



## Integration of Information And Communication Technology in Management of Public Universities in Nigeria

Osamede Ikponmwosa, Edeki Oghomwen Mine  
Department of Educational Management,  
Faculty of Education,  
University of Benin

### ABSTRACT

*The growing reliance on Information and Communication Technology (ICT) has changed the way universities carry out their administrative and academic responsibilities. This paper is grounded in socio-technical theory, which emphasizes the integration of socio and technical sub-systems within the work environment. The paper examined the place of ICT in the management of public universities in Nigeria, areas of ICT integration in public universities discussed are; planning and decision making, personnel management, financial management, student data management, admission and examination, campus security, teaching and learning, research development. It identified benefits of ICT integration in management of public university to include administrative efficiency, effective data management, optimal use of resources among others. Challenges of ICT integration in management of public universities discussed include; inadequate funding, poor internet connection and dearth of qualified ICT staff among others. Among other suggestions made include; prioritizing funding, engaging multiple internet servers and employment of qualified ICT personnel.*

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### INTRODUCTION

The 21st century is often described as the digital compliance century, an era characterized by rapid digital transformation driven by innovations in Information and Communication Technology (ICT). ICT has transformed university education across the globe, leaving an indelible mark on academic, administrative, and research outputs; breakthroughs in ICT have improved communication and the dissemination of information, enhanced data management processes such as data collection, processing, storage, and retrieval, and revolutionized work procedures and service delivery within universities.

Nigerian public universities are currently facing complex management challenges, such as bureaucratic bottlenecks, traditional paper-based record systems, increasing student enrolment,

and expansion of academic programs, among others, these numerous challenges limit their capacity to achieve efficient outcomes and the timely realization of institutional goals. Hence, there is a need for the integration of ICT into the management of public universities in order to reposition them for excellence in line with global standards and best practices.

### Theoretical Framework

This paper is hinged on Socio-technical theory propounded by Trist and Bramforth in 1951 the theory supports ICT integration in management of public universities; Socio-technical theory states that the work place is a socio-technical system rather than just being a social or technical system, optimum performance of an organization depends on the interaction of both sub-systems, not on one subsystem alone.

Corresponding author: Osamede Ikponmwosa

✉ [osamede.ikponmwosa@uniben.edu](mailto:osamede.ikponmwosa@uniben.edu)

Department of Educational Management, Faculty of Education, University of Benin.

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The theory emphasized the interdependence between the social or technical system of an organization; the social sub-system consists of the people working in the organization while the technical subsystem consists of the technological tools used for carrying out work procedures. It further opined that, an organization functions better when both social and technical systems are optimized together. Socio-technical theory is relevant to integration of ICT in management of public universities because it supports the combination of social and technical sub-systems in management of higher institutions, such that ICT (hardware, internet, software,) and the social sub- system (people) will be combined in daily discharge of management duties to achieve excellence in public universities.

### **Concept of Information and Communication Technology (ICT)**

There are diverse definitions of ICT depending on the perspective it is viewed from, Olojuolawe and Oluwadamilola (2025) defined ICT as competence-based technological framework that aids in planning, organizing, and sustaining educational programmes in universities, contributing to institutional development and efficient resource management. ICT includes technologies such as computers, the internet, mobile devices, satellite systems, and software applications that enable users to access, store, transmit, and manipulate information (International Telecommunication Union, 2023).

ICT resources that have reconfigured work processes in universities include computers (laptop and desktop), printers, examination scoring machine, scanners, mobile devices, (smart phones and tablets), hard drives, metal detector, digital cameras, artificial intelligence (AI), block chain, closed-circuit television cameras (CCTV), Internet, Wi-Fi, servers, e-mail systems, networks, data processing and storage tools, among others.

### **The Concept of Management of Public Universities**

Management of public University is the process of planning, coordinating, controlling,

leading and organizing the efforts of university staff and using the university resources to achieve university set goals (Ajayi and Ogunode, 2022). Management of public universities consists of various categories of staff jointly responsible for discharging strategic functions to promote academic development.

