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Adoption of Information and Communication Technology (ICT) and its Impact on Service Delivery in Industrial Research Institutes in Nigeria

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Abstract

The study examines the adoption of Information Communication Technology (ICT) and its impact on service delivery within industrial research institutes in Nigeria. In spite of the high-level success recorded in industrial research institutes in Nigeria with the application and use of Information Communication Technology (ICT), adoption of ICT within the Nigeria public research institutes remains inconsistent. However, the digital gap caused by lack of internet connectivity, poor telecommunication infrastructure, and high cost of network technology facilities continue to limit the global competitiveness of the industrial institutes in Nigeria by hindering their ability to collaborate effectively with international partners. Utilizing a descriptive survey research design, the study investigates the extent to which digital infrastructure- such as automated laboratory tools, management information systems and analytical research skills are coordinated into research operations. Findings reveal a high level of benefits where the needed technological tools are available with required professional skills such as analytical skills, evaluation skills, assessment skills, and managerial skills. However, surmountable challenges are encountered. The major constraints are incessant power failure, lack of suitable laboratory equipment and professional laboratory skills. The study concludes that Nigerian industrial institutes should braze up in order to optimize service delivery. Nigeria government should make adequate budgetary allocation for the acquisition of proper ICT infrastructural facilities, provide constant supply of electricity power and sustain digital literacy training.

Keywords: *ICT Adoption, Service Delivery, Industrial Research Institute.*

INTRODUCTION

Research activities in Nigeria is necessary for economic growth and development. The global transition towards a knowledge-based economy has elevated Information and Communication Technology (ICT) to a basic foundation for socio-economic development all over the world. In the context of research and development (R&D), ICT refers to the convergence of telecommunications, computers and enterprise software, that enables researchers to store, transmit and manipulate data (Adebayo &Oyeleye, 2020). Information and Communication Technology (ICT) serve as the fundamental support and fortitude for economic development, industrial transformation and growth. ICT has contributed to the enhancement of industrial institutes, such as the Projects Development Institute (PRODA), and the Federal Institute of Industrial Research, Oshodi (FIIRO).

In Nigeria, specific research centers are given the mandate to drive local technological advancement and reduce dependence on imported goods and services to enhance the economic growth of the country and to promote International Competitiveness. However, Nigeria research institutes are characterized by poor communication skills, poor telecommunication infrastructure and manual data recording. These have impeded the pace of industrial output according to (Oladokun&Aboyade, 2022). It was revealed by Makindo et al (2026) that Nigerian research institutes have improved in the area of ICT professional skills through constant training and retraining of the research personnel.

Globally, research organizations have been transformed with the ongoing evolution of Information and Communication Technology (ICT). ICT is a reforming and transforming tool for industrial revolution, economic transformation and international collaboration (Mabaso 2026). In a country like Nigeria, investment on Information and Communication Technology (ICT) should be given priority in making budgetary allocations in order to enhance international competitiveness. Research institutes such as the Federal Institute of Industrial Research, Oshodi (FIIRO) and the Projects Development Institute (PRODA) are pivotal to achieving national economic diversification and technological self-reliance (Oguezue, 2025)

The impact of Information and Communication Technology (ICT) on service delivery in industrial research institute is of

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many aspects. (Nwonye et al 2025) opined that integration of ICT on service delivery reduces administrative cumbersome and promote standardization, external transparency and internal efficiency, making research results more accessible to industrial research stakeholders and the general public. Nolulu& Joseph (2021) declared that in spite of the numerous benefits, Nigeria is faced with diverse constraints. These constraints include incessant electricity power failure, low bandwidth, poor telecommunication infrastructure, high cost of network technology facilities and lack of funds.

STATEMENT OF PROBLEM

Information and Communication Technology (ICT) is relevant to research institutes globally, especially with the advent of computer which is the most influential technology of the last millennium. Industrial institutes in Nigeria is the anchor for socio-economic transformation in this digital age. The ICT helps to provide real-time technical support to industries and enhance collaboration research. Efficient ICT adoption promotes faster research results, effective information dissemination, significant increase in industrial productivity and quality. Despite the impact of ICT on industrial research and global digital transformation of industrial production, management and quality control, Nigeria is still not keeping up the pace technologically because of consistent manual, traditional and fragmented process in this information age. Many research institutes are faced with diverse challenges such as infrastructure deficit, poor internet connectivity, lack of professional digital skills, staff and management indifference towards ICT based research systems

However, preliminary investigations by the researcher show that if the gap between ICT availability and real integration is not bridged, the industrial institutes in Nigeria will go extinct.

