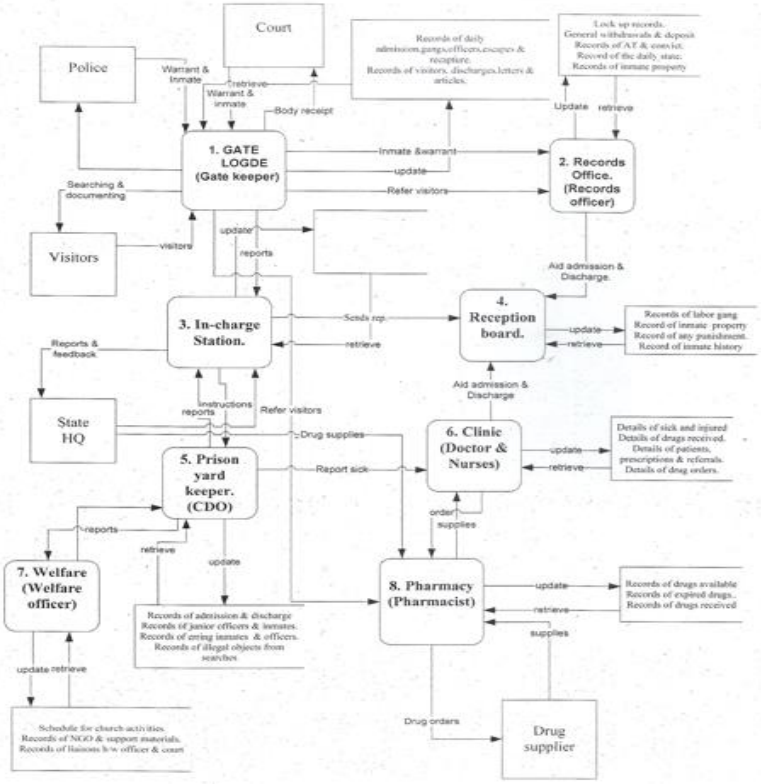

Figure 3. Level 1 Diagram of CCIS

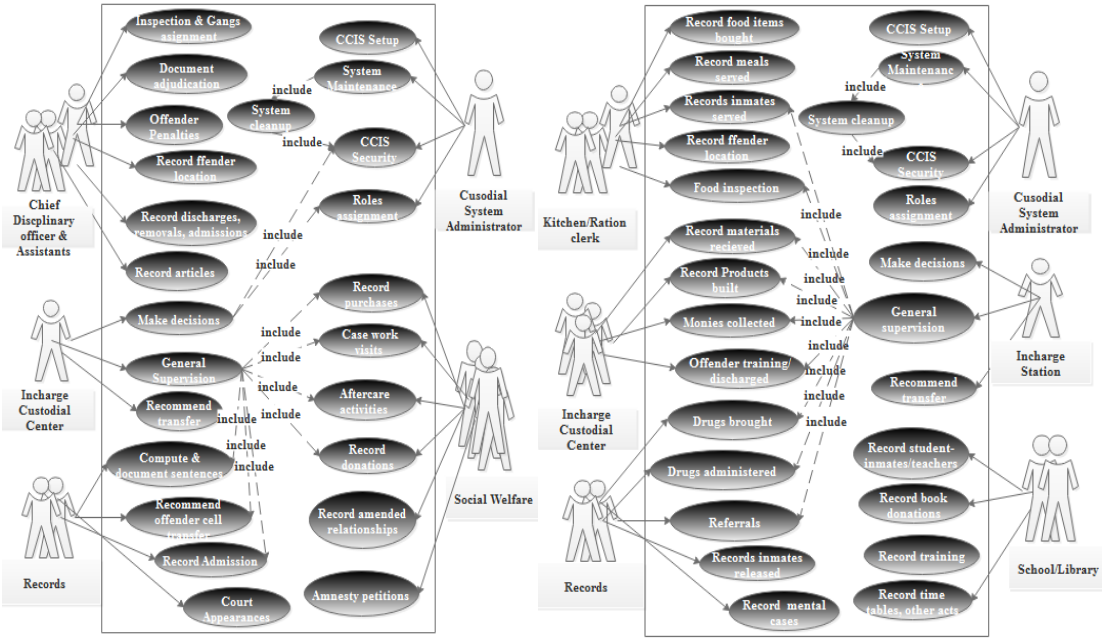

Figure 4.Use case diagram for CCIS

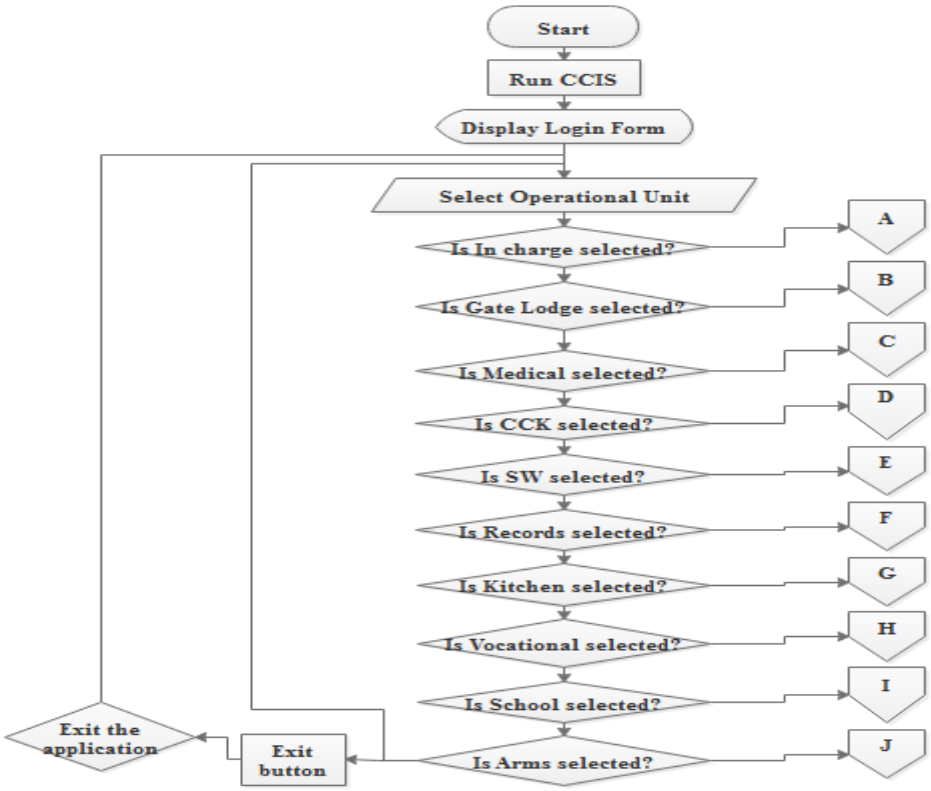

Figure 5.Flowchart of the Proposed CCIS

4. Implementation and Results

Rapid Construction: UPD was both interactive and iterative i.e. working hand in hand with the staff of the different operational units of the CC while creating the individual forms. With the goals and expectations collected, we jumped into actual construction of the system, converting all the prototypes into an operational model. In other words we performed application development i.e. writing of codes for CCIS with Visual Studio as well as database design using MySQL. Some of the tables that constitute the database include inmate, wards, staff, visitors, sick, drugs, admission board, warrant, items, etc. This stage also involved unit and overall system testing, debugging, error identification and correction. Since we want to implement the iterative JAD all through the study, we still sought feedback from the staff and they gave slight alterations and changes, which was quickly implemented.

The following figures constitutes the results of CCIS construction; it also explainsthe operational steps of system. Double–clicking the CCIS application on the desktop displays Figure 5 which is the login form showing all the operational units of a CC, they include In charge station, Gate lodge, Medical, CC Keeper, Social Welfare, Records, Kitchen, Vocational, School/Library and Arms. This form uses the unique officer's service number and name as login details. Figure 6 is the destination form arrived at when one clicks on Gate lodge radio button. The gate keeper takes account of staff roll check, inmate court update and coordinates session handover. Clicking on Medicals takes one to Figure 7, which allows health administration and clinic management. With this form, health staff can manage the sick, drugs' (receipt and dispense by the Pharmacist), out patient referrals, and mental cases. Figure 8 is displayed when one clicks the CCK radio button on the login form. This form allows the CDO to manage duty allocation, junior staff handling, inmate labor gangs and

