An Assessment On Awareness,Adoption And Utilization Of Fourth Industrial Revolution Devices In Federal Polytechnic Libraries In South-West Nigeria

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ABSTRACT
The paper investigated the awareness, adoption and utilization of Fourth Industrial Revolution devices for improved service delivery in Federal Polytechnic libraries in South-West Nigeria. The research adopted survey design method. Total Enumeration sampling method was used on a population of 120 library staff in the sampled libraries. 98 questionnaires were returned which accounted for 82% of the population. Questionnaire was used for data collection and analyzed using simple percentages, relative important index, average and weighted mean. Findings from the research revealed that utilization of 4th IR devices is low; level of awareness towards the utilization of 4th IR devices is low; Test of Hypothesis with Pearson Product Movement Correlation Co-efficient (PPMC) revealed a significant positive relationship between awareness and utilization of Fourth Industrial Revolution devices at (r=0.655; N=98; P<0.05). Moreover, the findings showed that majority of the respondent preference to enhancement of productivity as the major benefit adopted for the utilization of 4th IR devices. From the challenges, the findings showed issue of data quality and transparency was the major challenges associated with the use of 4th IR devices for improved service delivery. The study therefore, recommended that government should provide enough funds to academic libraries in federal polytechnics to adopt the use of 4th IR devices for improved service delivery; libraries should create platform for training and retraining of professional and para-professional staff on the importance of 4th IR devices; security risks such as ethical issues, cybercrime should be given more attention among others.

I. INTRODUCTION
Background to the study

Academic libraries are libraries found in institutions of higher learning such as in tertiary institutions. In Nigeria, academic libraries are constantly evolving to meet the needs of their diverse users. Saddled with the responsibility to support the objective of the parent institution in terms of learning, teaching and research, they are expected to find, store and share information as well as connect users to information resources. With the advent of Information and Communication Technologies (ICTs), the roles and position of academic libraries and librarians have changed dramatically as they are compelled to incorporate digital sources and resources in order to remain at the fore front of information provision and dissemination. The Fourth Industrial Revolution (4th) is a disruptive change that is mostly focused on artificial intelligence, mobile computing, automation and Internet of Things (IoT) among others. Trades, businesses and various sectors have highly been affected by these Fourth Industrial Revolution devices libraries inclusive.

Fourth Industrial Revolution devices is characterized by the utilization of Artificial Intelligence (AI), Internet of Things (IoTs), Cloud Computing, Drones, Smart Libraries, Block Chain, Bookmark App, Big Data, Expert Systems, Robotics, Makerspace, Library Bookmark App etc. are already being applied in libraries in developed countries. The evolution of information technology towards greater automation and interconnectedness is known as Fourth industrial revolution (Lund, 2021). Libraries have lot to gain in the application

of these technologies to library services. The collection of technologies that enable machines to act with high level of intelligent similar to that of humans is regarded as fourth industrial revolution devices. Libraries and information institutions could take advantage of AI in their operations, this makes their activities smart. The systems integrate computing, networking and physical processes. Therefore, librarians at the moment must be reflective in their thinking, in order to enhance library product and services. Artificial Intelligence and automation process are changing agents of the Fourth Industrial Revolution which will make certain employees redundant and will replace them with the needed skills or with machines that do the job cheaper if libraries fail to adopt and use devices of the fourth industrial revolution.

Academic libraries of the 21st Century are shifting their paradigms from traditional setup to modern information networking. Digitally equipped libraries, knowledgeable, skilled and competent librarians that can form the information superstructure for the application and use of Fourth Industrial Revolution devices and technologies in academic libraries have become a need of the day (Chigwada and Chisita 2021).