To what extent is ICT infrastructure currently available and utilized within these institutes? How does the level of ICT adoption directly correlate with the speed of research service delivery? What are the organizational and technical challenges?

All these observations and questions require empirical study to understand the actual situation of adoption of ICT industrial research institute in Nigeria.

Research Questions

1. Which specific ICT application are most frequently utilized by research staff of industrial research institutes in Nigeria?
2. What is the impact of ICT adoption in industrial research institutes in Nigeria?
3. What are the ICT skills possessed by staff for effective service delivery within the organizations?
4. What are the significant institutional and technical challenges with the adoption of ICT in industrial research institutes in Nigeria?

LITERATURE REVIEW

Information and Communication Technology (ICT) is verified bedrock of industrial research revolution while comprehensive search is the cornerstone of socio – economic development of developed countries (Ntim 2024). Research institutes in Nigeria such as the Federal Institute of Industrial Research Oshodi, International Institute of Tropical Agriculture (IITA) Ibaran, National Institute for Oil Palm Research (NIFOR) Benin city, Edo state and National Animal Production Research Institute (NAPRI, Zaria to have all adopted ICT as their backbone for industrial innovation.

In Nigeria today, the pace of technological innovations and different forms of information presentation have led to the enhancement of industrialization as a result of the adoption of information and communication Technology (ICT) on service delivery in industrial research (Oladokun&Aboyade, 2023).

Most of the industrial research institutes in Nigeria have been given mandate to improve in their research activities in order to thrive in the industrial technology for increased productivity and quality. However, the indifference of the staff of research institutes in Nigeria towards the application of Information and Communication Technology (ICT) in research activities, lack of internet connectivity, poor telecommunication infrastructure, lack of analytical research skills and lack of ability to easily learn new technology have hindered the pace of industrial productivity according to Babgang&Abubaka (2025). Recent studies by Adewale&Ogunlade (2022) have revealed that most of researches in Nigeria are ready to explore new areas for industrial innovations with the adoption of ICT but inadequate budgetary allocation, poor management skills and greed have slow down the pace for scientific industrial research (Adebayo &Oyeleye, 2020).

The findings of different researchers such as Nwonye et al (2025) have revealed that the impact of ICT adoption on service delivery is of great contribution to the socio – economic development of Nigeria if consistently sustained. The contributions include improved quality and standard, increased productivity, improved management system, enhanced information sharing with other information seekers and unavoidable competitiveness with international bodies. Despite the numerous benefits of ICT adoption in service delivery in industrial research institutes in Nigeria, makinde (2020) suggested that Nigerian government should break the barriers facing research institutes by making adequate budgetary allocations for research institutes in order to ameliorate the effects of high cost of broadband, incessant power failure, and lack of continuous digital training for the staff of industrial research institutes.

METHODOLOGY

A descriptive survey design was employed to examine this study titled “Adoption of ICT and its impact on Service Delivery in Industrial Research Institutes in Nigeria.” The research was considered appropriate for obtaining data. The design is appropriate because it makes it easy and possible to describe the current state of ICT adoption and statistically analyze its relationship with service delivery in research institutes in Nigeria (Oladokun&Aboyede, 2023).

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The population of the study comprised 120 staff of selected Federal Industrial Research Institutes in Nigeria. This decision was taken by the researcher to ease the coordination, distribution and retrieval of questionnaire by the Lainson Officer or representative of the researcher.

A structured questionnaire was the primary tool used because of its perceived ease of use based on the Technology Acceptance Model, ICT infrastructure availability, and service responsiveness (Nwaimo et al. 2024)

The questionnaire was personally administered but was coordinated and retrieved by the researcher's Lainson Officer were analyzed using frequency and percentage distribution.

Result and Discussion

The results that emanated from the analytical procedure are presented by means of relevant tables and analyzed accordingly in the following sections.