visitor, who are mostly inmates' friends and relations. Figure 9 is for the Social Welfare unit, whose responsibilities include need assessment and inmate care. This unit also handles inmates' complaints, church activities, donations by visitors/NGOs, inmates/relation correspondence, aftercare and case visits. Figure 10 is the form used by the Records to handle inmate documentation, sentence computation, cell allocation daily and court attendance by awaiting trial inmates. Figure 11 is the Armed Squad form for perimeter wall security and riot management. Figure 12 shows the form for managing inmate reformation through skill acquisition in areas such as carpentry, laundry, agriculture, show making, motor repairs and tailoring. Figure 13 include sub-forms (All CC Beats and inmate cell update/allocation) arrived at by clicking a button/label link on CCK and Records forms respectively. Figure 14 is the In-charge CC form, that allows the overall head (Superintendent) of the institution perform his duties of overseeing all activities. On the form is the Admission Board (AB), which allows the assessment of offender needs during admission into a CC and the Discharge Board that assists offenders on discharge. AB consists of the Superintendent In-charge, the CC keeper, the Medical Officer, the Vocational Officer and the Welfare officer. According to the SO, section B1445, subsection 14a-d [6], AB interviews offenders, notifying them of rights, privileges, restrictions, length of sentence and suitable labor under the advisement of the Medical Officer.

