Integration of Artificial Intelligence Applications for Financial Process Innovation by Commercial Banks in Nigeria

Eno Gregory Ukpong
Department of Accounting
Akwa Ibom State University

Abstract

Artificial intelligence is increasingly being adopted globally in finance and by commercial banks with increasing penetration into the Nigerian financial market. This study investigated the Integration of Artificial Intelligence (AI) applications for financial process innovation by commercial banks in Nigeria. Three specific objectives and three research questions and hypotheses were stated for the study. The variables of the study were AIs for credit risk management, personalized banking experience and the challenge of implementing AI in commercial banks in Nigeria. A sample size of 143 selected from a population of 174 comprising accounting lecturers in public universities in Akwa Ibom State and bank managers, operational staff and key personnel in commercial banks operating in Uyo, Akwa Ibom State were used for the study. Descriptive survey research design was employed for the study. The research instrument used for the study was a researcher- developed questionnaire tagged "Artificial Intelligence Applications for Financial Process Innovation Questionnaire" (AIAFPIQ). The instrument developed by the researcher was face validated by three experts in the Faculty of Social Sciences, Akwa Ibom State University. The instrument was administered to 20 persons who were not part of the sample but part of the study population. The result was then coded for testing using cronbach alpha technique. The reliability index yielded 0.89. The data generated was analyzed using mean, standard deviation and t-test Analysis. Findings of the study revealed that AI can be applied for credit risk management and personalized banking experience. Furthermore, Experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in credit risk management and personalized banking experience in promoting financial process innovation by commercial banks in Nigeria. It was recommended among others that AIs should be systematically implemented by banks, not just as a form of competition but as an overall business strategy; and that The international financial community should actively cooperate to share new scientific and technological achievements, to establish and improve the financial market of AI, so that the welfare of the society brought by financial AI will ultimately shine on mankind.

Keywords: Credit risk management, personal banking experience, AIs in banks, AI application

Introduction

Artificial intelligence (AI) is intelligence demonstrated by machines as opposed to natural intelligence displayed by animals including humans. Leading AI textbooks define the field as the study of "intelligent agents": any system that perceives its environment and takes actions that maximize its chance of achieving its goals (Poole, et al, 1998). Researchers use the term "artificial intelligence" to describe machines that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving", although this definition is rejected by major AI researchers (Russell & Norvig, 2003), Artificial Intelligence (AI) has been around for a long time.

AI was first conceptualized in 1955 as a branch of Computer Science and focused on the science of making "intelligent machines" that could mimic the cognitive abilities of the human mind, such as learning and problem-solving. AI is expected to have a disruptive effect on most industry sectors, compared to what the internet did over the last couple of decades (Dumasia, 2021). The adoption of AI in different enterprises has increased due to the COVID-19 pandemic. Since the pandemic hit

the world, the potential value of AI has grown significantly. The focus of AI adoption is restricted to improving the efficiency of operations or the effectiveness of operations. However, AI is becoming increasingly important as organizations automate their day-to-day operations and understand the COVID-19 affected datasets. It can be leveraged to improve the stakeholder experience as well. Interest in artificial intelligence technology is sky-high in the banking and finance sector. Outside of the technology sector, the financial services industry is the biggest spender on AI services and is experiencing very fast growth (Citi, 2018).

The reason for the high interest in AI for banks is vast and irresistible even for banks developing nations like Nigeria. The strategic application of AI's technologies including machine learning, natural language processing and computer vision can drive meaningful results for banks, from enhancing employee and customer experiences to improving back-office operations (Tucci, 2020). The application of artificial intelligence in the enterprise is profoundly changing the way businesses work. Companies are incorporating AI technologies into their business operations with the aim of saving money, boosting efficiency, generating insights and creating new markets.

