ACADEMIC STAFF READINESS, ACCEPTANCE AND MANAGING EDUCATION 4.0 CHALLENGES IN UNIVERSITIES IN NORTH EAST, NIGERIA

UMARU ABDULLAHI, Ph.D.
DEPARTMENT OF EDUCATION, YOBE STATE UNIVERSITY, DAMATURU, YOBE STATE
&
TERHEMBA GODWIN ATSUA, Ph.D.
MUTUAL LINKS & DATA SERVICES LTD., WEB 73 ACADEMIC AREA, UNIVERSITY OF MAIDUGURI

Abstract
Technological progress in the last decades has been remarkable fast, and major technological changes offer the chance to improve human life, but they also create concerns about the future. One of the biggest fears related to the new technologies is that the robots and the artificial intelligence will replace the human factor in work leading to the technological unemployment. The emergence of the Fourth Industrial Revolution (4IR), has heightened the need for awareness among all stakeholders in education and synergy among higher institutions of learning. This study investigated university academic staff readiness, acceptance and managing challenges with Education 4.0 in North East Nigeria. The study adopted the correlational design of the survey research type. A sample of 136 university academics responded to University Staff Readiness, Acceptance and Managing Challenges with Education 4.0 Questionnaire, which was the instrument used to collect data. Data were analyzed descriptively using weighted mean and Pearson Product Moment Correlation. Findings revealed that academic staff highly perceived the universities readiness for Education 4.0, academic staff highly perceived universities acceptance of Education 4.0, academic staff agreed that the universities are managing the challenges countered as they interface with Education 4.0, It was recommended that IT educators need to play significant role to ensure a smooth glide of university staff into Education 4.0.

Key words: Technology, Artificial intelligence, Unemployment, Stakeholders

Introduction
In March 2020, the pandemic caused by the Corona Virus Disease 2019 (COVID-19) engulfed the whole world causing severe dislocation, making social distancing and quarantine part of the new normal. This situation forced higher education institutions (HEIs) globally to fully embrace online learning classes, a major component of Education 4.0. COVID-19 has become a catalyst for educational institutions worldwide to search for innovative solutions in a relatively short period of time. Moreover, education has undergone a tremendous change over the past few decades.

Education 4.0 is a new concept of education that set to combine the real and virtual world.

But this concept will bring some new risks. Education 4.0 as introduced in Germany in 2016 coincided with discussions about changes in the business environment driven by technology and innovation, popularly known as Industrial Revolution 4.0 or IR4.0 (Uy & Rabo, 2019). The use of technology tools has been managed to engage learners in a better context (Chea & Huan, 2019). Industrial Revolution 4.0 or IR4.0 is the term for the realistic concept of the next industrial revolution (Bughin, *et al*, 2018; Dadios, *et al*, 2018). IR4.0, known as digital age with big data, artificial intelligence and internet of things, has great impacts on many sectors and leads to new terms such as Education 4.0. The main vision of this fourth industrial revolution is the emergence of smart factories.

The review of related literature showed that Education 4.0 was recognized as a response to IR4.0, greatly increasing the use of Internet technologies and cross communication tools. Education 4.0 is developed for IR4.0 and prepares qualified professionals for a very global and digital work environment (Sharma, 2019). IR4.0 is a well-researched topic (Kim, Torneo & Yang, 2019; World Economic Forum, 2018). Similarly studies on Education 4.0 has been growing and expanding (Uy & Rabo, 2019; Benesova, 2018).

In the Nigerian context, a major drawback for readiness in Education 4.0 is a weak digital infrastructure. In 2018, Nigeria was ranked 57th out of 79 participating countries in the Global Connectivity Index (GCI) (Montealegre, 2019). A bright spot for the country is, on the other hand, is the fact that Nigeria is the fastest-growing digital populations in the world with 63 percent of the population accessing the internet, spending an average of 10 hours a day. Digital 2019 (digital marketing community.com, 2020) reported that Nigerians are the top internet users in the world with 47 percent of online activities spent on social media.

The main objective of the study was to determine the preparation of the university academic in the implementation of Education 4.0 in North East Nigeria. Specifically, the study focused on the readiness and acceptance of Education 4.0 as well how university academic staff are managing the challenges encountered with Education 4.0. The findings of the study served as the basis for proposed implementation framework of Education 4.0. The three frameworks which served as theoretical lenses for this study are Aziz-Yusof's Organizational Readiness Model (2012) for readiness, the Unified Theory of Acceptance and Use of Technology (UTAUT) formulated by Venkatesh, Morris, Davis, and Davis (2003) for acceptance and the Hald and Mouristen Model of Supply Chain Performance Management System (2018) for managing the challenges encountered. From the theoretical anchorage of the study, the study identified the independent and the dependent variables of the study. The independent variables are the level of readiness and the level of acceptance of Education 4.0 while the dependent variable is managing the challenges encountered in interfacing with Education 4.0. The proposed output as shown in the operational model includes the proposed framework for implementation of Education 4.0 and an action plan that will improve university interface with Education 4.0.