Statement of the Problem

The significance of fourth industrial revolution devices cannot be overlooked in organizations especially academic libraries. This is because libraries in 21st century greatly relies on technology for enhanced services delivery to patrons, discovery and access of library's digital resources in performing their tasks effectively which has changed the way we live and work with trends such as Artificial Intelligence (AI), robotics system, visual reality, quantum computing, smart manufacturing, 3-D printing, Cloud Computing, Internet of Things (IoT). These 4IR devices are already being incorporated into library services and operations in developed countries. They can perform certain tasks which mostly depend on data and internet and tells how to gather data in an ever-growing information explosion age. Academic libraries are highly affected by this fourth industrial revolution in term of services and marketing values. Libraries are changing agents of the fourth industrial revolution and if not updated will face numerous Challenges (Abid, 2019).

According to Wilson and Daugherty (2018) they submitted that "additional expertise is not needed in machine learning or robot programming rather a thoughtful people who can apply socio-emotional, creative and complex reasoning skills to the specific needs of the business". The study explained that for interaction between human and smart technologies to be successful, there is need for three dimensions of skill development; mutual readiness to embrace the fourth industrial revolution, accelerated ability to learn faster and learn from each other, and adopt and adapt to the fourth industrial revolution. Librarians' creativity and smart technologies can work together instead of causing division; they can support each other's weaknesses and strengths in meeting the objectives of the academic library. Library staff gain support from smart technologies (4th IR) to apply advanced socio-emotional intelligence to better meet the needs of the library. They therefore need these technologies and devices to conquer the 3 Rs (repetition, replication and redundancy). The researcher observed that in spite the benefits of fourth industrial revolution device, it appears that library staff in Federal Polytechnic libraries in South West of Nigeria are not fully aware of their existence.

However, despite the importance of fourth industrial revolution devices in this era of innovation, it appears that little has been documented on the awareness of 4IR devices in academic libraries. Thus, this study is conceived to fills this paucity in literature by investigating the awareness, adoption and utilization of Fourth Industrial Revolution (4th IR) devices for improved service delivery of libraries in Federal Polytechnics libraries in South-West of Nigeria.

Research Objectives

The main objective of this study is to assess the awareness, adoption and utilization of Fourth Industrial Revolution (4th) devices for improved service delivery in Federal Polytechnic libraries in Nigeria. The specific objectives are to;
1. ascertain the level of awareness of library staff in Federal Polytechnic libraries in South West States of Nigeria towards the utilization of Fourth Industrial Revolutions devices for improved service delivery.
2. assess the extent of adoption and use of Fourth Industrial Revolution devices for improved service delivery to library patrons in the Federal polytechnic libraries in South West States of Nigeria.

II. LITERATURE REVIEW
Awareness of Fourth Industrial Revolution Devices

The Fourth Industrial Revolution (4IR) is an expression which is used to frame and assess the impact of emergent technologies in the 21st century. The concept was first coined at the

WorldEconomic Forum in Davos, Switzerland by Klaus Schwab, with the reference that it would be building on "...the Third, the digital revolution" and would be characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres" (Klaus, 2016). According to Philbeck and Davis (2018) 4IR refers to "epi-digital" revolution where the new technologies become more integrated into the physical, social, and political worlds, they bring fundamental shifts to human behaviors, relationships, and way in which humans experience things (including products and services).The Fourth Industrial Revolution (4IR) is the current and developing environment in which disruptive technologies and devices is the trend. This disruptive technological changes in the field of librarianship is radically transforming the roles and responsibilities of academic librarians and library staff. This therefore calls for a fundamental rethink in order to retool the competencies and skills of librarians to ensure that they deliver efficient services to patrons having diverse and dynamic information needs. Chigwada and Chisita (2021) expressly stated that "The digital era provides librarians with an opportunity to re-profile their competencies and reinvent themselves in order to remain relevant".