There are AI-powered enterprise applications to enhance customer service, maximize sales, sharpen cybersecurity, optimize supply chains, free up workers from mundane tasks, improve existing products and point the way to new products. It is hard to think of an area in the enterprise where AI - the simulation of human processes by machines, especially computer systems will not have an impact. Within the financial services industry, AI applications include algorithmic trading, portfolio composition and optimisation, model validation, back testing, robo-advising, virtual customer assistants, market impact analysis, regulatory compliance and stress testing. This paper discusses three specific areas in which AI is currently changing the financial services industry, namely: fraud detection and compliance; personalized banking experiences (banking chatbots and robo-advisory services); and credit risk management.

Statement of the Problem

One great challenges with all new innovations is the problem of acceptability. Issues of whether people will accept change to some extent depends on awareness of the new innovation, its capabilities and impact. Artificial intelligence carries a lot of benefits for the financial market. Already, FINTECHS are applying more AIs than other units of commercial banks. However, the application is spreading from marketing, operations to everyday bank activities and services. Where people, especially, stakeholders fail to understand the dynamics, then, issues of bias, neglect and missed opportunities become a threat to the bank in the near future. Most bankers are not even aware of the impacts and ways of application of artificial intelligence for financial markets and management. This study, thus, intends to ascertain the opinion of experts on the extent to which AI applications can be integrated for promoting financial; innovation services among commercial banks in Nigeria.

Objective of the Study

The main objective of the study is to determine the ways and means of integrating artificial intelligence applications for financial process innovation by commercial banks in Nigeria. Specifically, the study sought to ascertain:

1. How the integration of artificial intelligence (AI) in personalized banking experience promotes financial process innovation by commercial banks in Nigeria.
2. How the integration of artificial intelligence (AI) in credit scoring promotes financial process innovation by commercial banks in Nigeria
3. the challenges of implementing AI for promoting financial process innovation by

commercial banks in Nigeria

Research Questions

The following research questions were stated for the study

1. How does the integration of artificial intelligence (AI) in personalized banking experience promote financial process innovation by commercial banks in Nigeria?
2. How does the integration of artificial intelligence (AI) in credit scoring promote financial process innovation by commercial banks in Nigeria?
3. What are the challenges of implementing AI for promoting financial process innovation by commercial banks in Nigeria?

Research Hypotheses

The following null hypotheses guided for the study:

Ho_1: Experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in personalized banking experience for promoting financial process innovation by commercial banks in Nigeria.

Ho_2: Experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in credit scoring for promoting financial process innovation by commercial banks in Nigeria.

Conceptual Review
Artificial Intelligence (AI)

Artificial Intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. As the sophistication of artificial intelligence and intelligent algorithm technologies has increased, they now have the potential to revolutionize traditional banking models and deliver a shift to digital banking which is faster, more agile, and more customer centric. AI has the potential to transform all aspects of banking – from the way we save to the way we invest and spend – making possible a model of banking that is smarter, faster and more customer friendly (Franck, 2021).

On banking on artificial intelligence, Anjum (2020) aver that harnessing cognitive technology with Artificial Intelligence (AI) brings the advantage of digitization to banks and helps them meet the competition posed by FinTech players. In fact, about 32% of financial service providers are already using AI technologies like Predictive Analytics, Voice Recognition, among others. Artificial Intelligence is the future of banking as it brings the power of advanced data analytics to combat fraudulent transactions and improve compliance. AI algorithm accomplishes anti-money laundering activities in few seconds, which otherwise take hours and days. AI also enables banks to manage huge volumes of data at record speed to derive valuable insights from it. Features such as AI bots, digital payment advisers and biometric fraud detection mechanisms lead to higher quality of services to a wider customer base. All this translates to increased revenue, reduced costs and boost in profits (Anjum, 2020).