Methodology
The research design used in this study was descriptive-correlational. The primary source of data were the 136 respondents of the study who were university academics. Secondary

sources of data included books, theses, online journals and the internet to support the findings in this study. The self-made instrument titled: "University Staff Readiness, Acceptance and Managing Challenges with Education 4.0 Questionnaire" was based on exhaustive review of the literature consisted of statements that gauged the level of readiness and acceptance as well as perspectives on how the challenges encountered with Education 4.0. Part 1 of the questionnaire covered the demography of the respondent. Part 2 dealt with level of readiness of university lecturers for Education 4.0 while Part 3 focused on the level of acceptance of university lecturers for Education 4.0. The last part, Part 4 centered on how the challenges encountered were managed by universities lecturers as it interfaces with Education 4.0.

For the internal consistency of the questionnaire, pilot testing was done to non-teaching staff of who were not part of the actual survey. Cronbach's alpha values were used to estimate the reliability of the instrument used. There were good internal consistencies for readiness (0.949), acceptance (0.931) and managing the challenges encountered (0.881). For the questionnaire, respondents were given instructions to indicate their level of agreement with the statements regarding readiness and acceptance of Education 4.0 by checking the column representing their choice in a 4-point Likert scale. To measure the respondents' level of acceptance and readiness for Education 4.0, the following measures were used: Very High, High, Low and Very Low. To describe the challenges faced by university academic staff in interfacing Education 4.0, the following measures were used: Strongly Agree, Agree, Disagree and Strongly Disagree.

None of the items in the questionnaire were reverse scored. The higher the scores, then the more the respondents agree with the statements that constitute the items. Weighted mean and standard deviation were used to describe the level of readiness and acceptance of Education 4.0 as well as the challenges they encountered in interfacing with it. Pearson Moment Correlation Coefficient were used to describe the relationship between the level of readiness and acceptance for Education 4.0 as well as the relationship between level of readiness for Education 4.0 and how the challenges encountered are managed in interfacing with it. The confidentiality and anonymity of the respondents were ensured. They were informed that the data they provided will be used for research purposes only. The participants were not exposed to any mental, physical, or environmental risk, and no unethical techniques were used. They were also informed that participation is voluntary and that they were not forced to participate. No respondents were excluded based on their gender, age, tribe, or socio-economic status.

Results and Discussion
Table 1: Level of Readiness of Universities for Education 4.0

S/N	Indicators	Weighted Mean	Interpretation	Rank
1	Top management of the universities are supportive of implementing Education 4.0	3.56	Very High	1
2	Universities have clear vision and direction for Education 4.0	3.50	Very High	2.5
3.	Education 4.0 as implemented in the universities is the most appropriate teaching-learning method in today's changing environment	3.50	Very High	2.5
4.	Education 4.0 as implemented in the universities is effective in addressing the needs of IR4.0	3.44	High	4
5.	I can observe the ongoing developments as well as sustainability efforts of the universities to cope with Education 4.0 academic paradigm	3.36	High	5
6.	The universities as they implement Education 4.0 have a history of adopting change to better serve its customers	3.33	High	6
7.	Several top officers at the universities are product champions for Education 4.0	3.28	High	7.5
8.	The universities are adequately redesigning learning spaces for Education 4.0	3.28	High	7.5
9.	The universities have organisational flexibility in its implementation of Education 4.0.	3.25	High	10.5
10.	The universities as it implements Education 4.0 actively seeks to reduce or remove conflicts within its organisation	3.25	High	10.5
11	The universities are a strong adopter of educational technologies, including mobile earning, next generation LMS	3.25	High	10.5
12.	The universities are investing adequate resources as it interfaces with Education 4.0	3.22	High	12
13.	The universities are implementing adequate training of its staff as it interfaces with Education 4.0	3.17	High	13.5
14.	The universities as they implement Education 4.0 actively seeks to reduce or remove conflicts within its organisation	3.17	High	13.5
15.	The universities solicit collective feedback from its stakeholders in order to interface with the opportunities, challenges and demands brought by Education 4.0	3.14	High	15
	Average	**3.31**	**High**	

Table 1 shows that the academic staff highly perceived the universities readiness for Education 4.0, with an average weighted mean of 3.31. This means that academic staff believe that the universities have high level of readiness for Education 4.0. This aligned with the findings of Tinmaz and Hwa (2019) on the readiness level of Korean students for Education 4.0 and IR4.0. Similarly, Alakrash and Razak (2020) reported similar result when they investigated the readiness level of students of English as a Foreign Language (EFL) in utilising technology in learning English in the classroom.