Nisha and Naushad (2011) in Delhi, revealed cutting edge technologies like OPAC, Institutional Repositories and Databases are not utilized by majority of respondents in Indian Institute of Technology even when they are available due to poor awareness of these devices.Akparobore, Omosekejimi and Nweke (2020) investigated librarians' awareness, positive attitude and ICT skills as panacea for effective services delivery in the Fourth Industrial Revolution (4th IR) era in academic libraries in Southern Nigeria. The population of study was 841 academic librarians from 84 university libraries in Southern Nigeria. They made used of total enumeration sampling with questionnaire used for collecting data from the respondents. The study showed that the extent of librarians' awareness on 4IR technologies is low.They suggested that librarians should develop natural talent for technological innovations which will transform into positive attitude needed to effectively use the complex technology associated with the 4th IR era. They also added that professional library staff who are one of the key stakeholders in service delivery to library patrons are supposed to be aware of existence/availability, usage, benefits and most importantly their challenges of 4IR technologies so

that the implementation process will not be complete waste.

Bhuiyan, Ali, Zulkili and Kumarasamy (2020) in Bangladesh, reported academia, businesses, policymakers, workers, consumers and authorities are not familiar with the concept of industry 4.0 due to the fact that it a new concept. Therefore, employees, SMEs, industries, and national economies faced with absence of awareness and/or means to adapt to fourth industry revolution devices would definitely be lagging behind. They stressed that there should be sufficient awareness among the authorities and policymakers lead the economic growth and development; businesses and industries lead the productivity and production flexibility and control, efficiency and competitiveness; academia and employees lead the growth in high-skilled and well- paid jobs; finally, consumer awareness leads the improved customer satisfaction and product customization. The current state of awareness regarding revolutionized disruptive technologies of 4IR device has not been well known, but it is crucial to accelerate its present economic progress and meet with international standards (M. A. Islam et al., 2018).

There are some libraries that have adopted Industry 4.0 tools and applications in their day-to-day activities. There is an advanced robotic conveyer system that transports books from Bryant Park off-site storage area to New York Public Library underground (Smith, 2019). At Connecticut West Port Library, two librarians, Vincent and Nancy are responsible for teaching AI to library users. Some libraries are collecting data using social media tools,drones, cameras, and other Industry 4.0 devices to analyze and use it intelligently. The University of Pretoria employed Libby, a client service robot in May 2019 as a way of evolving in line with the 4IR. According to the University of Pretoria (2019), the robot is responsible for providing guidance, conduct surveys, display marketing videos, and answering questions.

The International Federation of Library Associations and Institutions (IFLA) in 2017, conducted a special Global Vision discussion focused on how a united library field can tackle the challenges of the Fourth Industrial Revolution era. They arrived at an agreement stating that: "Libraries enable literate, informed and participative societies. When we look at the future, according to the debates in our teleconference, libraries will be trustworthy information brokers; will do more with new technology; provide universal access to information and scholarly

works, whether it be media or information we already know or new media; preserving and providing access to information in all formats and providing trusted and effective support for political and social engagement. Libraries will be advocates for and facilitators of the Fourth Industrial Revolution, where people create their own devices and objects".

The 4IR is stepped down and almost affected many trades and libraries are also one of them. The librarians and libraries should embrace this revolution for number of reasons such as Uber, Book to desk B2D, Mobile work lists alerts and push information for academics etc. As all stakeholders of global polity from the public and private sectors have been affected by these revolutions, similarly libraries should also implement such changes in their services to fulfill the growing demands of their patrons"(Cronje, 2018).Odeyemi (2019) affirms that digital technology applications exponentially improve academic library's effectiveness and efficiency, provided such academic library could afford the infrastructure and resources required. The emergence of digital technology applications and devices therefore are removing the physical barriers thereby turning the library space into an intelligent space which is one of the characteristics of the Fourth Industrial Revolution (4thIR).

Abid (2019) in his work industrial revolution 4.0 reported that in this revolution, people will get more pace by producing more result with the help of a machine. Many people in library field argue that the industrial revolution will create unemployment in librarianship. But, equipping ourselves with latest technology and artificial intelligent, one can get their job more easily than that of a past. The librarians can reshape their job by trying more skills to develop their job. Under this learning process, one can secure their job future for a lasting period.