Figure 5: Strategic Units of the CCIS Login Form

Figure 6: Gate Lodge Form **Figure 7: Medical Unit Form**

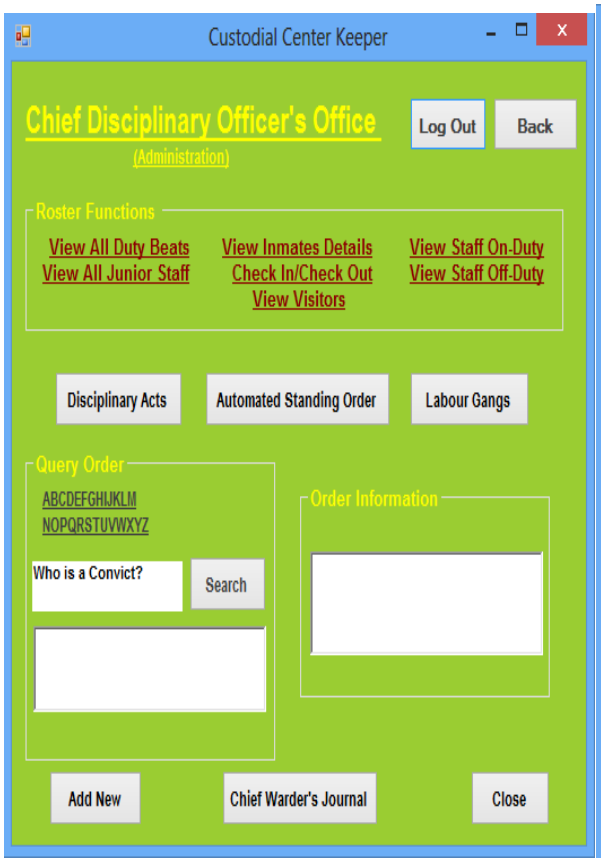

Figure 8: CCK Form **Figure 9: Social Welfare Form**

Figure 12: Records Unit Form

Figure 13: Arms Squad Form

Figure 12: Vocational Form

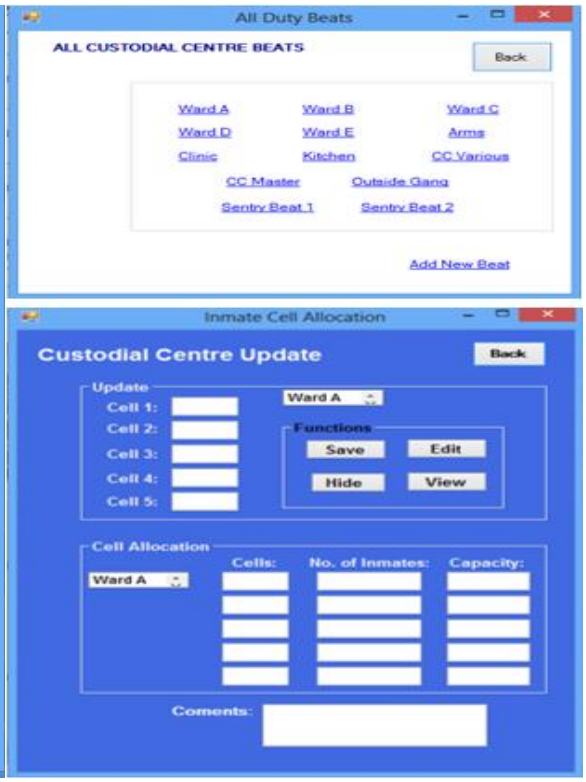

Figure 13: School/Library Form

Figure 13. In charge CC Form

All Beats shows all duty locations manned by correctional officers in the CC. Then, CC update form is used by Records officers to allocate cells to new inmates as well as update cells in a ward. Note that due to space constraints, not all sub-forms were presented. We however, presented just the forms of functional units of an average Nigerian correctional center.

After the construction of the entire system, we made suggestions to the correctional management on issues surrounding the last phase (cutover) of the RAD methodology. On training, we suggested the channeling of funds to the development of a user manual equipped with pictorial representations of CCIS usage as well as elaborate discussions on shortcuts. Also, we suggested that training the staff on CCIS appreciation should be integrated into the already establishedNCoS in-house courses, which the members of staff undergo at different cadres of the job. It is a known fact that people reject change, therefore, we advised the management on some personality issues that might affect the use of CCIS and also advocated regular in-house training to douse any kind of fear attributed to the system.

On the security of the system, we looked at ways in which CCIS can be made secure considering the sensitive information it holds. We advocated for strong passwords that involvesstaff unique service numbers, letters/symbols, hiding all backdoors, encrypting and segmenting the database, as well as the monitoring/auditing of the database. Ensuring database security should also involve regular screenings and background checks. We advocated for the provision of basic training on security for all staff. Staff education is necessary to increase the security awareness of the employees. The CC management was encouraged to install security software such as anti-malware and firewalls to ward off hackers. We helped the CC to create a contingency backup plan for proactive security management.

Furthermore, on implementation, we recommended a conversion plan that would be dynamic and yet effective, without hindering the daily discharge of duties. On this, we

proposed a two-step approach (involving pilot and phased conversion methods). First, one unit (such as the Records) will be used for the use of CCIS, to allow the evaluation of actual work processes with a portion of CCIS. Even after all has been confirmed well, we still advocated a phased incremental approach of conversion, wherein different subsystem is used awhile before the new whole work processes becomes fully automated.

5. Conclusion and Future Work

It seems as if the huge walls of prisons have blocked off the least upgrade and advancement in IT. The high dependence on manual documentation, storage, retrieval and the absence of a functional database points to that fact. The qualitative research (survey) conducted showed that the current manual system is very tough, time consuming, causes delay due to is labor-intensive nature. In addition, the PP used ensured our focus remained with the core needs of the staff and inmates as well as the refinement of the overall design layout. The motivation to design and develop CCIS was stirred by reasons like reducing to the barest minimum the paper-based medium and introducing the use of disk storage medium. Other reasons include; reducing the need for manual intervention, providing seamless integration between the functional sections and positioning the agency to share data with other law enforcement agencies. The RAD methodology was used for CCIS development because of its advantages which include breaking the whole project into manageable tasks, optimized team efficiency, short time for product completion and delivery, and a profound iterative form of communication that recognizes user feedback and increases usability. As CCIS was done bearing all the operational units and nomenclature of an average Nigerian CC in mind, it would indeed, facilitate consolidated offender information and aid the advancement of this body of knowledge. In future, we will extend the information system to incorporate enabling technologies for liaisons between the correctional community, the NPF and the judiciary. This might encourage smooth and faster discharge of offenders so as to reduce congestion. Additionally, we will conduct formative research using theories such as Technology Acceptance Model [18] and the Unified Theory of Acceptance and Use of Technology [19].

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