Table 2: Level of Acceptance of Education 4.0

S/N	Indicators	Weighted Mean	Interpretation	Rank
1	Facilitating Conditions. In interfacing Education 4.0, I will encounter challenges and opportunities in order to grow personally and professionally.	3.56	Very High	1
2	Effort Expectancy: Education 4.0 is a reality in the academe today that must be embraced.	3.50	Very High	2
3.	Performance Efficacy. Education 4.0, as being implemented at the university will lead to better teaching learning experiences for both the faculty and the students.	3.42	High	3
4.	Effort Expectancy: Education 4.0, as being implemented at the university will make students better prepared for IR4.0.	3.36	High	5.5
5.	Facilitating Conditions: The university is making adequate investments to make its infrastructure and facilities matched with Education 4.0, making me accept it with a positive mindset.	3.36	High	5.5
6.	Facilitating Conditions. Education 4.0 is an effective mechanism to make students prepared and competitive in today's challenging and demanding workplace.	3.36	High	5.5
7.	Performance Efficacy: Education 4.0, as being implemented at the university, will make students feel that they are the real owners of their education.	3.33	High	7.5
8.	Effort Expectancy: Education 4.0is adoptable and implementable among the teaching force of the university.	3.33	High	7.5
9.	Facilitating Conditions. The university as it implements Education 4.0, is adopting adequate organisational improvements to make its structure matched with Education 4.0.	3.31	High	9
10.	Performance Efficacy: Education 4.0 will lead to students having knowledge, skills and attitudes that are useful and responsive for IR4.0.	3.28	High	10
11	Effort Expectancy: Education 4.0 is adoptable and implementable among the students of the university.	3.25	High	11
	Average	**3.37**	**High**	

Table 2 shows that academic staff highly perceived universities acceptance of Education 4.0, with an average weighted mean of 3.37, interpreted as High. This means that academic staff believe that the universities have high level of acceptance for Education 4.0. This is similar with the findings of Caputo, Papa and Cillo (2019) that the concept of Education 4.0 can improve an organization's performance by considering the acceptance level for the requisite technologies. Similarly, the study underscored Karim, Abu and Adnan (2018) prediction that the future of mobile learning depends largely on the level of social acceptance.

Table 3: Managing Education 4.0 Challenges

S/N	Indicators	Weighted Mean	Interpretation	Rank
1	Related to Attitude and Commitment: Education 4.0 is a natural progression in the evolution of education.	3.52	Strongly Agree	1
2	Related to Organisational Alignment: Education 4.0, as being implemented at the universities, is aligned with the universities' strategy.	3.28	Agree	2
3.	Related to Technical Challenges: The universities upgraded their support infrastructures as it interfaces with Education 4.0.	3.25	Agree	3
4.	Related to Technical Challenges: The universities allocate adequate spaces for Education 4.0 implementation.	3.22	Agree	4.5
5.	Related to Organisational Alignment: Education 4.0, as being implemented at the universities, is aligned with the courses offered at the universities.	3.22	Agree	4.5
6.	Related to Attitude and Commitment: The university's staff are highly interested in Education 4.0.	3.18	Agree	6
7.	Related to Conflicts and Objections: Being knowledgeable of Education 4.0 is an advantage for any educator, career-wise.	3.17	Agree	7.5
8.	Related to Organisational Alignment: Education 4.0, as being implemented at the universities, is a natural fit with the universities' organisational characteristics.	3.17	Agree	7.5
9.	Related to Attitude and Commitment: The universities management and policy makers share adequate information about Education 4.0.	3.14	Agree	9
10.	Related to Conflicts and Objections: There are no observed apprehensions and objections of Education 4.0, as it is being implemented at the universities.	3.11	Agree	11.5
11	Related to Technical Challenges: There are adequate mechanisms (assessment and evaluation tools) to measure performance of the faculty in Education 4.0 implementation.	3.11	Agree	11.5
12.	Related to Technical Challenges: The universities provide relevant training and seminars for faculty and staff to be competitive in Education 4.0.	3.11	Agree	11.5
13.	Related to Attitude and Commitment: I believe the university's staff members share adequate information about Education 4.0 among themselves.	3.08	Agree	13
14.	Related to Attitude and Commitment: The universities management and policy makers provide adequate incentives to faculty members for them to learn more about Education 4.0	3.06	Agree	14
15.	Related to Conflicts and Objections: The implementation of Education 4.0 is not creating divisions among academicians.	2.97	Agree	15
	Average	**3.17**	**Agree**	