Population Spread

Table 1: The population for the study

S/N	Industrial Research Institutes	Frequency	Percentages (%)
1.	National Agricultural Research Institute of Tropical Agriculture (IITA) Ibadan	16	13.3
2.	Nigerian Institute for Oceanography and Marin Research (NIOMR), Lagos	7	5.8
3.	Forestry Research Institute of Nigeria (FRIN), Ibadan	8	6.7
4.	Rubber Research Institute of Nigeria (PRIN) Benin City	15	12.5
5.	Cocoa Research Institute of Nigeria (CRIN), Ibadan	14	11.7
6.	National Horticultural Research Institute (NIHORT) Ibadan	10	8.3
7.	Nigeria Institute of Medical Research (NIMR), Lagos	11	9.2
8.	Nigeria Institute of Medical Research (NIMR), Lagos	18	15.0
9.	National Institute for cultural Orientation (NICO) Lagos / Abuja	9	7.5
10	Centre for Management Development (CMD) Lagos/Abuja	12	10.0
	Total	120	100.0

Sources: Offices of the Research Institutes

Table 1 presents the population distribution of the staff of industrial research institutes in south west region of Nigeria due to concentration of government research agencies and to save cost of transportation.

The data reveal that Nigerian Institute of social and Economic Research (NISER), Ibadan accounted for the largest proportion of respondents with 18 (15.0%) followed closely by National Agricultural Research Institute of Tropical Agriculture, Ibadan 16 (13.3%); Rubber Research Institute of Nigeria (FRIN), Benin City 15(12.5%), Cocoa Research Institute of Nigeria (CRIN) Ibadan 14 (11.7%), Center for Management Development (CMD) Lagos 12(10.0%), while the least respondents emanated from Nigeria Institute For Oceanography and Marine Research (NIOMR) Lagos, accounted for the least proportion of respondents with 7 (5.8%) followed closely by forestry Research Institute of Nigeria (FRIN) Ibadan 8 (6.7%), National Institute for Cultural Orientation (NICO) Lagos 9 (7.5%) and National Horticultural Research Institute (NIHORT) Ibadan 10 (8.3%).

Age Distribution

Table 2: Age of the Respondents

Age	Frequency	Percentage
20 – 30 Years	25	20.8
31 – 35 Years	28	23.3
36 – 40 Years	30	25.0
41 – 45 Years	14	11.7
46 – 50 Years	13	10.8
51 – 55 Years	10	8.3
Total	120	100.0

Source: Fieldwork, 2026

Table 2 presents the age distribution of respondents. The data show that researchers withing the 36 – 40 years age group constituted the largest proportion of respondents accounting for 30(25.0%) of the total population. This is followed by those age 31 -35 years with 28(23.3%) and 20 – 30 years with 25 (20.8%). Respondents aged 41 – 45 years made up 14 (11.7%), while those with age brackets of 46 – 50 years

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represented 13 (10.8%) and those very close to retirement age constituted the least number of respondents 10 (8.3%).

The distribution of age indicates that majority of the researchers which comprises Research Fellows/scientists, Research Officers/Associates, Assistant Research Officers and Technologists are within their early and mid – career stages. Particularly between 31 and 40 years. This suggested a relatively youthful and active work force all things being equal. This is advantageous for the effective adoption of ICT on service delivery in industrial research Institutes in Nigeria, as this age group is significantly more technologically inclined and adaptable to digital innovations.

However, the presence of older researchers aged 40 years and above, also reflects institutional continuity and the availability of staff with wealth of professional experience who can mentor younger colleagues to ensure knowledge transfer and balanced professional development

Spread of Respondents Work Experience

Table 3: The work experience of the respondents

Work Experience	Frequency	Percentages (%)
5 Years and below	20	16.7
6 – 10 Years	24	20.0
11 – 15 Years	36	30.0
15 – 20 Years	30	25.0
Above 20 Years	10	8.3
Total	120	100.0

Sources: Fieldwork 2026

Table 3 presents the distribution based on their years of professional work experience in industrial research institutes. The results show that a majority of the researchers' 36 (30.0%) have 10 – 15 years of professional experience which is the largest proportion of the respondents closely followed by respondents with 15 – 20 years' experience 30 (25.0%). 20 respondents (6.7%) had 5 years of work experience or less, 24 respondents (20.0%) had 6 – 10 years of professional work experience, while 10 respondents (8.3%) had above 20 years of professional work experience.

The data reveal a balance distribution of professional work experience levels. This revelation suggests a blend of fresh entrants who are more technologically inclined working with veteran researchers who posses' institutional memory and professional expertise essential for strategic decision – making.