The Vice-chancellor of the university is the Chief Executive and Academic officer of the institution, he/she is the Chief Accounting Officer, the Chairman of Senate and Congregation, as regards the University hierarchy he/she takes precedence before all other members of the university except the Chancellor and the Pro-chancellor. He/she provides leadership for the University, directs all activities of the university, ably supported by other arms of the University administration such as Registry, Bursary, Library and Academic Units, different units' discharge varied and complementary tasks reports directly to the Vice-chancellor of the university towards the actualization of the vision and objectives of the university. The capacity of public universities to maintain their relevance in the dynamic digital driven educational landscape largely depends on the efficiency and effectiveness of its management system (Oshio, 2015).

### **Integration of Information and Communication Technology (ICT) in Management of Public Universities**

The word integration means to combine or blend, while integration of information and communication technology implies using ICT to discharge management functions to enhance collaboration, communication, transfer of information, support teaching and learning, academic research, problem- solving and decision-making process in universities. ICT integration in management of public universities refers to using technological resources to collect data, communicate, exchange information, plan, organize, coordinate and control human and material resources to achieve institutional objectives within the stipulated timeframe. The integration of ICT in public universities management would undoubtedly transform public universities from traditionally slow bureaucratic

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Corresponding author: Osamede Ikponmwosa

✉ [osamede.ikponmwosa@uniben.edu](mailto:osamede.ikponmwosa@uniben.edu)

Department of Educational Management, Faculty of Education, University of Benin.

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institution into modern, digital, innovative, responsive, student- centered, future ready institution.

The growing complexity in management functions in this digital age has increased the demand for more efficient, transparent, and technologically driven data management systems to cope with the increasing student enrolment and program expansion. Universities in developed countries are leveraging ICT to revolutionize administrative functions, such as enrollment management, financial operations, human resource management and student support services (United Nations Educational, Scientific and Cultural Organization UNESCO 2022). The Integration of ICT in management of public universities have become a defining feature of effective administrative performance in universities globally. The areas where ICT can be utilized in universities are as follows:

#### **Planning and Decision-Making:**

Planning is the process of deciding in advance a set of decisions or actions to be taken in the future, in educational setting it involves setting school objectives and goals. Effective management of public universities depends on availability and accuracy of relevant school data, information stored in cloud, institutional dashboards, e- platforms, data analytics platforms, computer system, hard drives, are easier to access and retrieve compared to traditional records kept in files, or filing cabinet. ICT provide real-time access and retrieval of reliable data on student enrolment, personnel, finance, and school facilities; thereby supporting evidence-based planning, forecasting, and eliminating administrative bottlenecks.

The university management under the leadership of the Vice-chancellor, supported by principal officers and other educational stakeholders through ICT can make informed decisions and decide on pertinent issues of the University based on available data. ICT-driven planning and decision-making improves responsiveness and promotes sustainable institutional development (Laudon and Laudon,

2020; Organization for Economic Co-operation and Development OECD, 2021).

#### **Personnel Management:**

Personnel management refers to planning, organizing, directing and controlling of human resources (academic and non-academic staff) to achieve educational goals. It involves ensuring that personnel of an institution are well coordinated and effectively used to ensure the smooth running of the institution, computerized personnel management process enhances effective personal coordination. Human Resource Information Systems (HRIS) enhances control of staff record, automated administrative procedures; biometric attendance technologies improve accountability, transparency, and staff productivity. ICT-supported personnel management reduces administrative bottlenecks and enhances effective workforce utilization in public universities (World Bank, 2022).

#### **Financial Management:**

Adekunle (2022) described financial management as the efficient and effective management of funds in such a way as to accomplish the objectives of an organization. Finance play a very important role in attainment of educational goals; finance management in universities involves financial planning, budgeting, allocation, monitoring, and control of institutional finances. ICT plays a critical role in strengthening financial management through computerized accounting systems, electronic payment platforms, and Financial Management Information Systems, Budgeting and Financial Management Software. These technologies enhance budget preparation, expenditure tracking, and financial reporting, thereby reducing errors and financial malpractice.

Integrating ICT resources like computers, calculators, printers, photocopiers, internet, social media platforms, e- mails, in budgeting and financial operations of university promotes, allocation of resources, financial services to staff and students and control institutional expenditure. Involving ICT analytics and artificial intelligence in financial management



enables financial managers allocate resources effectively and forecast trends. Efficient resource allocation through ICT contributes to improved organization and coordination within the university system (Bates, 2022). Manual financial processes are often prone to fraud; it involves cash payments and physical collection of cash, that is cash handling, and keeping records in notebooks or cash vouchers. Effective use of ICT improves transparency and accountability in the management of public funds within universities (Organization for Economic Co-operation and Development OECD, 2020).