Table 3 shows that academic staff agreed that the universities are managing the challenges countered as they interface with Education 4.0, with an average weighted mean of 3.17. This is similar to the findings of Wallner and Wagner (2016) that highlighted that future challenges for Education 4.0 are increasingly interdisciplinary and trans-disciplinary.

Likewise, Ramirez-Mendoza, *et. al*. (2018) explored Engineering Education 4.0 program wherein the scientific activity is centered on specific challenges related to their disciplines.

Table 4: Relationship between Readiness, Managing and Acceptance of Education 4.0

Statement	*R*	p-value	Remark
Level of Readiness and of Acceptance of the Universities for Education 4.0	0.786	0.00	Sig.
Level of Readiness and Managing Challenges Encountered by the Universities as they Interfaces with Education 4.0	0. 857	0.00	Sig.
Level of Acceptance and Managing the Challenges Encountered by the Universities as IT Interfaces with Education 4.0	0. 877	0.00	Sig.

As shown in Table 4, there is a significant relationship (r = 0.786) between the level of readiness and level of acceptance of Education 4.0, a significant relationship (r = 0.857) between the level of readiness and managing Education 4.0 challenges and a significant relationship (r = 0.877) between the levels of acceptance and managing Education 4.0 challenges. This means that the higher the level of readiness and managing challenges of the universities for Education 4.0, the higher is the level of acceptance. This is similar to the findings by Ismail, Bokhare and Azizan (2021) that probes the influence of technology acceptance on teachers' readiness for the pedagogical usage of mobile phone and the possible implications this influence affords. Likewise, Sun, Lee, Law, and Hyun (2020) found a similar definitive relationship between the two variables. From a study of children who require special education, Yusof *et al* (2019) showed that there was a significant relationship between readiness, knowledge and teachers' acceptance.

Proposed Framework for Universities Implementation of Education 4.0
The proposed framework for implementation of Education 4.0 at the universities is shown in Figure 1. From the results of this study, particularly the insights drawn from the survey of the universities professors, the implementation of Education 4.0 is hinged on the delivery of instructions by the professors. This delivery is affected by two inputs, the Infrastructure (Infra) the Human Resource Development (HRDev). Neither Infra nor HRDev are isolated boxes. For instance, a key finding of this research is the need for the universities to provide better incentives for professors to engage themselves in Education 4.0. This task is definitely HRDev but the universities also need to adopt processes, systems, and structure to implement the initiative but such are covered under Infra. Hence, the placement of two arrows linking the boxes.

Figure 1: Proposed Framework for Implementation of Education 4.0
Both Infra and HRDev are influenced by the measures of readiness, acceptance and managing challenges. The measure of readiness in the framework focuses on five classes of antecedents that have direct effects on organisational readiness: attributes of change, leadership support, internal context, attributes of change target and IT support (Aziz & Yusof, 2012). The measure of acceptance hinges on the unified theory of acceptance and use of technology (UTAUT), which proposes four key constructs, namely, performance efficacy, effort expectancy, social influence, and facilitating conditions, to use a technology and actual technology used primarily in organisational contexts (Venkatesh, Morris, Davis, & Davis, 2003). Moreover, the measure of managing the challenges for this framework recognises four (4) main groups of organisational challenges, namely, conflict and objection, technical challenges, attitudes and commitment, and alignment (Hald & Mouristen, 2018).

Figure 2: Delivery of Blended Learning Teaching Model
(Adapted from Dalaguete, 2020)
The delivery of instructions is covered by the next diagram of the framework, as shown in Figure 2, and involves Blended Learning-Teaching (BLT) model that universities could adopt. The BLT Model, one of the ways of teaching learning deliveries under Education 4.0, was developed by Dr. Felicito Dalaguete in 2020. As this part of the Framework suggests, the essential requirements for the delivery are the course specifications (topmost box), which are drafted by each HEIs in congruence with the guidance from the National Universities Commission (NUC). Since the universities are focused HEIs, the NUC also plays a major role in developing the course specifications. From the course specifications, the Blended Learning Teaching (BLT) modules are generated by the universities professors as Planned Classroom Activities (PCA), Planned Online Activities (POA) and Planned Lab Activities (PLA). The other two components of BLT delivery are Faculty Competence and Blended Learning Resources. Faculty Competence are manifested in Planning, Delivery Strategies and Engagement Assessment. Meanwhile, Blended Learning Teaching Resources are composed of the technology adoption through e-classrooms, digital tools and virtual laboratories.