Spread of Respondents by Ranks

Table 4: Ranks of the Respondents

Bank	Frequency	Percentages (%)
Chief Research Officer	5	4.2
Assistant Chief Research Officer	12	10.0
Principal Research Officer	23	19.2
Senior Research Officer	20	16.7
Research Officer 1	18	15.0
Research Officer 2	15	12.5
Senior Technologist	13	10.8
Technologist	14	11.7
Total	120	100.0

Source: Fieldwork 2026

Table 4 presents the distribution of respondents according to their professional ranks, within the industrial research institutes. The results indicate that principal Research Officer contributed the largest group, with 23 respondents (19.2%) followed by Senior Research Officer accounting for 20 respondents (16.7%), Research Officer1 18 (15.0%), Research Officer 2 accounted for 15 respondents (12.5%) while senior Technologist, Technologist ranked closely with 13(10.8%) and 14 (11.7%). Chief Research Officer formed he smallest group comprising 7 respondents 5 (4.2%) of the total population. The rand distribution reveals that the majority of the committed researcher are between the rank of Research Officer 2 to the rank of principal Research Officer. The relatively small proportion of Assistant Chief Research Officers and Chief Research Officers suggests that the industrial Research Institutes is dominated by mid–career professionals, which may be linked to ability to manipulate the ICT systems for positive results. The dominance of the mid–career professionals highlight the need for leadership development initiatives to prepare the young professional for effective adoption of ICT in industrial research activities in the evolving digital industrial research landscape.

Specific ICT Application Most Frequently Utilized by Research Staff

Table 5: ICT Applications most Frequently Utilized

Item	Frequency	Percentage (100%)
Googledrive	24	20.0
Dropbox	10	8.3
Emails/Portals	7	5.8
Specialized Software – CAP Mat Lab	25	20.8
Internet / WiFi	20	16.7
Databases	23	19.2
E – books and E – Journal	6	5.0

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Webpages	5	4.2
Total	120	100.0

Source: Fieldwork, 2026

Table 5 presents the distribution of respondents based on the ICT applications most frequently used in Industrial Research show that specialized software such as CAP, Mat Lab etc. 25 (20.8%), Google drive 24 (20.0%) and Databases 23(19.2%) are the most frequently adopted ICT applications. These channels reflect a strong preference and widely accessible by all staff of Industrial Research Institutions.

Moderate adoption rate was observed for Dropbox 10 (8.3%). Email/Portals 7 (5.8%), E - books and E – journals 6 (5.0%), suggesting that these ICT applications are not constantly integrated into research activities

The Impact of ICT Adoption in Industrial Research Institute in Nigeria

Table 6: Impact of ICT Adoptions

Impact of ICT adoption	Frequency	Percentage (%)
Saved time for research processing	32	26.7
Increased efficiency in research activities	28	23.3
Transparency and accuracy in service delivery	18	150.0
Easy and speedy dissemination of research results	26	21.7
Reduced errors in data analysis and technical reporting	16	13.3
Total	120	100.0

Source: Fieldwork 2026

Table 6 present the distribution of respondents' views on the impact of ICT adoption on Industrial Research Institutions in Nigeria. The results indicate that the most significant impact is that it saved time for research processing 32 (26.7%), reflecting that ICT adoption in research service delivery has enhanced quick result than the analog process.

Similarly, 28 (23.3%) of the respondents declared that increased efficiency in research activities is notable. Additionally, 26 (21.7%) of respondents suggested that easy and speedy dissemination of research results encourages the adoption of ICT in industrial Research Institutes, underscoring the role in bridging the gap between ICT availability and its use in research service delivery. Moderate responses were recorded for transparency and accuracy in service delivery 18 (15.0%) and reduced errors in data analysis and technical reporting 16(13.3%).

Overall, the findings imply that adoption of ICT and its impact on service delivery in Industrial Research Institutes in Nigeria yields multidimensional benefits ranging from research operational efficiency and improved image. However, realizing the full potential of adoption in service delivery in Industrial Research Institutions, investment in digital infrastructure and continuous training for staff of Industrial Research Institutes become inevitable.