Library users are now able to afford and access the digital world due to the advances in technology regardless of time and location. Libraries are now offering both on and off campus access to information resources and patrons only need an internet connection to enjoy the facilities where they can access the services 24/7. This has greatly increased the use of electronic resources since convenience of accessing library services had been improved. New products and services that increase the efficiency of library services are also being introduced in libraries due to the Industry 4.0. These include the use of social media platforms to communicate with clients, online reference services, online renewal of print materials, and self-services at circulation points. Libraries and librarians will have to reinvent and re-strategize on how they can benefit from the numerous opportunities arising from the 4IR era as highlighted below:

Libraries enable literate, informed and participative societies. When we look at the future, according to the debates in our teleconference, libraries will be trustworthy information brokers; will do more with new technology; provide universal access to information and scholarly works, whether it be media or information we already know or new media; preserving and providing access to information in all formats and providing trusted and effective support for political and social engagement. Libraries will be advocates for and facilitators of the Fourth Industrial Revolution, where people create their own devices andobjects. (Church, Butz, Cassell, Kamar, Swindells, Tallman, &Snellenberg, 2017)

Research Methodology
The research design to be adopted for this study is survey design method. This method is adopted by the researcher because of it advantage of wider application as it allows data to be collected from both large population and smaller population. Kamba (2013) posited that survey design is more preferred as it is less time consuming and more affordable for scattered population.

III. RESULTS AND DISCUSSION
Section A: Demographic Data of Respondents

Table I: Distribution of Respondents Gender

Demographic Data		Frequency	Percentage (%)
Sex			
	Male	48	49%
	Female	50	51%
Total			100
Education qualification		**Frequency**	**Percentage (%)**

	Frequency	Percentage
ND	14	14.2%
HND	51	52%
BSC/BLIS/.B.Tech	24	24.5%
Msc/M.Phil	8	8.2%
Ph.d	1	1.0%
Total	98	100
Working experience	**Frequency**	**Percentage (%)**
1 -5	4	4.1%
6-10	22	22.4%
11-15	26	26.5%
16-20	20	20.4%
21 and above	26	25.5%
Total	98	100

Results in table 1 indicated that 49% of the respondents are male while 51% are female. 52% of the respondents have HND while only 1% has PhD. 4.1% of the respondents have working experience of 1 to 5 years while 26.5% of the respondents have working experience of 11 to 15 years.

Question 1: What is the Level of Awareness towards the Utilization of Fourth Industrial Revolution for ImprovedService Delivery?

		HIGH	MODERATE	LOW
1	Internet of things	49 (50%)	33 (33.7%)	16 (16.3%)
2	Artificial Intelligence	30 (30.6 %)	43(43.9%)	25 (25.5%)
3	Smart sensor	20 (20.4%)	46 (46.9 %)	32 (32.7%)
4	3D printer	33 (33.7%)	32 (32.6%)	33 (33.7%)
5	Virtual reality	23 (23.4%)	42 (42.8%)	33 (33.8%)
6	Advance robotic	14 (14.3%)	49 (50%)	35 (35.7%)
7	Block chain	13 (13.3%)	38 (38.8%)	47 (47.9)
8	Drones	13 (13.3%)	36 (36.7%)	49 (50%)
9	Biotechnology	21 (21.4%)	35 (35.7%)	42 (42.9)
10	Cloud computing	19 (19.4%)	51 (52%)	28 (28.6%)
11	Geo engineering	26(26.5%)	45 (45.9%)	27 (27.6)
12	Big data	17 (17.3%)	53 (54%)	28 (28.7%)
13	Gamification	20 (20.4%)	49 (50%)	29(29.6)
14	Neuro Technology	27(27.6%)	21 (21.6%)	50 (51.0%)
15	Mobile devices	29 (29.4%)	28 (28.6%)	41 (41.8%)
16	Quantum Computing	40 (40.8%)	29 (29.6%)	29 (29.6%)
17	Smart factories	44 (44.9%)	31 (31.6%)	23 (23.5%)
18	Networking	47 (48%)	29 (29.6%)	22 (22.4%)
19	Cyber Physical System	52 (53%)	26(26.6%)	20 (20.4%)
20	Internet of service	55(56.1%)	22(22.5%)	21 (21.4%)
Total		592	738	630
Average		29	37	32