The effectiveness of the delivery for Education 4.0 should be monitored on a timely basis. Suggestion is three reviews annually, at the end of each trimester in order to calibrate the direction of Education 4.0. Should the delivery be effective, there is no need for further revisions. However, should the delivery be no longer effective or whenever the universities stakeholders have suggestions for improvement of delivery, there is a need for review and enhancement.

Action Plan
Congruent with the conclusion and recommendations of this study, hereunder is an action plan addressing the findings of this study. Objective 1: Fostering the development of a high performing Education 4.0 ecosystem infrastructure within the universities' actions:
I.   Universities to adopt adequate organisational improvements, infrastructure upgrades and improved digital connectivity to enable the HEIs to meet the requisites of Education 4.0.

ii.   Universities to improve structure in soliciting feedback from its stakeholders in order to interface with the opportunities, challenges and demands brought by Education 4.0.

iii. Universities policy makers, specifically those in-charge of organization development, to adopt adequate organisational improvements to make its structure matches with the requisites of Education 4.0.

iv.   Universities to ensure that the implementation of Education 4.0 is not creating divisions among professors and other universities personnel.

v.   Universities to continually monitor and improve effort expectancy, which is the degree of ease associated with the use of the system thus making Education 4.0 adaptable and implementable among university academic staff and students. This can be done by conducted announced and unannounced surveys and interviews of the university academic staff and students.

Timeline: During the whole academic year
Responsibility: Universities top management, HRM Department
Outcome: A more future-proof organisation interfacing with the demands of Education 4.0.
Objective 2: Fostering the development of a high performing university academic and support staff who are confident in interfacing with Education 4.0 Actions:

i.   Improve training of university academics to produce digitally component and confident teachers. Training to include use of new technologies for Education 4.0, ways of online assessments and creative ways to better engage students online.

ii.   Development of further enhancements of incentives to faculty members for them to learn more about Education 4.0.

iii. Monitoring of performance efficiency, a metric that provides a means of determining the learning efficiency of instructional conditions. This will lead to students having knowledge, skills and attitudes that are useful and responsive to both Education 4.0 and IR4.0.

iv.   Sharing adequate information about Education 4.0 implementation at the universities.

Timeline: During the whole academic year, 3 times annually
Responsibility: University top management and HRM department
Outcome: An HEI whose faculty and non-teaching personnel are confident to meet the challenges and demands of Education 4.0

Conclusion
Based on the findings of the study, the following conclusions were drawn: There is a high level of readiness of the universities for Education 4.0. This is manifested by the very high level of top management support in implementing Education 4.0. There is a high level of acceptance of the universities for Education 4.0. University professors understand that in interfacing Education 4.0, they will encounter challenges and opportunities that will lead to personal and professional growth. The universities is managing the challenges encountered in interfacing Education 4.0. Education 4.0 is a natural progression in the evolution of education. The higher the level of readiness of the universities for Education 4.0, the higher is their level of acceptance. The higher the level of readiness of the

universities for Education 4.0, the better the management of challenges encountered. 6. The higher the level of acceptance of the universities for Education 4.0, the better the management of challenges encountered.

Recommendations

Based on the significant findings of the study and the conclusions drawn, the following are offered for future actions:

I. To further improve the level of readiness of the universities for Education 4.0, the HEIs should intensify the solicitation of collective feedback from its stakeholders in order to interface with the opportunities, challenges and demands brought by Education 4.0.

ii. The level of readiness of the universities for Education 4.0 may be improved by implementing adequate training of its faculty and staff, including use of new technologies for Education 4.0, alternative ways of online assessments and creative ways to better engage students online.

iii. The universities could also adopt policies, structures, and processes that aim to actively seek to reduce conflicts within its organization as it implements Education 4.0.

iv. To further improve the level of acceptance of Education 4.0, the universities could improve the Effort Expectancy, thus making Education 4.0 adaptable and implementable among university academic staff and students.

v. The level of acceptance of Education 4.0 may be further improved by increasing performance efficacy. This will lead to students having knowledge, skills and attitudes that are useful and responsive to both Education 4.0 and IR4.0.

vi. University policy makers should adopt adequate organizational improvements to make its structure matches with the requisites of Education 4.0.

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