#### **Student Data Management:**

Student data management basically refers to digital platform used by institutions to coordinate and control students' records centrally. The importance of students' data cannot be overemphasized in school management, the availability of Student data enable management plan, monitor students' academic progress as well as make informed decision that would improve students' academic performance. Engaging ICT in management of student records would enhance collection of students' bio-data, admission and registration status, academic records, attendance log, and feedbacks. Through block chain student's credentials are not only verified locally but also globally, Students' Information Systems (SIS) support efficient management of admissions, registration, academic records, examination, results, and graduation processes.

On the other hand, Management Information Systems (MIS) integrates people, processes and technology to manage an institution's data, it can be used to collect and track students' personal records, course enrolment and grades. The system would collect data, process it and provide reports by way of helping lecturers, and administrators make decisions on student academic performance, against the manual admission, registration, filing, course registration methods often characterized with lots of flaws which include missing records (improper handling of files, improper shelving) damage records (flood, theft or fire outbreak) and delays in retrieval. Digital record management improves data

accuracy, prevents loss or manipulation of records, and enhances timely access to student information. Automated record-keeping, contributes significantly to improved service delivery and administrative efficiency in student affairs (Al-Sharhan, 2020; United Nations Education Scientific and Cultural Organization UNESCO 2021).

#### **Admission and Examination management:**

ICT enhances seamless students' admission and examination coordination through online application portals and computer-based assessment systems. Public universities are gradually embracing admission and enrolment management software which reduces the burden of school administrators, by electronically managing student admissions, on-line clearance, e-registration processes, Enterprise Resource Planning (ERP) automates student's enrolment. These platforms promote transparency, timeliness, and improve students' satisfaction in the process. The online examination has provided the platform to evaluate intending students and students alike as questions are personalized giving no opportunity for examination misconduct. Results are automated that way; the institution gets feedbacks about the academic performances of students.

Many developed countries have advanced to the point whereby all tests and examination whether internal or external are conducted online, such that all duly registered students have access pass to use; campus wi-fi, tests and examination portal, online lectures rooms, e-lecture notes and other course materials. Under this arrangement test and examination processes have gone paperless, students appear physically in examination venue with their fully charged computers and then afterwards logged on to the examination portal, once logged in the students' examination time starts counting and the examination portal automatically logs out other on-line applications during the time period of the examination, while examination is in progress students are required to face the camera on their monitor failure to do so after third warning will be compulsory submission and the student logged



out automatically. ICT-based examination systems enhance faster grading, result dissemination, and assessment integrity, thereby improving the efficiency of academic administration (OECD, 2021; Adebayo and Abdulrahman, 2022).

#### **Campus Security:**

ICT strengthens effective campus monitoring and control through installation of emergency alert systems, CCTV surveillance systems on campus guarantees safety of staff, students and school facilities. The use of ICT resources in campus security ensures indoor and outdoor control and monitoring of all academic and non-academic activities on campus, campus security entails monitoring of staff and student activities. The interconnectedness to a unified dashboard displays threats centrally, installation of access control systems like biometric access devices, smart ID cards, finger print or face recognition restricts intruders, metal detectors among others enhances security management. ICT-based monitoring systems contribute to improved institutional discipline and safety (World Bank, 2021).

Developed countries like United States of America, Japan, France to mention a few monitors their students with Access Control System, through access identification the institution gets feedbacks on students' payment history, and engagements with school facilities. ICT security resources like metal/ weapon detector, Artificial intelligence (AI) screeners used to identify or signal concealed weapons or hidden fire arms, reduces the time wasted on manual processes (checking of cars and bags at entry points).

#### **Teaching and Learning activities:**

ICT has transformed teaching from conventional classroom contacts to technology enhanced learning environment. ICT supports pedagogy and improves learning outcomes through the use of multimedia, interactive whiteboards which makes learning more engaging, it offers comparative and competitive advantage over the traditional method of teaching.