Table indicate 4 the level Awareness of awareness towards the utilization of fourth industrial revolution devices for improve services delivery in south west federal polytechnic libraries in Nigeria. An average 37 respondent attest that the utilization of fourth industrial devices is use moderately in the library, while an average of 32 respondent attest that the utilization is low and an average of 29 respondent are of the opinion that the utilization of the fourth industrial device is high. It

can be concluded that the utilization of the fourth industrial revolution device is low in south west federal polytechnic in Nigeria.

Hypothesis 1

There is no significant relationship between awareness and utilization of Fourth Industrial Revolution devices in Federal Polytechnic Libraries in South West States of Nigeria.

Correlations

		Awareness	Utilization
Awareness	Pearson Correlation	1	.655**
	Sig. (2-tailed)		.002
	N	98	98
Utilization	Pearson Correlation	.655**	1
	Sig. (2-tailed)	.002	
	N	20	20

**. Correlation is significant at the 0.01 level (2-tailed).

This hypothesis sought to determine significant relationship between awareness and utilization of Fourth Industrial Revolution devices in Federal Polytechnic Libraries in South West States of Nigeria. The findings revealed a significant positive relationship at r= 0.655 and p value $0.002 < 0.05$. The test shows that there is significant relationship between awareness and utilization of Fourth Industrial Revolution devices in Federal Polytechnic Libraries South West States of Nigeria.

Question 2: Level of Adoption and Use ofFourthIndustrial Revolution Devices

		VHE	HE	LE	VLE	TOTAL	XW
1	Level of adoption and use Internet of things	36	48	11	3	98	3.2
		144	144	22	3	313	
2	Level of adoption and use Artificial Intelligence	25	47	18	8	98	2.9---*
		100	141	36	8	285	
3	Level of adoption and use Smart sensor	23	41	24	9	98	2.5
		92	123	48	9	245	
4	Level of adoption and use 3D printer	23	45	24	6	98	2.6
		92	135	96	6	256	
5	Level of adoption and use Virtual reality	22	41	28	1	98	2.8
		88	123	58	1	270	
6	Level of adoption and use	12	26	47	13	98	2.4
		48	78	94	13	233	
7	Level of adoption and use Block chain	16	15	53	12	98	2.3
		64	45	106	12	227	
8	Level of adoption and use Drones	17	19	52	10	98	2.4
		68	57	104	10	239	
9	Level of adoptionand use Biotechnology	18	17	51	12	98	2.4
		72	51	102	12	237	
10	Level of adoption and use Cloud computing	18	17	55	8	98	2.5

No	Item						XW
		72	51	110	8	241	
11	Level of adoption and use Geo engineering	15	27	47	9	98	2.5
		60	81	94	9	244	
12	Level of adoption and use Big data	19	33	35	11	98	2.6
		76	99	70	11	256	
13	Level of adoption and use Gamification	19	27	40	12	98	2.5
		76	81	80	12	249	
14	Level of adoption and use Neuro Technology	22	16	48	10	98	2.5
		88	48	96	10	242	
`15	Level of adoption and use Mobile devices	22	30	32	14	98	2.6
		88	90	64	14	256	
16	Level of adoption and use Quantum Computing	26	36	25	9	98	2.8
		104	108	50	9	271	
17	S Level of adoption and use mart factories	28	36	25	9	98	2.8
		112	108	50	9	279	
18	Level of adoption and use Networking	23	35	30	10	98	2.7
		92	105	60	10	267	
19	Level of adoption and use Cyber Physical System	24	31	26	17	98	2.6
		96	93	52	17	258	
20	Level of adoption and use Internet of service	32	33	25	8	98	2.9
		128	99	500	8	285	