ICT Skills Possessed by Staff of Industrial Research Institutes

Table 7: ICT skills possessed by staff

ICT Skills	Frequency	Percentage (%)
Analytical research skills	86	71.7
Data medium skills	120	100.0
Data management and analysis	120	100.0
Digital collaboration and communication	120	100.0
Information retrieval and digital literacy	120	100.0
Cybersecurity and data privacy awareness	82	68.3
Technical support and system administration	80	66.7
Digital content creation	84	70.0

Source: Fieldwork 2026

Table 7 presents the distribution of respondents based on the professional skills possessed by staff of Industrial Research Institutes. The findings reveal that online medium skills 120 (100.0%), data management and analysis skills 120 (100.0%), digital collaboration and communication skills 120 (100.0%) and information retrieval and digital literacy skills 120 (100.0%) are the most professional ICT skills that must be possessed by the researchers to serve effectively in Industrial Research Institutes in Nigeria. These revelations reflect a strong preference for service delivery in Industrial Research Institutes. This therefore means that any staff that appears to be incompetent with the above-mentioned skills may not have the opportunity to serve in such organization because they are the core skills.

Moderate adoption rates were observed for analytical research skills 86 (76.7%), cybersecurity and data privacy awareness skill 82 (68.3%), technical support and system administration skill 80 (66.7%) and digital content creation skill 84 (70.0%), suggesting that while these skills are considered useful, they may not be as consistently integrated into routine research strategies.

Overall, the analysis suggest that the Federal government exhibit a strong inclination towards ICT integration in

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Industrial Research Institutes established by the Federal government of Nigeria by acquiring current ICT infrastructural Facilities and retraining a staff for effective service delivery.

The institutional and Technical Challenges with ICT Adoption in Industrial Research Institutions in Nigeria.

Table 8: Challenges of ICT adoption in Industrial Research Institutions

ICT Challenges	Frequency	Percentage (%)
Resistance to change and organizational culture	9	7.5
Poor budgetary allocation	27	22.5
Skill gap and inadequate training	12	10.0
Lack of management support	14	11.7
Incessance power failure	24	20.0
Poor internet connectivity and bandwidth	26	21.7
Cybersecurity threats	8	6.7
Total	120	100.0

Source: Fieldwork 2026

Table 8 presents the major challenges encountered by the staff of Industrial Research Institutes in Nigeria with the adoption of ICT. The findings reveal that poor budgetary allocation 27 (22.5%), poor internet connectivity and bandwidth 26 (21.7%), and incessant power failure are the most prevalent challenge identified by respondents.

Other significant challenges include lack of management support 14 (11.7%), skill gap and inadequate training 12 (10.0%), Resistance to change and organizational culture 9 (7.5%) and cybersecurity threats 8 (6.7%). All the above-mentioned challenges place a serious limitation to effective service delivery in industrial research institutions in Nigeria.

Overall, the analysis indicates that the adoption of ICT in service delivery in Industrial Research Institutes in Nigeria is constrained by a combination of technical, Financial and human – resource limitation. Addressing these challenges require a multifaceted strategy that include adequate budgetary allocation for the acquisition of standard ICT infrastructural facilities, investment in ICT infrastructure should not be seen as a luxury as opined by Olokor& Gideon (2024). More so, stable power supply and capacity- building initiatives for the staff of Industrial Research Institutions will enhance effective service delivery.

Conclusion

The adoption of Information and Communication Technology ICT in Industrial Research Institutions in Nigeria is no longer left to personal choice in this information age but economically essential for promoting productivity, collaboration and service delivery. Acquisition of ICT infrastructural Facilities, database management systems, server management and cloud infrastructure are unprofitable without human capital – researchers, administrators and technologists.

The study showed that researchers in Industrial Research Institutes employ a diverse range of ICT applications – including Dropbox, specialized software – CAD, MAT LAB, databases, internet and google drive for effective research delivery. The study revealed the impact and benefits of ICT adoption in industrial research which include efficiency and automation, transparency and accuracy, easy and speedy in dissemination of research result, reduced error in data analysis and technical reporting.

In line with these findings, it is suggested that the Federal government of Nigeria and policy makers adopt a more inclusive approach to the training of staff (researchers and the technologists) to enhance effective research service delivery.

Recommendations

1. Federal government of Nigeria and the stakeholders should endeavor to maintain and sustain digital platform to facilitate e-learning and knowledge update, ensuring researchers have access to global databases and current scientific trends.
2. Adequate budgetary allocation should be approved every year for the acquisition of high cost of internet bandwidth.
3. The absence of defined ICT adoption policies was noted as one of the factors that hinder effective research service delivery. The stakeholder and the Ministry of Science and Technology should develop and adopt comprehensive policies and operational framework that outline strategies, and performance indicators for effective research service delivery.
4. Industrial Research Institution Board of Directors should consciously reward staff that are competent and result oriented. This can be achieved through mentorship programs and leadership opportunities through delegation.

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