Learning Management Systems (LMS) like Moodle or Canvas helps lecturers to plan and organize their courses, develop course nomenclatures, course codes and track progress. Digital platforms like video conferencing, google or virtual classrooms promotes blended learning, collaborative learning and engagement between lecturers and students and provides immediate feedback (Adeyemo and Akinbode, 2020). Through ICT learners can access wide range of relevant online course materials, ensures self-paced study and supports continuous learning.

#### **Research Development:**

ICT plays a vital role in promoting modern academic research in universities, it has enhanced open-access repositories and global research network. Traditional research (relied mostly on textbooks and journal stocked up in school or public libraries). Researchers all over the world can access and download relevant literatures to their study; on-line libraries stock diverse textbooks, articles and publications. ICT fosters inter-discipline research, researchers and students' can cite academic publications through digital libraries, collaborative platforms like google scholar, research gate, block chain (shares data across network), to mention a few. Electronic channels supports' research collaborations, accelerated dissemination of academic research output among scholars by democratizing access to large datasets through wider and more collaborative participation both internally and externally among educational stakeholders in areas of academic research.

Similarly, quality assurance management is sustained through digital repositories, research grant management systems guarantee aids and sponsorship for academic research. ICT facilitates advanced data collection and research analytics, software like Statistical Package for the Social Sciences (SPSS) is effective statistical analysis of large data set and graphical presentation of data in research, Plagiarism software such as Turnitin, Grammarly Premium among others help to detect intellectual theft, track publication and maintain academic integrity. Furthermore, effective use of



ICT strengthens institutional research capacity and enhances global visibility and competitiveness of public universities (OECD, 2021; World Bank, 2022).

### **Benefits of ICT Integration in the Management of Public Universities**

#### **Administrative efficiency:**

ICT makes administrators work with ease, smartly and fast. Ibrahim and Jimoh (2021) stated that ICT collect information, execute policies, manage resources, and deliver services in a manner that minimizes waste and redundancies while maximizing outcomes.

#### **Effective data management:**

ICT supports digital data collection, processing, storage, retrieval and dissemination which is accurate, reliable, fast and timely ensuring real-time access to information required by internal and external stakeholders for planning and making-evidence based decision.

#### **Optimal use of resources:**

Adopting ICT in discharge of administrative functions is cost effective. it saves labor, manages time, at the click of bottoms records are accessed, data are saved either in cloud, computer systems, hard drives, flash drives, which eliminates the challenge of insufficient storage space and filing cabinets. Traditional bureaucratic management relied heavily on manual paper-based systems, and consequent demand for filing rooms, wastage of resources on payment of salaries of staff due to its labor-intensive nature and roles duplication, resulting in loss of productive hours to avoidable delays and procedures

#### **Transparent and Accountable Management:**

Policies and decisions are based on reliable data, school data are digitally obtained less prone to human handling error, often transparent accurate and auditable.

#### **Collaboration among stakeholders:**

ICT enables wider collaboration, e-regulation of activities communication networks for proper synergy and ensures accessibility to relevant data when needed by stakeholders even when they are not physically present in the university environment.

#### **Achievement of university goals:**

ICT supports electronic planning and implementation of institutional objectives, it fosters institutional effectiveness and supports the achievement of university goals in a dynamic and competitive higher education environment (Laudon and Laudon, 2020; OECD, 2021).

### **Challenges of ICT Integration in Management of Public Universities.**

Despite the potential benefits of integration of ICT in management of public universities, it is fraught with the following challenges:

#### **Inadequate funding:**

It is no longer news that public universities depend on government for its funding needs, the educational sector is in constant struggle with other sectors of the economy like Health and Defense for its financial needs and survival. One of the biggest issues facing Nigeria's higher education administration is inadequate finance (Ahaotu and Ogunode 2020). Poor funding provides little opportunity for creativity and innovation which could hamper, adoption and integration of ICT in management of universities.

Underfunding has negatively restricted access to internet, university staff always complain about poor salaries not withstanding they would have to buy mobile data to access the internet. Hence, majority prefer to do official duties offline and manually to reduce cost. In addition, many public universities are still bedeviled with inadequate ICT infrastructure, till date some still rely on out dated; transmitting facilities, slow bulky desktop computers, photocopiers, printers, among others.