TW = Total Weight
XW = Mean of Weighted Scores.
Figures in Bracket ( ) are weighted scores
TW = Total Weight
XW = Mean of Weighted Scores.
Figures in Bracket ( ) are weighted scores

Criterion Mean = $\dfrac{SA (4) + A(3) + SD (2) + D(1)}{4}$

$\dfrac{4+3+2+1}{4} = \dfrac{10}{4} = 2.5$

Weighted Mean = $\dfrac{\sum XW}{N} = \dfrac{52.5}{20} = 2.6$

DECISION RULE
We reject if mean of weighted mean is greater than (>) criterion mean and reject if criterion mean is greater than (>) mean of weighted means. Criterion mean (x) = 2.5, Mean (x) of weighted means = 2.65

Since the mean x of the weighted mean 2.6 is greater than (>) the criterion mean 2.5,the Level of adoption and of 4th industrial revolution devices of : Internet of service, Internet of things, Smart sensor,3D printer, Virtual reality, Mobile devices, Quantum Computing, Smart factories, Networking, Cyber Physical System, Cloud-computing, Geo-

engineering Big-data and Neuro-Technology are positive in the south west polytechnic in Nigeria while the Level of adoption of 4th industrial revolution devices for Advance robotic, Block chain, Drones and Biotechnology are negative

Hypothesis 2
There is no significant relationship between adoption and utilization of Fourth Industrial Revolution devices in Federal Polytechnic Libraries in South West States of Nigeria.

Correlations

		Utilization	Adoption
Utilization	Pearson Correlation	1	.646[**]
	Sig. (2-tailed)		.002
	N	98	98
Adoption	Pearson Correlation	.646[**]	1
	Sig. (2-tailed)	.002	
	N	20	20

**. Correlation is significant at the 0.01 level (2-tailed).

This hypothesis sought to determine thesignificant relationship between adoption and utilization of Fourth Industrial Revolution devices in Federal Polytechnic Libraries in South West States of Nigeria.The findings revealed a significant positive moderate relationship at r= 0.646 and p value 0.02< 0.05 it implies as the utilization increase adoption will also increase. There is significant relationship between adoption and utilizationof Fourth Industrial Revolution devices in Federal Polytechnic Libraries in South West States of Nigeria.

IV. CONCLUSION

Awareness, adoption and utilization of fourth industrial revolution (4th) devices for improved service delivery in federal polytechnic libraries in Nigeria will be of great benefit if libraries adopt them for providing information services. The low awareness, non-availability and utilization of fourth industrial revolution devices which will be of great benefits if adopted and used in libraries for provision of services, inability to adopt and use the devices, constrains to its use such as cyber security and ethical considerations will be a great constraints to effective services delivery in the libraries considering its importance in the 21st century especially the use of Internet of Things IOT, Cloud Computing, Blockchain and so on. Its adoption will increase the provision of various services which will have positive effects on productivity in the libraries.

Recommendations
Using the results of the finding as backdrops, the following recommendations were made:

1. Government should provide enough funds for academic libraries especially polytechnic in the country to adopt the use of forth industrial devices for improved service delivery
2. Libraries should create platform for awareness and training and retraining of professionals and para- professional on the importance of Fourth Industrial Revolutions devices in libraries.
3. Academic libraries should endeavor to adopt and use the new trends in librarianship, since libraries has been on the forefront to use and adopt new innovation when need arises.
4, Provision of adequate devices such as big data, Internet of Things (IoT), Cloud computing and so on, will have positive effects on academic libraries.
5. Academic institution should as a matter of urgency key in to use of the fourth industrial revolution to avoid been left so as to meet up with international standard of meting users need.
6. Security risk such as ethical issues and cybercrime should be given more attention, Effort should be made to preserve, conserve, and disseminate information to right person at the right time on the use of the devices.
7. Lastly, Government should provide access to the use of these available devices

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