AIs are increasingly being applied in credit risk management. AI is instrumental in helping alternate lenders determine the creditworthiness of clients by analyzing data from a wide range of traditional and non-traditional data sources. This helps lenders develop innovative lending systems backed by a robust credit scoring model, even for those individuals or entities with limited credit history. One of the crucial applications of machine learning in the financial industry is credit scoring. Many financial institutions, be it large banks or smaller fintech companies, are in the business of lending money. And to do so, they need to accurately assess the credit worthiness of an individual or another company. Traditionally, such decisions were made by analysts after conducting an interview with individuals and gathering the relevant data points. However,

artificial intelligence allows for a faster and more accurate assessment of a potential borrower, using more complex methods in comparison to the scoring systems of the past. To do so, advanced classification algorithms use a variety of explanatory variables (for example, demographical data, income, savings, past credit history, transaction history at the same institution, and many more) to arrive at the final score which determines whether the person will receive the loan.

An additional advantage of AI-based scoring systems is the potential of making unbiased decisions - there is no human factor, such as the bank employee's mood on a given day or some other factors influencing the decision. Also, it might benefit people without an extensive credit history, allowing them to prove their trustworthiness and ability to repay the loan regardless (Eryk, 2020). AIs also support enhanced customer experience. Based on past interactions, AI develops a better understanding of customers and their behavior. This enables banks to customize financial products and services by adding personalized features and intuitive interactions to deliver meaningful customer engagement and build strong relationships with its customer.

Financial innovation is the process of creating new products, services, or processes related to the finance sector. They occur with the advancement in financial instruments and payment systems with time (Apoorva, 2021). Some types of financial innovation are driven by improvements in computer and telecommunication technology, the most recent being artificial intelligence and other associated fourth industrial technologies. For example, Volcker (2009) suggests that for most people, the creation of the ATM was a greater financial innovation than asset-backed securitization. Other types of financial innovation affecting the payments system include credit and debit cards and online payment systems like PayPal. These types of innovations are notable because they reduce transaction costs. Financial innovations may influence economic or financial systems. For instance, financial innovation may affect monetary policy effectiveness and the ability of central banks to stabilize the economy. The relationship between money and interest

Artificial Intelligence and Credit Risk Management for Financial Innovation
Extension of credit is quite a challenging task for bankers. If a bank lends money to insolvent customers, it can get into difficulties. If a borrower loses a stable income, this leads to default. According to statistics, in 2020, credit card delinquencies in the U.S. rose by 1.4% within six months (Kumar, 2021). AI powered systems can appraise customer credit histories more accurately to avoid this level of default. Mobile banking apps track financial transactions and analyze user data. This helps banks anticipate the risks associated with issuing loans, such as customer insolvency or the threat of fraud (Kumar, 2021).

Credit risk is the possibility a lender will default on a loan extended by a bank or financial institution. The use of artificial intelligence (AI) in credit risk management enables banks to predict the probability of a counterparty defaulting by leveraging on both traditional and alternative data sources. The probability insights provide a basis for banks to decide whether to avoid extending a loan or extend the loan with mitigations such as higher interest rates or collateral (Amplifi, 2021). Credit risk modeling is the means by which banks use data models to predict credit risks. The models when queried indicate the probability of a borrower defaulting and the corresponding impact of the default on the lender's finances.

On credit decision, AI offers a quicker, more precise evaluation at lower costs of a prospective borrower and reflects a broader range of variables leading to a better-informed, data-backed decision. AI's credit scoring is based on more complicated and advanced rules opposed to traditional loan scoring schemes. It enables lenders to differentiate between high-default risk candidates and those who are worthy of credit but lacks a credit record history. Objectivity is a further advantage of the AI system. Contrary to a person, a machine is unlikely to be partial. Digital banks and loan-issuing apps use machine-learning algorithms to analyze credit status with optional

information (e.g. smartphone data) to check loan eligibility and to offer customized options (Bachinskiy 2019).

Artificial Intelligence and Personalized Banking Experience for Financial Innovation
One of the applications and benefits of AI in personalized banking includes enhanced customer experience. Based on past interactions, AI develops a better understanding of customers and their behavior. This enables banks to customize financial products and services by adding personalized features and intuitive interactions to deliver meaningful customer engagement and build strong relationships with its customer.