#### **Poor internet connection:**

Unstable internet connection refers to slow or unreliable network access that disrupts or delays online operations especially in developing countries like Nigeria. International Telecommunication Union (2023) reports that connectivity gaps remain a major barrier to ICT integration in education, particularly in developing regions. Network disruptions interrupts the use of e-learning platforms, limits access to online research databases, reduces administrative efficiency by delaying students access to university portals and their KOFA pages (online portal interface provided by university for students to access academic and administrative services) due to delays occasioned by poor internet connections.

#### **Dearth of qualified ICT staff:**

Many public universities do not have adequate qualified ICT personnel, the few available are often overwhelmed with work making their impact in the institution hardly felt.

#### **Low ICT literacy:**

In this digital age some academic and non-academic staff are still grappling with basic ICT skills required to manipulate mobile devices, a good number are ignorant of the opportunities inherent in smart phones, the deficiency makes them less receptive to ICT integration.

#### **Resistance to Change:**

The "fear of the unknown" among staff possibly because of suspicion, conservatism and fear of downsizing in work places could impede acceptance of ICT, hence the slow pace of ICT integration.

#### **Unstable power supply:**

Epileptic power supply and power outage is a major challenge; poor power supply is a huge obstacle to the integration of ICT in teaching, learning, research and administration. ICT resources are basically powered by electricity, internet, servers, CCTV camera, means of communication, networking, e-learning, e-library

e-administration among others are enabled by steady power supply.

#### **Cyber security threats:**

Universities store large volume of student data, thereby putting them at risk of hackers seeking to gain unauthorized access with the intention of distorting or stealing information. Similarly, many public universities operate open networks that allows access to not only students and staff but also external researchers inadvertently putting them under threats of virus and hackers. The openness of their network increases the chances of malicious software spreading across institutional networks (Kaur and Bhargava 2024). Computer virus and malware can infect the university network through introduction of infected files, external hard drives, and e-mail attachment. As soon as virus are introduced into the system they corrupt files, destroy data bases and disorganize institutional operations like examination processes, student's registration among others.

#### **CONCLUSION**

The paper concludes that integration of ICT in management of public universities represents a transformative opportunity for public universities desiring to improve institutional efficiency. Public universities should seek for funds from government and collaborate with partners, developmental agencies to fund ICT integration, engage multiple internet service providers (ISP) to ensure backup, engage qualified ICT personnel, dispel ICT resistance through sensitization awareness, improve power generation and supply, ensure cyber security awareness and training among ICT personnel.

#### **SUGGESTIONS**

1. The government at the state and federal level should prioritize funding of educational sector especially public universities; universities can Leverage Partnerships, Collaboration with technical firms, development agencies, special intervention funds, donations



- and grants from alumni, corporate bodies or individuals to mitigate funding issues, to hasten ICT integration in management of public universities.
2. Increased investment in broadband expansion (World Bank 2024), fiber optics and reliable Wifi, engaging multiple internet service providers (ISP) to ensure backup connectivity in case one fails, as well as encouraging education stakeholders to adopt offline-compatible ICT tools such as preloaded content to reduce dependence on internet.
  3. Employment of qualified ICT personnel such as programmers, web designers, software developers, hard ware engineers and ensuring their continuous professional development and training.
  4. ICT in-service training among staff: Universities should regularly organize training, workshops, seminars' continuously to afford all categories of staff of the university the opportunity to update their knowledge as regards acquisition of operational and practical skills in manipulation and efficient usage of ICT resources relevant to their areas of specialization.
  5. In other to dispel ICT resistance in management of public universities, institutions can organize collaborative enlightenment forums for disabusing all forms of negativity in the minds of staff against ICT innovation at departmental and faculty levels to foster acceptance and adaptability to changes brought about by the advancement in information and communication technology. Social media platform for exchange of experiences, challenges and exploits among staff should be created to promote cross ventilation of ideas to navigate information technology era.
  6. Power generation in the country should be privatized to improve its performance, alternative power supply

such as inverter, solar systems among others should be encouraged to foster power supply in public universities.

7. Cyber security awareness and training among ICT personnel on advanced security technologies to protect their ICT resources and to enlighten members of staff and students against clicking malicious links, downloading unverified software, and use of weak passwords in other to protect the integrity of the institutions' cyber space.

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Corresponding author: Osamede Ikponmwosa

✉ [osamede.ikponmwosa@uniben.edu](mailto:osamede.ikponmwosa@uniben.edu)

Department of Educational Management, Faculty of Education, University of Benin.

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