As part of this post financial crisis response, robo-advisors and chatbots are emerging across the financial services sector, helping consumers choose investments, banking products and insurance policies. A "bot" is a software application created to automate certain tasks using AI technology (Future Today Institute, 2017). A robo-advisor is an algorithm based digital platform that offers automated financial advice or investment management services. The term "robo-advisor" was essentially unheard-of a decade ago, but it is now relatively commonplace in the financial landscape. However, the term is misleading and doesn't involve robots at all. Instead, robo-advisors are algorithms built to calibrate a financial portfolio to the user's goals and risk tolerance. Chatbots and robo-advisors powered by natural language processing (NLP) and machine learning (ML) algorithms have become powerful tools with which to provide a personalised, conversational and natural experience to users in different domains. Chatbots and robo-advisors have gained significant appeal with millennial consumers who do not need a physical advisor to feel comfortable investing, and who are less able to validate the fees paid to human advisors. Banks are also engaging chatbots to improve their self-service interfaces. Chatbots and conversational interfaces are a rapidly expanding area of venture investment and customer service budget. Such chatbots have had to be built with robust natural language processing engines as well as reams of finance-specific customer interactions.

Natural language processing is making it increasingly difficult for bank customers to tell whether they are talking to an AI interface or a human. Japan's three megabanks are using AI and robotics to streamline customer questions. For example, the Mizuho Group has a robot that helps answer asset management questions and compiles documents (Huang, Lehavy, Zang & Zheng, 2018). But chatbots are not the only personalized experience in finance. Many institutions leverage the vast amounts of data they have to analyze the consumers' spending behavior and provide tailored financial advice which can help them achieve their goals. Such services can include tips on how to reduce monthly expenses or perhaps visualizing them for the customer in a simple and user-friendly way, for example, the three places in which you spent the most this month. The institutions can also let you know that some recurring transfers will take place soon and you do not have enough funds on your account. All of those are just the tip of the iceberg of what modern financial companies can provide for their customers (Eryk, 2020).

Concept of Financial Innovation

Financial innovation is the process of creating new financial products, services, or processes (Chen, 2021). Financial innovation has come via advances in financial instruments, technology, and payment systems. Digital technology has helped to transform the financial services industry, changing how we save, borrow, invest, and pay for goods. While large banks continue to invest in mobile banking, FinTech companies, like Stripe, help small businesses conduct online payments, and investment broker Robinhood seeks to democratize investing and finance. These innovations have increased the number of financial providers available to consumers, borrowers, and businesses (Chen, 2021).
Financial innovation is the act of creating new financial instruments as well as new financial technologies, institutions, and markets. Recent financial innovations include hedge funds, private

equity, weather derivatives, retail-structured products, exchange-traded funds, multi-family offices, and Islamic bonds (Sukuk) (MacKenzie, 2008).

There are 3 categories of innovation: institutional, product, and process. Institutional innovations relate to the creation of new types of financial firms such as specialist credit card firms or internet only banks. Process innovation involve new ways of operating business and implementing information technology, such as the Automated Teller Machine (ATM), mobile banking, and online banking, among others. Product innovation includes new financial products such as securitized assets, derivatives, weather derivatives, foreign currency mortgages, hedge funds, exchange-traded funds, private equity and retail structured products, among others. An institutional innovation is the process of introducing new types of financial firms such as discount broking firms, internet banking, and specialist credit card firms, among others. All these types of innovation improve bank efficiency in the borrowing and lending of funds, which ultimately opens up a quick way of dealing with customers. This is in line with the findings of Nkem and Akujinma (2017) that the banking sector in the developing economy is strengthened by financial innovations in various payment methods such as the use of automated teller machines, mobile banking, and electronic banking and in the area of technological progress, resulting in increased competition in the sector.

New technologies have enabled banks, insurers and other financial services firms to overhaul their operations and identify different ways of serving their clients. Over recent decades, innovative products have transformed the financial services industry – from payment types including credit and debit cards, to transaction processing such as telephone and online banking, to saving options such as investment funds and structured products, to e-commerce for financial assets, to risk management techniques, and beyond. Financial services firms must embrace the opportunities offered by innovation and further integrate disruptive technologies, such as artificial intelligence (AI), advanced analytics, robotics, the cloud and blockchain, to enable new services and capabilities.

Manju (2019) in a landmark study on artificial intelligence in finance, understanding how automation and machine learning is transforming the financial industry. The study examined the influence of artificial intelligence in modern world, especially in the field of finance. This research focuses on application of artificial intelligence, its challenges, opportunities and its impact on jobs and functions. The research applied qualitative and quantitative research designs. This study found out that many financial sectors have been benefiting greatly by implementing different artificial intelligence applications. The study found AI useful in fraud detection, credit scoring and personalized banking experience in the form of roboadvisers and chatbots among others.

Nekesa & Olweny (2018) investigated effect of financial innovation on financial performance: a case study of deposit-taking savings and credit cooperative societies in kajiado county. It was established that product, process and organizational innovations are the critical factors that influence the performance of the financial status of deposit-taking money banks. The challenges of implementing new innovation are staff and institutional adaptability, security and compliance.

However, there are some challenges involve in the implementing of artificial intelligence for financial innovation, for example, the influx of artificial intelligence (AI) investment in the financial services space has brought forward new questions around data security and transparency. These, among other challenges of AI in financial services are particularly essential to address as data management practices evolve with the introduction of new AI solutions. Organizations must be aware of expected challenges such as data quality, Security and Compliance, Transparency, Explainability and Trust (Lerner & Tufano, 2011).

Methodology

The study was conducted in Uyo, Akwa Ibom State, Nigeria. The design of the study was quantitative, employing the descriptive survey research design for the study. The population is 174 respondents, comprising of 28 accounting lecturers in public universities in Akwa Ibom State and bank managers, operational staff and key personnel in commercial banks operating in Akwa Ibom State, Nigeria. The sample size is 143 determined through the Krecjie and Morgan Finite Table. The Sample comprised of lecturers, bank managers, operational staff and key personnel in commercial banks operating in Uyo, Akwa Ibom State. Simple random sampling was used. The research instrument used for the study is a researcher-developed questionnaire tagged "Artificial Intelligence Applications for Financial Process Innovation Questionnaire" (AIAFPIQ). Section A of the instrument elicited information on the demographic data of the respondents and Section B sought the opinion of respondents on issues based on the objectives of the study. All items in Section B was structured using four-point rating scale of Strongly Agree (SA), Agreed (A), Disagree (D) and Strongly Disagreed (SD) with weighted options of 4,3,2 and 1 respectively. The instrument developed by the researcher was face validated by three experts in the Department of Accounting, Akwa Ibom State University. All corrections and inputs were built in to the final version of the instrument. The test retest method was used to determine the reliability of the instrument. The instrument was administered to 30 persons who were not part of the sample but part of the study population. The result was then coded for testing using cronbach alpha technique. The reliability index yielded 0.89. On the basis of the high reliability index, the instrument was deemed suitable to be used in conducting the study. The data generated was analyzed using mean, standard deviation and t-test analysis. The mean and standard deviation was used to answer all the research questions while t-test was used in testing the research hypotheses at .05 level of significance.

Presentation of Results and Discussion of Findings

Research Question 1: How does the application artificial intelligence (AI) in Personalized banking experience promote financial process innovation by commercial banks in Nigeria?

Table 1: Summary of mean of respondents on application artificial intelligence (AI) in Personalized banking experience

S/N	ways of integrating artificial intelligence (AI) for Personalize d banking	$\overline{X}$	SD	Remarks
1	customer support	3.28	0.92	SA
2	Image recognition	3.65	0.84	SA
3	Speech recognition	3.28	0.92	SA
4	Chatbot	3.97	1.19	SA
5	Natural language generation	3.78	1.06	SA
6	Sentiment analysis	3.55	1.03	SA
7	Virtual financial assistants	3.82	0.95	SA
8	Personal Planning	3.65	0.84	SA
9	Personalized Reminders	3.28	0.92	SA
10	Automated Transactions	3.97	1.19	SA

SA –Strongly Agree

Table 1 shows the item analysis on how AI can be applied in personalized banking experience. The study identified 6 ways of applying AI for personalized banking experiences.

Table 2 shows that all the items have mean responses above 3.5, indicating strongly agreed. Thus, all the items were taken as being ways and means of application artificial intelligence (AI) in personalized banking experience in promoting financial process innovation by commercial banks in Nigeria. This include image recognition, speech recognition, chatbot, natural language generation and sentiment analysis.

Research Question 2: How does the application of artificial intelligence (AI) in credit scoring promote financial process innovation by commercial banks in Nigeria?

Table 2: Summary of mean of respondents on application artificial intelligence (AI) in credit scoring

S/N	Ways of integrating artificial intelligence (AI) for credit scoring	$\overline{X}$	SD	Remarks
1	Near instantaneous decisions	3.73	0.83	SA*
2	Predictive analysis	3.78	1.02	,,
3	Market risk analysis	3.79	0.63	,,
4	making use of qualitative data for risk modeling (e.g., news articles, annual reports, social media)	3.78	0.67	,,
5	Validating and backtesting risk models	3.80	0.58	,,
6	Producing forecasts of financial or economic variables used in risk management (e.g., bankruptcy probability, value at risk, interest rates, exchange rates)	3.63	0.76	,,
7	Risk reporting	3.83	0.58	
8	assess the creditworthiness of prospective borrowers	3.83	0.52	
9	AI models are used to predict borrowers' defaults with superior forecasting accuracy compared to standard statistical models	3.81	0.61	

*SA- Strongly Agree

Table 2 reveals the item analysis for how application of AI in credit scoring promote financial process innovation by commercial banks in Nigeria. The study identified 9 ways of applying AI for credit management. Table 3 shows that all the items have mean responses above 3.5, indicating strongly agreed. Thus, all the items were taken as being ways and means of application artificial intelligence (AI) in credit scoring and management for promoting financial process innovation by commercial banks in Nigeria. AI in credit management include market risk analysis, predictive analysis, making use of qualitative data for risk modeling (e.g., news articles, annual reports, social media), risk reporting, and to assess the creditworthiness of prospective borrowers.

Research Question 3: What are the challenges of implementing AI for promoting Financial process innovation by commercial banks in Nigeria?

Table 3: Summary of mean of respondents on the challenges of implementing AI for promoting Financial process innovation by commercial banks in Nigeria

S/N	Challenges of implementing AI for promoting Financial process innovation	$\overline{X}$	SD	Remarks
1	Unethical and unintended practices	3.35	0.34	SA
2	Threat of criminal interference	3.78	0.45	SA
3	Data localisation requirements	3.63	0.71	SA
4	Inadequate skills and traning	3.65	1.2	SA
5	Lack of regulatory framework	3.93	0.25	SA
6	Cost of new technology	3.69	0.64	SA
7	Data quality and sufficiency	3.52	0.77	SA
8	Data privacy and confidentiality	3.39	0.94	SA

Table 3 gives the summary of the mean and standard deviation of respondents on the challenges of implementing AI for promoting financial process innovation by commercial banks in Nigeria. The result shows that all the 8 items have mean responses above 3.50, indicating strongly agreed by all the experts. The Table identifies the following as the challenges of implementing AI in banking - data quality, data privacy and confidentiality, cost of new technology, lack of regulatory framework, inadequate skills and training, data localization requirements as well as unethical and unintended practices.

Hypotheses Testing

Ho₁. Experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in Personalized banking experience for promoting financial process innovation by commercial banks in Nigeria.

Table 4: Summary of t-test analysis for expert responses on application artificial intelligence (AI) in Personalized banking experience in promoting financial process innovation by commercial banks in Nigeria

Group	N	Mean	Std. Dev.	df	tcal	tcrit.	Decision
Bankers	108	3.83	0.50		.906	1.96	Reject Ho
Lecturers	35	3.91	0.28	141			

Table 4 gives the summary of the t-test analysis for expert responses on application of artificial intelligence (AI) in personalized banking experience in promoting financial process innovation by commercial banks in Nigeria. The calculated t-value (tcal) is 0. 906. At 141 degree of freedom and .05 alpha level, the critical t value (tcrit) is 1.96. Since the tcal is less than the tcrit, the null hypothesis is accepted. Thus, Experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in personalized banking experience in promoting financial process innovation by commercial banks in Nigeria.

Ho₂: Experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in credit scoring for promoting financial process innovation by commercial banks in Nigeria.

Table 5: Summary of t-test analysis for expert responses on application artificial intelligence (AI) in credit scoring in promoting financial process innovation by commercial banks in Nigeria

Group	N	Mean	Std. Dev.	df	tcal	tcrit.	Decision
Bankers	108	3.86	0.44		.383	1.96	Reject Ho
Lecturers	35	3.77	0.73	141			

Table 5 gives the summary of the t-test analysis for expert responses on application artificial intelligence (AI) in credit scoring in promoting financial process innovation by commercial banks in Nigeria. The calculated t-value (tcal) is 0. 906. At 141 degree of freedom and .05 alpha level, the critical t value (tcrit) is 1.96. Since the tcal is less than the tcrit, the null hypothesis is accepted. Thus, Experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in credit scoring in promoting financial process innovation by commercial banks in Nigeria.

Discussion of Findings
The findings of the study show that respondents strongly agreed on the application of AI for personalised banking experience. The study identified 6 ways of applying AI for personalized banking experiences. Table 2 shows that all the items have mean responses above 3.5, indicating strongly agreed. Thus, all the items were taken as being ways and means of application artificial intelligence (AI) in Personalized banking experience in promoting financial process innovation by commercial banks in Nigeria. This included image recognition, speech recognition, chatbot, natural language generation and sentiment analysis. The hypothesis test shows that experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in Personalized banking experience in promoting financial process innovation by commercial banks in Nigeria. This finding is corroborated by Nekesa and Olweny (2018) who investigated effect of financial innovation on financial performance. They found AI and other innovations as enriching the customer experience and making customer service more flexible while extending more services to the customers.

The findings of the study show that respondents strongly agreed on adoption of AI for credit risk management. The study identified 9 ways of applying AI for credit management. Table 3 shows that all the items have mean responses above 3.5, indicating strongly agreed. Thus, all the items were taken as being ways and means of application artificial intelligence (AI) in credit scoring and management for promoting financial process innovation by commercial banks in Nigeria. AI in credit management include market risk analysis, predictive analysis, making use of qualitative

data for risk modeling (e.g., news articles, annual reports, social media), risk reporting, and to assess the creditworthiness of prospective borrowers.

The corresponding hypothesis test shows that experts (bankers and Accounting lecturers) do not differ significantly on their responses on application artificial intelligence (AI) in credit scoring in promoting financial process innovation by commercial banks in Nigeria. This finding is supported by Manju (2019) who investigated artificial intelligence in finance, understanding how automation and machine learning is transforming the financial industry. This study found out that many financial sectors have been benefiting greatly by implementing different artificial intelligence applications. The study found AI useful in credit scoring and credit risk management. The result identified the challenges facing the implementation of AI by commercial banks in Nigeria. It shows that all the 8 items have mean responses above 3.50, indicating strongly agreed by all the experts. The Table identifies the following as the challenges of implementing AI in banking as data quality, data privacy and confidentiality, cost of new technology, lack of regulatory framework, inadequate skills and training, data localisation requirements as well as unethical and and unintended practices. This finding is supported by Manju (2019) who found that artificial intelligence is changing the financial service industry with positive effects, but also exposing the banks to systems that might soon be beyond their control while also introducing errors that would be costly to the banks in terms of dollars and cents.

Conclusion
The introduction of AI into financial services is one of the more inclined forward-looking explorations in today's international financial institutions. It is concluded that AI could be applied by commercial banks in Nigeria for credit scoring and enhancing customer services.

Recommendations
The following recommendations are made:
1. AIs should be systematically implemented by banks not just as a form of competition but as an overall business strategy.
2. Banks should integrate AIs for enhanced personal banking experience
3. Commercial banks can integrate AIs for assisting in credit scoring and management
4. As the global financial world adopts AIs for financial services, banks in Nigeria should follow the same lines for seamless transition into the digital age.

References

AMPLYFI (2021). How ai is changing credit risk management. https://amplyfi.com/2021/07/30/ai-in-credit-risk-management/Anjum, K. (2020, April 13).

Why banks need artificial intelligence. https://www.wipro.com/business-process/why-banks-need-artificial-intelligence/

Apoorva, S. (2021). Financial innovation. https://cleartax.in/g/terms/financial-innovation

Bachinskiy, A. (2019). The growing impact of ai in financial services: Six examples. https://towardsdatascience.com/the-growing-impact-of-ai-in-financial-services-six-examples-da386c0301b2.

Chen, J. (2021). Financial innovation. https://www.investopedia.com/terms/f/financial-innovation.asp.

Citi (2018). Bank of the future: The abcs of digital disruption in finance. Citi Report March 2018.

Dumasia, J. (2021). 5 applications of artificial intelligence in banking. https://ibsintelligence.com/ibsi-news/5-applications-of-artificial-intelligence-in-banking/.

Eryk, L. (2020). Artificial intelligence in finance: Opportunities and challenges. https://towardsdatascience.com/artificial-intelligence-in-finance-opportunities-and-challenges-cee94f2f3858.

Huang, A. H., Lehavy, R., Zang, A.Y. & Zheng, R. (2018). Analyst information discovery and interpretation roles: A topic modeling approach. *Management Science*. 64, 2473-2472.

Kumar, S. (2021). Use of artificial intelligence in banking world today. https://www.finextra.com/blogposting/20688/use-of-artificial-intelligence-in-banking-world-today

Lerner, J. & Tufano, P. (2011). The Consequences of financial innovation: A Counterfactual Research Agenda. *Annual Review of Financial Economics,* 3:41–85. https//www.10.1146/annurev.financial.050808.114326

MacKenzie, D. (2008). *An Engine, Not a Camera: How Financial Models Shape Markets*. Boston: MIT Press.

Manju, K. (2019). Artificial intelligence in finance. Understanding how automation and machine learning is transforming the financial industry. Masters Degree Thesis, Centria University of Applied Sciences, India.

Nekesa, M. & Olweny, T. (2018). Effect of financial innovation on financial performance: a case study of deposit-taking savings and credit cooperative societies in Kajiado county. *International Journal of Social Sciences and Information Technology*, 4(5),370-389.

Nkem, I. S. & Akujinma, A. F. (2017). Financial Innovation and Efficiency on the Banking Sub-Sector: The Case of Deposit Money Banks and Selected Instruments of Electronic Banking, *Asian Journal of Economics, Business & Accounting*, 2(1), 1- 12.

Poole, D., Mackworth, A. & Goebel, R. (1998). *Computational intelligence: A logical approach.* New York: Oxford University Press.

Russell, S. J.& Norvig, P. (2003). *Artificial intelligence: A modern approach* (2nd ed.), Upper Saddle River, New Jersey: Prentice Hall.

Tucci, L. (2020). A guide to artificial intelligence in the enterprise. https://www.techtarget.com/searchenterpriseai/Ultimate-guide-to-artificial-intelligence-in-the-enterprise.

Trends Annual Report (2017). https://futuretodayinstitute.com/2017-tech-trends/.
     Volcker, P. (February 20, 2009). Crisis may be worse than depression. Reuters, February 20, 2009.